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THE UNIVERSITY OF YAOUNDE I
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POST GRADUATE SCHOOL FOR THE SOCIAL AND EDUCATIONAL SCIENCES
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COMPETENCY BASED ASSESSMENT PRACTICES AND ATTAINMENT OF MATHEMATICS COMPETENCE AMONGST PRIMARY SCHOOLS PUPILS IN THE CENTRE REGION OF CAMEROON

A Thesis submitted to the Faculty of Science of Education ,Department of Curriculum and Evaluation in partial fulfilment of the requirement for the award of a Ph.D. in Educational Evaluation

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DEDICATION

To my entire family.

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Writing a research proposal and the final thesis can be most interesting but also most disturbing events in the life of a PhD candidate. While the content of the thesis is very important, other issues like organisation of work, conference or workshop presentations, working in a team, time management and coping with the supervisor, as articulated by Gosling and Noordam (2006), are very important as they count towards the ‘sinking’ or ‘swimming’ of the candidate. Hence, the researcher would like to express my heartfelt gratitude to the following people without whose help and cooperation I would have ‘sunk’ and the thesis would not have been a success.

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ABSTRACT

The study investigated the different types of assessment practices used in competency based assessment approach (CBA) which are susceptible to influence the attainment level of mathematics competence amongst primary schools pupils especially those of class six of the Anglophone subsystem education in the Centre region of Cameroon. It is in this light, the researcher has formulated the following general research question: How do Competency Based Assessment practices influence the attainment of Mathematics Competence amongst class six pupils in the Centre Region of Cameroon? Four research questions and four research hypotheses guided the study. Descriptive survey research design was used in the study. A total population of 3913 class six pupils across 697 primary schools formed the study population out of which 320 across 64 primary schools were drawn as a sample using a combination of a random and stratified sampling to select both schools and class six pupils under study. To collect the data, a questionnaire and a Mathematics Competency Test have been administered to the 320 respondents. The researcher made questionnaire entitled “class six pupils’ questionnaire” purpose was for the respondents to assess their teachers in the used of different types of assessment practices used in competency based assessment approach (CBA) susceptible to influence their mathematics competence attainment level. The researcher’s supervisor who is an expert in measurement and evaluation established the validity of the questionnaire and evaluation in the faculty of education, University of Buea using Cronbach Alpha statistics, which gave coefficients of meanwhile, the Mathematics Competency Test, actually measured pupil’s state of mathematics competence attainment at the time framework of the study. Frequency counts and percentages mean and standard deviation were used to answer the research questions while Pearson Product Moment Correlation Coefficient (PPMCC) (r) were used to test the hypotheses. Findings of the study revealed that, there is a positive perception in the mean scores of diagnostic assessment practices; formative assessment practices continuous assessment practices, summative assessment practices for the attainment of mathematics competence. It could be noted that all the four types of assessment practices had a mean scores above 15.0. This implies that, competency based assessment practices influence the attainment of mathematics competence of class six pupils in the Centre of region of Cameroon. Again, diagnostic assessment practices had the highest variation of scores(5.538) followed by formative assessment practices(4.308) then, continuous assessment practices(4.283) while summative assessment practices had the least variation of scores(3.399) in the attainment of mathematics competence. Pupils had an increase in Mathematics competence (36.64) the mean score is above 15.0 with a S.D=14.489. A statistically significant positive relationship respectively results revealed that:- the calculated Γ_{xy} - value of diagnostic assessment practices using CBA= 0.40; for formative assessment practices = 0.22; for continuous assessment practices using CBA= 0.30 and for summative assessment practices using CBA= 0.18. in each case, the calculated Γ_{xy} is higher than the critical Γ_{xy} at .05 level of significance with 318 degrees of freedom. In addition, their p-value were lower than 0.05. Using the multiple regression analysis the calculated F-value of 58.658 was higher than the critical F-value of 2.41 at 4 and 315 degrees of freedom. This indicates that the selected predictor variables: X_1, X_2, X_3 and X_4 significantly predicted the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. The study recommended that, the educational policies makers should revise a new curriculum and make provisions to indicate in terms percentage scores weigh continuous assessment portfolios evaluation, should be taken into account towards final terminal examinations or certificate evaluation. They should organize more pedagogic seminars or regular in service training on pupils’ competency based assessment practices to enhance teachers ‘assessment skills in cognitive, psychomotor and affective domains of knowledge. Teachers should involve pupils to participate in the selection of assessment criteria. The government should provide an incentive at the end of the seminars to participants.

Key words: Competence, Competency, Competency Based Assessment, Assessment Practices, Mathematics Competence, Primary schools Pupils, Attainment

RESUME

L'étude a examiné les différents types de pratiques d'évaluation utilisées dans l'approche d'évaluation basée sur les compétences (ACA) qui sont susceptibles d'influencer le niveau d'acquisition des compétences en mathématiques parmi les élèves du primaire en particulier ceux de la sixième classe du sous-système anglophone dans la région du Centre du Cameroun. C'est dans cette optique que le chercheur a formulé la question de recherche générale suivante : Comment les pratiques d'évaluation basée sur les compétences influencent-elles l'acquisition des compétences en mathématiques parmi les élèves de la classe de sixième dans la région du Centre du Cameroun ? Quatre questions de recherche et quatre hypothèses de recherche ont guidé l'étude. Une conception de recherche par sondage descriptive a été utilisée dans l'étude. Une population totale de 3913 élèves de sixième classe dans 697 écoles primaires a formé la population étudiée, dont 320 dans 64 écoles primaires ont été tirés comme échantillon en utilisant une combinaison d'un échantillonnage aléatoire et stratifié pour sélectionner à la fois les écoles et les élèves de sixième classe à l'étude. Pour recueillir les données, un questionnaire et un test de compétence en mathématiques ont été administrés aux 320 répondants. le questionnaire réalisé par le chercheur intitulé « questionnaire des élèves de sixième classe » visait à ce que les répondants évaluent leurs enseignants dans l'utilisation de différents types de pratiques d'évaluation utilisées dans l'approche d'évaluation basée sur les compétences (ACA) susceptibles d'influencer leur niveau de compétence en mathématiques. Le superviseur du chercheur qui est un expert en mesure et évaluation et Doyen à la faculté d'éducation de l'Université de Buea a établi la validité du questionnaire et de l'évaluation en utilisant les statistiques de Cronbach Alpha, qui ont donné des coefficients pendant ce temps, le test de compétence en mathématiques, a effectivement mesuré l'état d'atteinte des compétences en mathématiques des élèves dans le cadre temporel de l'étude. Les comptages de fréquence et les pourcentages de moyenne et d'écart-type ont été utilisés pour répondre aux questions de recherche, tandis que le coefficient de corrélation du moment du produit de Pearson (PPMCC) (r) a été utilisé pour tester les hypothèses. Les résultats de l'étude ont révélé qu'il existe une perception positive des scores moyens des pratiques d'évaluation diagnostique ; pratiques d'évaluation formative pratiques d'évaluation continue, pratiques d'évaluation sommative pour l'acquisition de compétences en mathématiques. On peut noter que les quatre types de pratiques d'évaluation ont obtenu des scores moyens supérieurs à 15,0. Cela implique que les pratiques d'évaluation basées sur les compétences influencent l'acquisition des compétences en mathématiques des élèves de la sixième classe dans la région du Centre du Cameroun. Encore une fois, les pratiques d'évaluation diagnostique présentaient la variation la plus élevée des scores (5,538), suivies des pratiques d'évaluation formative (4,308), puis des pratiques d'évaluation continue (4,283), tandis que les pratiques d'évaluation sommative présentaient la plus faible variation des scores (3,399) dans l'atteinte des compétences en mathématiques. Les élèves ont eu une augmentation de la compétence en mathématiques (36,64) le score moyen est supérieur à 15,0 avec un S.D = 14,489. Une relation positive statistiquement significative, respectivement, a révélé que : la valeur Γxy calculée des pratiques d'évaluation diagnostique à l'aide de l'ACA = 0,40 ; pour les pratiques d'évaluation formative = 0,22 ; pour les pratiques d'évaluation continue utilisant CBA= 0,30 et pour les pratiques d'évaluation sommative utilisant CBA= 0,18. Dans chaque cas, le Γxy calculé est supérieur au Γxy critique au niveau de signification de 0,05 avec 318 degrés de liberté. De plus, leur valeur de p était inférieure à 0,05. En utilisant l'analyse de régression multiple, la valeur F calculée de 58,658 était supérieure à la valeur F critique de 2,41 à 4 et 315 degrés de liberté. Cela indique que les variables prédictives sélectionnées : X_1, X_2, X_3 et X_4 ont prédit de manière significative l'atteinte de la compétence en mathématiques parmi les élèves de la sixième classe dans la région du Centre du Cameroun. L'étude a recommandé que les décideurs politiques en matière d'éducation révisent un nouveau programme et prennent des dispositions pour indiquer en termes les scores en pourcentage pèsent l'évaluation continue des portefeuilles d'évaluation, devraient être pris en compte pour les examens terminaux finaux ou l'évaluation du certificat. Ils devraient organiser davantage de séminaires pédagogiques ou de formations continues régulières sur les pratiques d'évaluation basées sur les compétences des élèves afin d'améliorer les compétences d'évaluation des enseignants dans les domaines cognitifs, psychomoteurs et affectifs de la connaissance. Les enseignants doivent faire participer les élèves à la sélection des critères d'évaluation. Le gouvernement devrait fournir une incitation à la fin des séminaires aux participants.

Mots clés : Compétence, Évaluation basée sur les compétences, Pratiques d'évaluation, Compétence en mathématiques, Élèves du primaire, Niveau atteint

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

LIST OF APPENDICES

ACRONYMS AND SYMBOLS

%	:	percentage
<	:	less than
∑X	:	sum of
A	:	agree
A+	:	expert
AA	:	average achiever
AaL	:	Assessment as learning
ACT	:	American College Test
AE	:	Approaching Expectation
AE	:	Above Expectation
AfL	:	Assessment for learning
AIDS	:	Acquired Immuno deficiency Syndrome
AIF	:	l’Agence Intergouvernementale de la Francophonie
AoL	:	Assessment of learning
ARG	:	Assessment Reform Group
B.Ed	:	Bachelor Degree in Education
BC	:	Before Christ
BEPC	:	Brevet d’Études de Premier Cycle
BIEF	:	Bureau d’Ingénierie de l’Éducation et de la Formation
C B A	:	Competency-Based Approach
CA	:	competence acquired
CA	:	Continuous assessment
CAP	:	Continuous assessment practices
CAPIEMP	:	Certificat d’aptitude pédagogie des instituteurs de l’enseignement maternel et primaire
CAT	:	Computer adaptive tests
CBA	:	Competence being acquired
CBC	:	Competence based curriculum
CBE	:	Competence based education
CBI	:	Competence based instruction
CBM	:	Curriculum-based measures
CBT	:	Competency Based Teaching
CEFR	:	Common European Framework of Reference

CEMAC : Communauté Économique Monétaire d'Afrique Central
CEP : Certificat d'Études Primaires'
CESA : Continental Education Strategy for Africa
CIDE : Consortium International Development Education
CIPP : Context, input, process, product
CIRC: Co-operative integrated reading and composition
CNA : Competence Not Acquired
CONFEMEN: Conférence des ministères de l'éducation des pays ayant le français en partage
COVID 19: Corona Virus Disease 2019
CPDM: Cameroon People's Democratic Movement
CPSCES: Cameroon Primary School Curricula for English schools
CRT : Criterion Referenced Testing
Cti : Context, Task and Instructions
DA : Disagree
DAP : Diagnostic Assessment Practices
DBDM: Databased Decision Making
DeSeCo: Defining and Selecting Competences
Df : Degree of freedom
DSCE : Document de Stratégie pour la Croissance et l'Emploi
DSSEF : Document de Stratégie du Secteur de l'Éducation et de la Formation
DV : Dependent Variable
E U : European Union
e.g : For example
EBLS : Experience Based Learning Systems,
EBSS: Evidence Based Standard Setting
EC : European Commission
ECD : Early Childhood Development
ECD : Evidence Centered Design
ECOWAS: Economic Community of West African States
EFA : Education for All
ELT : Experiential Learning Theory
Etc... : Etcetera
ETSSP: Education and Training Sector Strategy Paper
FAP : Formative Assessment Practices

FSLC : First School Leaving Certificate

G.T.T.C: Government Teacher Training College

GCE A/L: General Certificate of Education Ordinary Level

GCE O/L: General Certificate of Education Ordinary Level

GDP : Growth Development Product

GEQAF: General Education Quality Analysis/Diagnosis Framework

GESS: Government's Education Sector Strategy

H_0 : Null Hypothesis

Ha : Alternative Hypothesis

HIV : Human Immunodeficiency Virus

I Q : Intelligent Quoficient

i.e. : that is

IBE : International Bureau of Education

ICT : Information Communication Technologies

ILT : Integrated Learning Themes

IRT : Item Response Theory

IV : Independent Variable

KSA : Knowledge, Skills, and Abilities

LD : Learning disabled

LP : Lower performing

M&E : Monitoring and evaluation

MCQ : Multiple-Choice Questions

MDGS: Millennium Development Goals

ME : Meeting Expectation

MINEDUB: Ministry of Basic Education

MINEFOP: Ministry of Employment, Vocational Education and Training

MINESEC: Ministry of Secondary Education

MINESUP: Ministry of Higher Education

MKO : More Knowledgeable Other

MoE : Ministry of Education

N : Target population

NCLB : No Child Left Behind

NCTM: National Council of Teacher of Mathematics

NECTA:	National Examination Council for Tanzania
NRC :	National Research Council
NRT :	Norm referenced testing
NYE :	Not yet meeting expectation
OAU :	Organization of African Unity
OBP :	Objective-Based Pedagogy
OECD:	Organization for Economic Co-operation and Development
OIF :	L'Organisation Internationale de la Francophonie
OPA :	Objectives Pedagogic Approach
p* :	p value
PALD :	Proximal Assessment for Learner Diagnosis
PALS :	Peer-Assisted Learning Strategies
PAREC :	Programme d'Appui aux Reforme Éducatives du Cameroon
PASEC :	Programme d'Analyse des Systèmes Éducatifs de la CONFEMEN
PASZEP :	Programme d'Appui en Zone d'Éducation Prioritaire
PBL :	Projects base learning
PHD :	Doctoral degree
PISA :	Program for International Students Assessment
PR :	Professor
PTA :	Parent-Teacher Association
RESEN :	Rapport d'État du Système Éducatif National
S.D :	Standard deviation
SA :	Strongly agree
SAP :	Summative Assessment Practices
SAT :	Scholastic Assessment Test
SAT :	Standard Assessment Tasks
SBA :	School-based assessment
SD :	Strongly Disagree
SDG4 :	Sustainable Development Goal N°4
SES :	Socio Economic Status
SPEST:	Strategic Paper of Education Sector and Training
SSE :	Stratégie sectorielle de l'éducation
SSS :	Secondary School Teachers
STEM:	Science, Technology, Engineering and Mathematics

T/F : True or False

TA : Teacher Assessment

TIMSS: Trends in International Mathematics and Science Study

UK: United Kingdom

UN: United Nations

UNESCO: United Nations Educational Scientific and Cultural Organisation

UNICEF: United Nations Children's Fund

UNN: University of Nigeria, Nsukka

USA: United States of America

ZPD: Zone of Proximal Development

Γxy: Pearson Product Moment Correlation Coefficient (PPMC)

GENERAL INTRODUCTION

Each state has it responsibility to ensure that the largest number of graduates upon completion of primary, secondary and tertiary level must have acquired knowledge, skills and attitudes of careers profiles of their choice. In order to achieve the goal and to upgrade the status of Cameroon as one of an emergent African country by 2035 various improvements have been made particularly in the educational system. As a major step to improve its educational system, Cameroon shifted since independence from subject matter through content-based curriculum, then objective based pedagogy (OBP) to new pedagogic approach (NPA) otherwise called inferential thinking pedagogy. During the era, the initial training teachers received on evaluation was limited on Docimology aspects (science of examination based on marks allocations and both examiners and examinees behaviors). Doxology (it is the systematic study of the role evaluation plays in an educational system), and Doximastic (this concerns evaluations techniques) (Tsafak, 2001, p.244) cited in Moche G.C (2017p.3). The Ministry of Basic Education fully adopted with an immediate implementation in 2018 the French school of thought of Competency-Based Approach (CBA) otherwise called Pedagogy of Integration in both nursery and primary schools nationwide. New curricula were drafted and replaced the 2000 Cameroon national primary schools syllabuses and the 1997 nursery schools syllabuses. The Ministry of Basic Education intended to develop the knowledge, skills and attitudes of learners' profile under its authority with the expectation that, at the end of the primary school cycle, the learner should have acquired seven national core skills and exhibit the four broad-based competences. Therefore, the Cameroon 2018 new pedagogic tool emphasized a shift from objective based pedagogy to competence-based education hence, competences arose as a response capable of facing the relations between academics, learning goals, and the labor challenges of the subjects). The Bureau International du Travail mentioned that the level of competence is one of the main advantages needed in a globalized market. Hence, the competences rose, as a response to the need of articulating positively the knowledge from their holistic and integrated character with the abilities that the subjects must have to face in the world of work as far as vocational domains are concerned. Halász and Michel,(2011) and Tchibozo,(2011) equally emphasized that the notion of competence was seen as being more pertinent to vocational education and training due to its direct link with the labor market. Thus, no doubt, recruitment now our days is based on the competencies of job seekers. Schools integrate this new reality so that graduates fulfill socio- professional exigencies in a timely manner. According to De Ketele 2001, in Hirrt, (2009, p.6), "it is indeed the socio-economic climate which has determined the notion of competency as the adults shaped by schools were not sufficiently trained to enter the work force".

Eric (2013) emphasized on school attainment. He reiterated that, human capital is a driving factor to economic growth in developing countries. Considering the point of view of Eric (2013), the 2018 new curriculum in Cameroon for the nursery and primary schools laid emphasis on the effectiveness and efficiencies mechanisms for quality education along with guaranteeing the success of the socio-professional integration of the largest number of graduates upon just completion primary school cycle level. The building up of a new curriculum took in consideration the International, Continental and National instruments reviewed latter in this thesis. In relationship to academics and in particular to learning goals, activities for Nursery schools and/or subjects of Primary schools cycles were technically distributed to represent the weighting that was hitherto given to the various domains. In fact, the annual time allocation has been calculated and activities as well as subjects identified are built under appropriate domains. The various domains related to the weighting are Basic knowledge (60%), Communal life and national integration (5%), Vocational and life skills (20%), Cultural identity (5%) and Digital Literacy (10%). Competences to be developed by each subject area were clearly stated otherwise called disciplinary competences with their evaluation criteria. The essence of CBA lies in its shift away from typical school practices. The adoption and implementation of CBA therefore necessitated a change of paradigm in education. The new approach involved some challenges in respect to teaching, learning, evaluation or assessment practices and the legal framework within the country educational system. Different educational stakeholders were urged to 'pass from the paradigm of teaching to the paradigm of learning' (Gauthier B.& Richard, 2008 cited in Georgette C. M 2017 p. 16). The new curricula give the teacher, the latitude to use the methods or pedagogic strategies that enable them to easily attain their objectives and develop competences in the learners. The Ministry of Basic Education (MINEDUB), recommended innovative pedagogic practices that make the learners more responsible for their own learning and which include Project-Based Learning (PBL), Cooperative Learning (CL), Flipped etc. in relationship to a monthly Integrated Learning Theme.

The new curriculum was designed to guide the development of knowledge, skills and attitudes in the learners and to set the foundation for learning with emphasis on Science, Technology, Engineering and Mathematics (STEM). The language of science and technology is Mathematics. The curriculum therefore responds to one of the key missions assigned to the Ministry of Basic Education (MINEDUB) Cameroon Primary School Curriculum English Subsystem - Level III: Class 5 & Class 6(2018 p.3). Introducing notions of Mathematics, Science, and Technology involves the acquisition of Knowledge, skills and attitudes in these subject areas and the ability to use them to address challenges in real life situations. Fafunwa in Maliki, Ngban and Ibu(2009) revealed in their research study that, *" everyone lives in a world where science and technology have become an integral part of world cultures. For any nation to be relevant, the role mathematics plays in the educational system must not be underrated" (p.131).* Mathematics is thus regarded as an extremely powerful tool for the development of other human disciplines and represents the most of the phenomenon under natural sciences more accurately and exactly (Goodwin, et al., 2014). Much of the information in the physical and social world is mathematical in nature and so it is necessary to be mathematically competent to analyze effectively the information. People without this mathematical competency will be at a great disadvantage in dealing with this information to make reasonable decisions affecting their work, their life and their society (Spannberg, 2011) cited in Tadesse W(2014 p. 2). Moreover, particularly, students who are not competent in mathematics have a difficult time in understanding their major discipline. The competition and the opportunities in the career world become a serious problem for those students who are not competent in mathematics, because then they are excluding themselves from the many career paths that need mathematical competency.

Academic achievement in mathematics cannot be enhanced without effective learning strategy. The learning environment should be conducive for the learner to be subjected in fostering deep learning instead of surface learning. *Surface learning is easy to achieve, for example, through relying heavily on an examination-oriented curriculum that rewards learners for ability to reproduce knowledge* (Sutherland &Peckham, 1998). Bonwell and Eison (1991) described some characteristics of active learning:

(1) Students do more than listen;
2) More emphasis on developing skills than transmitting information;
(3) Higher-order skills are targeted (analysis, synthesis, evaluation);
(4) Engages students in activities (e.g., reading, discussion, writing);
(5) Greater emphasis is placed on students' exploration of their own attitudes, values, and prior experiences (Gogus, 2012).

Learning is an interactive process between teachers, learners, and learning resources in a learning environment. The learning process requires planning, implementation, assessment, and monitoring in order to be effective and efficient. To determine if learning has taken place or not is through children’s assessment learning outcomes. Kuswanto, H. Penilaian, P.IPA. (2008) defined assessment as an integral part of the learning process. To Yahaya, A. H.(2001 p.1) assessment is as a continuous process applied to determine the method proposed in lessons by teachers and supervisors, and at the same time it can give guidance for them to overcome the existing shortage. In fact, assessment enables teachers to evaluate the effectiveness of their teaching (Boud &Falchikov, 2007) inMoges L. (2009). Ukwuije and Orluwene(2016) believed that assessment helps the teacher to determine entry behavior, sets objectives, determines efficacy, motivates learners, helps them to develop desirable study habits, serves as source of feedback to parents and other stakeholders and inform educational planning and policy makers.

Primary education cycle is characterized by a repetition rate of about 25 % (DSSE, 2006, p.53). Bernard, Simon and Vianou (2005, p.22) confirmed that, during the 2002-2003 school year in Cameroon, “ about a quarter registered in schools were repeaters “ and “ 60 % of the pupils completed primary school”. Concerning the retention rate, this is one of the direct consequences of repeaters rate, in 2005 that was 55% in primary school cycle and 65.3% in secondary school cycle DSSE (2006, p.38). Similarly, within the same age limit respectively in primary and secondary schools stood 45% and 34.7% abandoning their studies before the end of the cycle. To reduce the repetition high rate in Cameroon primary school, the policy of collective promotion by level was implemented from 2006 and a new vision of evaluation with emphasis on psychometric properties assessment was drafted and recommended in referenced to Article 7 of the Ministerial Decision N° 315/b1/1464/MINEDUB of 21st February 2006 in basic education. One innovative aspect of the new curriculum is the focus on the assessment process. To be fully engaged, children should be familiar with the goals of the curriculum and included in the assessment process (Hickey & Anderson, 2007; Silver & Smith, 2015). In the assessments process of learning activities, teachers must be role models, build students’ motivation, and develop their potentials and creativity through activities which inspire learners to set and achieve goals that challenge them (Hasan, 2013). Thus, Competency-Based Assessments are opportunities created for children to apply the skills and methods they have learned in their lessons to real world problems and situations to determine if children can synthesize, apply, and evaluate their learning in a purposeful way. The competency based-curriculum involves children in a wide range of active learning situations including the development and practical application of skills and knowledge in doing, making, explaining, and solving, to achieve competence in essential life skills. Learners are expected to acquire necessary life skills such as autonomy, honesty, adaptability to technological changes, respect for self, respect for others and respect for institutions, 21st century skills of the students, collaboration, teamwork, creativity, problem solving and critical thinking for effective lifelong learning. Learners are placed at the center and are considered as the main actor in learning process. This approach is thus, child-centered and outcomes-oriented. Outcomes oriented signify that it is focused on developing competence as an outcome of the learning process (Mosher, 2011). Child-centered means that the curriculum focuses on the needs, interests, and environment of the child (Griffith & Lim, 2010; Misbah, 2019; Sukandi et.al. 2001). In the same perspective, Schlomer, R.S., Anderson, M. A., & Shaw, R. (1997 p.249) emphasized that, competency-based education is learner-centered due to the fact that, outcomes are specified and described what the learner must do in order to demonstrate competency. The evidence may be observed during classroom activity and collected as an outcome of classroom activity.

Previously, assessment had been done only at the end of the learning activity, but the implementation of 2018 curriculum changed the assessment system to be a measure of all aspects of learning all along the learning activity. Therefore, one of the recommendations in the new curriculum is competency-based assessment with emphasis on criterion-referenced assessment and formative and summative assessment should take into consideration knowledge, skills and attitudes as indicated on the "Expected Learning Outcomes" in forms of orals, written and practical. The learner's performance is evaluated against a set of criteria provided to the learner so that both the learner and the assessor are clear on what performance is required. The 2018 new curriculum confirmed that, programs were focused to identify and to define at each cycle, competences to be mastered by pupils at each level and attributed two mains functions: 1- development of competences and 2- assisting learners to learn.

According to Schlomer, R.S., Anderson, M. A., & Shaw, R. (1997 p.249), there are two important stages in the development of competency assessments namely:

Firstly, assessment development and score validation: it is to verify whether scores on the assessment reflect the different levels of knowledge and skills that assessment designers are trying to measure.

Secondly, assessment provides the means by which learners are graded, passed or failed. That is it determining how well a student must perform on the assessment in order to demonstrate competency in other words, what is the cut score that separates the competent from the not-yet-competent. In the same perspective, Katie L. M & Matthew N (2015 p. 3), John Harris &Stephen Keller (1976) outlined the major development effort in competency-based education not only lie in design of instructional materials but in design of appropriate performance assessments. The goal is to evaluate performance for the effective application of knowledge and skill in the practice setting. Furthermore, institutions should not commit themselves to competency-based curricula unless they possess means to assess directly students' performance. Teachers, pupils and schools must acquire sound knowledge of assessment and the professional skills to develop and apply this in practice (GTCNI, 2011).

Based on these principles, competency-based assessments must be representative by adequately assessing the constructs they are measuring and be direct by not including irrelevant criteria or information. The underlying philosophy of the CBA requires that learning should be based on the potentials of the learner. The focus is on learning and not on teaching. The learner should be responsible for his/her own learning. It is thus a move away from the idea that curriculum is mainly implemented by having pupils reproduce theoretical knowledge and memorize facts (the conventional knowledge-based approach).The conventional knowledge-based approach based on the objectives pedagogic approach (OPA) adopted so far however took little consideration on the development of learners' competence development carried out in school-based assessment (SBA). According to Ahmad & Warti, (2014) school based assessment is the process which involves leaners' assessment based on their skills, abilities, talents, potentials in both curricular activities and co-curricular activities without comparing them to each other's. Therefore, School-based assessment (SBA) is considered as a holistic assessment capable to evaluate students' cognitive aspects, affective and psychomotor in line with terminal learning outcomes and evaluation criteria of each of the domains outlined in the various subjects arears as found today in the 2018 Cameroon primary school curriculum of English-speaking sub system. School-based assessment (SBA) reflects deep learning, on the other hand, is achieved by constructive or alternative assessment practices (Geyser as cited in Fourie-Malherbe &Strydom, 2016). Given that, assessment practices influence whether learners adopt a deep or surface approach to learning, the routine assessment techniques had not met the objectives during either the formative, summative or certificates evaluations. To assess the outcomes of active or deep learning, a dynamic approach to assessment is required. Dynamic assessment takes place as an integral part of active learning. It involves careful observation of what children do or say to gather evidence of achievement. An indicator usually identifies this evidence. When a sufficient number of indicators have been successfully observed, it is determined that the child has achieved a competency level appropriate to his or her age and stage of development (Griffith & Hye-Yeon, 2014).

The irony is that, teachers are continuing to evaluate pupils performances based on the traditional conventional norm referenced method where children performances are compared against each other and then classified amongst them. As such the traditional' role of the teacher being transmitter of knowledge becomes learners' guide, facilitator, mediator between the learner and the content knowledge. It is thus a necessity of an evolution from a behavioral perspective to either a constructivism or a socio-constructivism, a progressive transformation of teachers practices instead of trans missive models but to participative approaches, a focus is lead on the learning process instead of the teaching of decontextualized contents as mentioned in Jonnaert, Ettayebi &Defise, (2009, p. 61). In fact, Competency-based Assessment is an important research topic, which might be divided into two open problems:

(1) Assessment design, which includes competency modeling by test designers, it is about formulating a competency structure to assess and clearly link each competency to an appropriate situation, problem and material.

(2) Assessment implementation by test developers, it includes means and tools used to capture measurable attributes of competency. However, assessing competencies involves a complex range of learners' characteristics such us: knowledge level, style, abilities, cognitive skills, background, etc. Mohammed, K. I. et al (2016 p. 58).

The focus of this study is on the implementation of competency based assessment practices that teachers monitors the learning process in the development of primary school pupils' mathematic competences. In prelude in Cameroon, no adequate studies have been conducted on the competency-based assessment practices and the attainment of mathematics competence amongst primary schools pupils in the Centre region of Cameroon. In the light of setting such, an investigation there are some constraints to be taken in consideration in order to guarantee the quality of assessment practices adequate to different types of competence based assessment practices under the study that will gear towards the attainment of mathematics competence amongst primary schools' pupils. The researcher designed the following key research questions:

- How does diagnostics assessments practices, related assessment activities, and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?
- A questionnaire has been administered to the class six pupils in order to identify the degree of pupils' opinion on their teachers for the use of diagnostic competence based assessment practices. Meanwhile a Mathematics competency test has helped to measure pupils' level of attainment in mathematics competence amongst class six pupils.
- How do formative assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?
- The researcher intends to investigate formative assessment practices that gather information about learners through specific classroom assessment strategies through integrated problem situations that effectively assess the full range of learners' abilities and outcomes geared towards the achievement of expected learning outcomes set out in the curriculum.
- How does continuous assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?
- The researcher intends to investigate continuous assessment practices not focusing only on traditional norm referenced assessment but also in integration skills and/or real life situations that assess partially pupils' mathematical competences progressively at a well-defined period.
- How does summative assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?
- The researcher intended to investigate summative assessment practices not focusing only on the traditional standardized tests and examinations but rather on integrated problems situations and/or real life situations, which will permit to evaluate the acquisition of the target mathematics competence for the purpose either of promotion or of certificate.

Organisation of the Study

The study is organised into five chapters. Each of the chapter has sub divisions but and validation of the work has been done during a pre defence by the faculty' authorities; the researcher could then do the two others chapters.

Chapter 1- Introduction

Chapter introduction, Background to the study , Statement of the problem, Purpose of the study, Objectives of the study, Research questions ,Significance of the study, Delimitations of the study , Limitations of the study, Budgetary plans and implications, Operational definition of terms, Chapter Summary.

Chapter 2- Review of Related Literature

Chapter introduction, Conceptual review, Theoretical review, Empirical review, Chapter Summary.

Chapter 3- Methodology

Chapter introduction, Research design, Area of study, Population of the study, Sample and Sampling procedures, Instrumentation, Validity of the instrument, Reliability of the instrument ,Administration of the instrument, Data collection procedure, Data coding schedule, Data analysis procedure, Ethical and legal considerations, Chapter Summary.

Chapter 4- Presentation of Results

- Chapter introduction,
- General Description of Data/Variables
- Hypothesis-by-Hypothesis presentation of Result
- Summary of Results

Chapter 5- Findings, Conclusion and Recommendations:

Summary of findings, Conclusions and generalizations, Recommendations and suggestions, Chapter Summary

CHAPTER ONE: INTRODUCTION

The Cameroon formal education system consists of pre-primary, primary, secondary and higher education components. By the stipulations of the education Law N° 98/004 of 14 April 1988, which laid down guidelines for primary and secondary education in Cameroon, the Cameroon education system is made of two subsystems. These are the French speaking subsystem and the English speaking subsystem. Both subsystems are expected to co-exist, but each *"preserving its specific method of evaluation and awards of certificates" (*Section 15). Cameroon has been struggling to ameliorate its educational system and equally ensures to insert youths with holders of diplomas in active life. This desire started from its evaluation, evaluation that presented frequent children's' repetition irrespective of the educational system and order or cycle as well as a low rate of retention. ». In order to reduce drastically the repetitions rate and implement the 1996 constitution that guarantees the right to education to each child. In compliance to law No 98/004 of 14th April 1998, Section 4 stipulates that, the general goal of education at the nursery, primary and secondary education is to "train children for their intellectual, physical, civic and moral development and smooth integration into society bearing in mind prevailing economic, socio cultural, political and moral factors". On basis of this goal, some objectives of education were enumerated with the vision that Cameroon will be an emergent country by 2035. The government has taken a number of measures. Amongst others, in September 2018, the Ministry of Basic Education enacted with an immediate implementation a new curriculum on Competency-Based Approach (CBA) with emphasis on the French school of thought pedagogy of integration in both nursery and primary schools cycles. This brought about a shift from the Objective-Based Pedagogy (OBP) to the Competency-Based Approach (CBA) or pedagogic of integration. New curricula for both nursery and primary schools replaced the old 1997 nursery school syllabus and the 2000 English primary school syllabus. The curriculum recommended Project Based Learning that is supported by the Integrated Learning Themes (ILT) and the Cooperative Learning (C L) strategies to acquire developed competences prescribed in the curriculum.

All efforts invested in teaching are futile without ascertaining that learning has taken place. The only proof that learning has taken place is an assessment result or outcome. Assessment is a generic term for a set of processes that measure the outcomes of students' learning, in terms of knowledge acquired, understanding developed, and skills gained. According to Sterling, D. (2005 p.33.) an effective assessment is one that is related to the way of learning, and the results can be used to inform the learning outcomes. Mastery learning is an instructional approach that espouses the use of assessments to gauge students' progress toward mastering a learning goal. In principle, teachers should evaluate learner's learning in relation to their abilities and expected learning outcomes. Objectively the aim of assessment of learning outcomes by educators is to monitor and evaluate the process, the learning progress, and improvement of students learning outcomes on an ongoing basis. Through assessment, the effectiveness of instructional technologies and strategies are known and so assessment provides a basis for necessary modifications or improvement of any or all aspects of a given program. Assessment permits learners to obtain feedback on their learning and helps them improve their performance.

In an attempt to strengthen the evaluation mechanisms forces, Díaz-B.B (2014) proposed that teachers should innovate constantly their pedagogical practice that collaborate with the integral and autonomous learning processes by reinforcing evaluations with an authentic and contextual character. As such, teachers are recommended to new evaluative practices that allow learners to participate in the development of their own value judgments involving knowledge, skills and attitudes. In other words, current best practice includes assessment, which is aligned to learning goals, which focus not only on content knowledge but also on process and capabilities. Research demonstrates that, there is neither a single method that, would fully measure key core competences , transversal skills and the mathematical competences, nor serve as a best practice for student assessment. Children can be involved in assessing their performance, monitoring their progress, and selecting evidence of achievement for classroom display or for inclusion in their portfolio (Bates, 1983; Bosco, 2010; Hickey & Itow, 2012).

Fadel, C et al (2007) also revealed that researchers in the field of assessment should take in consideration the cultural shifts that arise from the emergence of more participatory cultures; they will need to find new methods of applying assessments to learners. This means a change of the evaluative practice to be able to integrate the competences in the learning processes and performance as a way of establishing links of the knowledge and contexts in which they can be transferred to improve decision-making. A mastery (or task-involving) climate emphasizes effort, cooperation, learning, improvement, social relations, and a positive approach to mistakes viewed as naturally associated with the learning process. In contrast, a performance (or ego-involving) climate fosters social comparison, intra-team competition, normative-based evaluation; individuals are disapproved of when committing mistakes or underperforming. By so doing, competence based assessment entails to measure the mastery and attainment level of the competence instead of learners' performance against each other's based on knowledge, skills and attitudes learning outcomes objectives or competence to be developed through core competences ,transversal skills that form each of the disciplinary competences in different context. Teachers are expected to derive appropriate strategies to handle them. It is not always necessary or desirable to limit the collection of evidence to written or other tests only. Different test types require different test taking skills because of the variation in the tasks and structure of answering mode. The effectiveness of a method depends on its purposes and design, as well as on schools and teachers' capacity to use it. The teacher's role is central to ensuring quality assessment within schools (Wyatt-Smith et al., 2010). Teachers can be rather flexible in their choice of methods as long as these assessment approaches serve multiple purposes and follow the principles of validity, reliability and equity (Assessment practices for 21st century learning: review of evidence p. 8). For instance, in mathematics curriculum, there are shifts from lecturing teaching to mathematics problem-solving teaching, from teaching objectives to expected learning outcomes. The conventional assessment based on norm referenced testing of the objective based pedagogy has its specificities to solve exercises has moved to tasks (integration situations), real life situations or complex problem situations in relationship to relevant assessment criteria elaborated for each of the subject area. Subjects are no more to be taught as a subject with more emphasis on theory, but must prepare the learners to develop competences.

To implement effectively classroom assessment, the teacher must be knowledgeable in competence based assessment literate and skills that according to Ani (2018) is a variety of skills adopted by the teachers help to make the learner achieve the goals of education. Based on literature review, it seems that competencies still subject to different modeling and scales, and have suffered from a variety of interpretations and implementations within learning systems. Competency-based Education (CBE) focuses on the outcomes of learning by defining goals and processes to achieve those (El Falaki et al., 2011). CBE involves a methodology to describe model and assess competencies. To assess competencies in an educational system, there are need to set clearly a competency assessment model. The variety in competency modeling and assessment techniques could be explained, then, by the fact that existing models and standardized tests do not follow the extremely rapid change by:

(1) Different conceptions of learner profile;
(2) Various approaches promoting knowledge, skills or attitudes;
(3) Different assessment strategies to meet specific needs.

For tutors, assessing student competencies help them generating concept maps, with understood concepts and misunderstood ones, that need further explanations or more practices in real contexts Mohammed ,K. I. et al (2016 p. 57). The starting point of developing a competency assessment model is defining and modeling students' attributes to be measured. Therefore, evaluation becomes one of the more significant stimulus for the development of learning as a tool and a practice that orient the involvement of the students to promote reflection, self-evaluation, and self-regulation of the apprehended competences (KNUST; GÓMEZ, 2009). As held by authors like Jaimes and Callejas (2009), evaluation must consider knowing, knowing to do and knowing to be, at which point especially the different learning goals intersect from a transverse view, since they are positioned and constructed from the everyday education. Evaluation activities should be done by using a good instrument of evaluation. A valid evaluation instrument is one that provides an overall picture of the program to be evaluated in addition, produces evaluation outcomes according to the purpose of the evaluation. CANO (2008) proposed two levels of new evaluative practices. Firstly, he defined evaluation **as a didactic crossroads** since it had an effect and cause of learning. Second, the **competence-based assessment forces the use of a diversity of instruments** and **the incorporation of different educational agents.**

To adapt the novelty in Cameroon educational system, the Ministry of Basic Education enacted a new curriculum in 2018 recommending competency-based approach resulting to competency-based assessment. Competence based assessment provides the basis for decisions on whether a learner is ready to proceed, to qualify for an award or to demonstrate competence to practice. Competency-based assessment thus, provides myriad benefits, starting with the involvement and engagement of the learner. This category of assessment is viewed as putting students on a competency scale in order to compare them, more specifically; it tends to pinpoint where their understanding is strong and where their understanding is less strong. Competence based assessment is thus regarded as a part of assessment, and referred to the making of a value judgment about the learner's competence against the assessment criteria (Scriven, 1991). In order to achieve the criteria, the first thing to do is a needs analysis. In fact, competence based assessment practices implies new orientations which entails a comprehensive assessment of how well learners perform academically in education looking at the cognitive, affective and attitudinal aspects in relation to active learning through constructive activities that not only build knowledge but develop skills and attitude in learners in general. The orientation leads the constructivism model of learning and could be considered a new paradigm of learners' competence based evaluations. The process of evaluation has been regarded as a guide to implement a plan/program (Grondlund, N. E., & Linn, R. L, 1990, Kuo-Hung Tseng, C. Ray Diez, Shi-Jer Lou, & all (2010). Furthermore, the process is useful to establish the basic terminology of evaluation, which is a systematic process of collecting, analyzing, and interpreting information in order to determine the extent to which learning objectives have been achieved by leaners. According to Ilhan Ozturk, Winter (2001 pp. 39-47), the process of needs analysis, enables the evaluator to gain clarity about the problems of the evaluated program.

Desperately, according to Niss (1993) in our classroom today, the experience shows that many teachers continue to assess their learners based on a behaviourist approach. According to Fine, Thayer, &Coghlan,(2000) and ;Torres &Preskill, (2001) ,traditionally assessment has involved the student in answering written questions, possibly under a time constraint. This traditional assessment practices, however, focus in large part on the individual and fail to account for knowledge building and learning in context. In this approach, discrete facts and skills are tested, where grading and ranking are the primary goals. It is in similar way pupils and students have been evaluated in past years in Cameroon. from , archives of the Regional Delegation of Basic Education for Centre the geographical area of this study , results of the 2020 session First School Leaving Certificate(FSLC) and class six pupils' Mock results showed that, roughly 85% of pupils' populations have been performing poorly in Mathematics.

A number of factors may influence the attainment of Mathematics in children. Therefore, it is important to be aware of these and, as far as possible, to reduce their impact. They include intellectual factors, emotional factors, neurological factors, teacher's attitude toward arithmetic and understanding of concepts, appropriate intervention in instructional strategies, teaching aids , pupils find difficulties in learning Mathematics because of the complexity of using symbols and computational practice, absence from school. In addition, pupils tend to forget previously learned concepts and skills that are necessary for the new skills to be learned. As a result, students lack the needed knowledge and comprehension to advance to the next level of study. Again, all of motivation, knowledge, and competence as well as more transient factors such as fatigue or distraction jointly affect performance. Finally, pupils' underperformance may be accredited to teachers' inability in competency based assessment skills Okpara,(2019).

Kilpatrick, (1993, p. 44) enumerated the challenge of the 21st century, as far as mathematics educators are concerned, with an aim to produce an assessment practice that does not only measures a person's mind but treat it. Further, he emphasized on the need to understand how people's cultures is embedded in the teaching of mathematics for their general interest. Referring to my specific context of this study, the main aim is to increase the attainment of a number of Cameroon primary schools pupils with low mathematical competence by appropriate competency based assessment activities as well as assessment tools/instruments not often used by teachers. Educational authorities have so far being organizing pedagogic follow up seminars and animations to update teachers in competency based assessment skills since 2018. Many stakeholders believed that, more frequent testing and grading has the potential to increase student performance by providing motivation to improve their grades and scores (Klapp, 2015). Since we are in an era of global digital world, STEM education policy is the backbone of future local careers specialists in scientific, technical and engineering domains. It is also necessary for financial literacy and relevant to most forms of employment and learners should acquire mathematical competences or skills involving in the above domains as a prerequisite for Cameroon to an emergent country by 2035.

According to Cameroon Primary School Curriculum English Subsystem - Level III: Class 5 & Class 6(2018 p.27), after the teaching-learning experiences of mathematics, learners will be able to exhibit the following Terminal Learning Outcomes/competences to be developed by the learners:

- solve problems involving sets and logic;
- solve problems involving number operations;
- solve problems involving measurement units;
- construct different geometric shapes;
- categorize statistics on graphs;
- use mathematical skills in daily life;
- show interest in mathematics;

Mathematics develops the learner's creativity, initiative and problem-solving skills. It equally develops logical and inferential thinking, the ability to deduce and visualize in space and time. Mastering Mathematics entails the acquisition of knowledge, skills and attitudes as well as problem solving skills related to the different integrated learning themes in Cameroon context. Primary School learners need these in computation, logical thinking and problem solving to construct knowledge and understand the world around them. If not properly handled by educational authorities, upon completion of class six leaver in primary school level, this state of affair will increase numeracy illiterates (citizens who are unable to count or solve simple daily or real life problems situations) and create a future disadvantage for local careers specialists that learners require mathematical competences.

There was a need to innovate and reformulate the pedagogical and evaluative practices, which are progressively replacing the traditional conventional norm, referenced testing or assessment. The officials of the Ministry of Basic Education recommended three forms of evaluation (oral, written, and practical) to assess competence development (knowledge, skills and attitudes), it is done based on three types of assessment (diagnostic, formative, and summative) using diverse tools to collect information about the learner in order to moderate and increase learners' chances of learning from one another. In assessing pupils Mathematics learning outcomes or competences, we need to assess factual knowledge, understanding of concepts, computational ability, appropriate application of techniques, and the practical skills of doing and communicating. However, competency-based assessment approach does not make any provision for assessing and recording the progress of lower attaining pupils. Teachers use the same approach for assessing all pupils to assess progress in learning and outcomes attainments. In an effort to identify the types of competency-based assessment practices and related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of Mathematics competence amongst primary schools' pupils in the centre region of Cameroon. This research work specifically thus, investigated how Competency Based Assessment practices influence attainment of Mathematics competence amongst primary schools pupils in the Centre region of Cameroon.

To achieve the aim, the researcher first administered a closed structured class six pupils' questionnaire under the guidance of the classroom teacher and general supervision of the researcher. The purpose of the questionnaire was to get an appraisal from the respondents (class six pupils), following the different types of Competency, based assessment practices under study, the types of assessment activities, tools and or instruments their classroom teachers had either carried out or used in the learning and assessment processes of mathematics competence. Secondly, the researcher wanted to find out whether learning actually took place or not by administering a Mathematics Competency Test to the same respondents, which obtained results justified the level of mathematics competence attainment of the respondents. In addition, this chapter will also deal with the background to the study, the statement of the problem, the purpose, the objectives of the study, the research questions, the hypotheses, the scope of the study, the significance, Justification and operational definition of terms and concepts.

1.1 Background to the study

1.1.1 Historical background

Every country has its long historical and cultural traditions that explicitly or implicitly are reflected on education system Lamichhane B.R (2018 p. 5). In the history of education, assessment back to the Zhou dynasty in China (1207-1771 BC) which was used to select officials for the imperial civil service (Berry & Adamson, 2011). It was used to assess public programs, but it emerged as a distinct area of professional practice only in the post-war period. In the 60s, different countries have set their educational priorities according to their needs, market demands, development of science and technology, economic status and socio-cultural aspects etc….in particular and their worldviews or paradigms of mathematics education in general. In the context of education in Cameroon since 1961 in Article 1 of the Constitution of the Federal Republic of Cameroon, bilingualism is a constitutional provision that made French and English the official languages of Cameroon. The state of Cameroon has formerly inherited two educational sub-systems from its colonial masters simultaneously: one based on British for the English speaking regions of the country and the other on the French speaking regions of the country. However today, the bilingual nature of Cameroon has stimulated the government, confessionals and lay private individuals to build bilingual institutions nationwide irrespective of the level in both the English-speaking and French-speaking regions. The trends in the UK, France , USA and the vast majority of education systems in the world including Cameroon today agree on placing competencies at the heart of curricula .They have shifted towards centrally prescribed curricula that provide for inclusion of pupils with difficulties or disabilities and a focus on learners. The EU, OECD countries, and UNESCO in common are on the opinion that, global economic recession with the advent of COVID 19 pandemic, advancing information and communication technologies, sociopolitical violence in communities, secessionism intolerance and identity crisis are all fundamentally altering the way people live, work and learn (Takayama, 2013; Busca Donet et al., 2017). On the part of the Common European Framework of Reference (CEFR 2018), which aims is to ensure the participation of countries' members valid assessment of learners in supports to competence development in general and the development of national and/or regional strategies for promotion of STEM (science, technology, engineering, and mathematics) education in particular. Emphasis is equally led on: -

- Inquiry-based pedagogy (i.e. inductive, discovery-like, student-centered approach to education) including experiential, hands-on opportunities;
- Multidisciplinary education including project-based learning across different subject areas (e.g. science in context -environmental, political, social, economic, cultural and artistic);
- Building partnerships with outside actors to ensure relevance to real-life situations, possible career choices, and jobs (e.g. partnerships of schools with the industry or research institutions, setting up science-education centers, between-schools partnerships, etc.(p.88.)

1.1.1.1 The Educational Policy of Cameroon

The educational policy and practice in Cameroon have historically been influenced by the policies and practices from the United Kingdom (UK), France as colonial masters and more recently to that of the United States of America (USA). The Cameroon formal education system consists of pre-primary, primary, secondary and higher education components. By the stipulations of the education Law N° 98/004 of 14 April 1988, which laid down guidelines for primary and secondary education in Cameroon, the Cameroon education system is made of the two subsystems. These are the French speaking subsystem and the English speaking subsystem. Both subsystem are expected to co-exist, but each *"preserving its specific method of evaluation and awards of certificates"(*Section 15). The structure of the education system differs slightly in the Francophone and Anglophone parts of the country. Although not recognised by the 1998 law, the Arabic speaking subsystem also exists in a less elaborated manner, particularly in the Northern Regions of Cameroon. In both parts of the country, primary education comprises six years with unified objectives and curriculum. Secondary schooling consists of 7 years total – in the Francophone system there is a first cycle of four years for lower secondary education and a second one of three years for upper secondary education, whereas in the Anglophone system there is a first cycle of five years for lower secondary and two years of upper secondary education. In the Bilingual Primary schools, the English-speaking children follow the Anglo-Saxon. The French- speaking children follow the francophone educational system and write the "Cerificat d'Etudes Primmaire"(CEP) after six years, the "Brevet d'Etudes de Premier Cycle" (BEPC) examination after four years, then Probatoire Examination after another two years and finally Baccalaureat at the end of the seventh year; and three year to obtain a "Licence' from any university. In summary, it is a 6-4-2-1-3 for the Francophone Sub-System meanwhile, the English sub-system that is a 6-5-2-3 system as children spending six years at the primary school and then writes First School Leaving Certificate (F S L C) at the sixth year. Five years at the secondary school then write the General Certificate of Education (GCE) Ordinary Level; two years at the high school to sit for the GCE Advanced Level. In addition, three years at the university to earn a First Degree; extra two years for masters and extra three years for PHD or doctoral degree.

As far secondary and high school levels are concerned, the government of Cameroon subsidizes others owned private stakeholders with subventions yearly. There are many private and prestigious mission secondary/high schools, which charge more school fees to parents. Students who can afford them or those who do not gain admission into government secondary/high schools resort to the mission/private institutions. The rate of students' enrolment has increased significantly in an alarming tune at both secondary and those attending universities. Within the last ten years, more institutions of higher learning have been created. In order to ensure the availability of education, governments used numerous policies. The process of reform and decentralization of its education system after the World Conference on Education for All held in Jomtien Thailand, in 1990 started despite the economic crisis. The right to education is secured in the African Charter on Human and Peoples' Rights (African Charter) 7 and the 1990 African Charter on the Rights and Welfare of the Child (African Children's Charter). Art 11 African Charter on the Rights and Welfare of the Child, OAU Doc CAB/LEG/24.9/49 (1990), entered into force on 2 November 1999. In 2000, the Dakar Framework for Action promoting education for all gave another impulse to ensure the availability of free primary education. Through this framework, states commit themselves to expand and improve comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children. Cameroon is party to all these instruments, providing for the right to education, which is enshrined in paragraph 23 of its Constitution's Preamble in these words: "The state shall guarantee the child's right to education. Primary education shall be compulsory. The organization and supervision of the education shall be the bounden duty of the state". In compliance to Article 7 of the law No 98/004 of 14th April 1998 laying down the guidelines for education in the Republic of Cameroon which states "the state shall guarantee equal opportunities for education to all, without discrimination, as to gender, political, philosophical or religious opinion, social, cultural, linguistic or geographical origin". Primary education became free for all children in Cameroon in the year 2000 despite the fact that, parents still pay minimal Parent-Teacher Association (PTA) levies in government or public schools. The government is the largest provider of primary education. In the cities, the number of privately owned primary schools is rising —they charge very high fees for higher quality education, involving ICT. Since 2020/2021, the government through PAREC and UNESCO provide progressively level by level some basic primary schools texts books to government primary schools. The government's policy of creating schools in every neighbourhood and at least a university in each region of the country is an attempt to give every citizen the opportunity of going at a low cost in proximity to their parents or guardians. It is revealed that;

- Cameroon's Education Expenditure stands at 3.0 % GDP (World Bank, 2013)
- Pupil/Teacher ratio is 46:1 (Open Data for Africa, 2012)
- % entering primary school having attended preschool – 28.71% (UNESCO, 2016)
- % completing primary school – 75.42 % (UNESCO, 2016)
- % Transition to secondary school – 66.49% (UNESCO, 2015)
- % Completion of secondary school – 45.6 % (World Bank, 2015)

Before the Cameroon GCE board came to existence in 1993, the General Certificate of Education in U K awarded certificates to Anglophone Cameroonian students because it was a Trust Territory under British administration (British Cameroons) from 1922 to 1961. With the gaining of Independence and the exit of the colonial powers, in 1976 the General Certificate of Education, London tradition was handed down from London to the Ministry of National Education, Yaoundé (Ngangeh, 2007). A Presidential Decree and Text of Application of October 12, 1993 was issued creating the body to be known as the Cameroon GCE Board. It is a Para-public establishment of an administrative nature and is placed under the tutelage of the Honourable Minister of Secondary Education. The mission of the examination board as completed by the Prime Minister's Order of 12th October 1993 is to organize the General Certificate of Education, Ordinary and Advanced Levels. The scope of the GCE Board was limited to GCE General Education examinations only. However, Anglophone technical schools candidates attributed their massive failure of due to poor translations of papers from French to English language during official's examinations, on 5th March 1997; the Presidential Decree of July 1993 was expanded to cater for Anglophone General Certificate of Education, Ordinary and Advanced Levels in charge of technical education. So far, the GCE advanced level and the Baccalaureate (the French Equivalent of academic attainment) are the two main entrance qualifications into Cameroon's institutions of higher learning. Cameroon has fragmented its educational system in four ministries in charge of education of its citizens namely the Ministry of Basic Education (MINEDUB), the Ministry of Secondary Education (MINESEC), the Ministry of Higher Education (MINESUP), and the Ministry of Employment, Vocational Education and Training (MINEFOP). The Ministry of Basic Education (MINEDUB) and the Ministry of Secondary Education (MINESEC) always in joint circular elaborate and publish the calendar of each school year which usually runs from September to June despite some adjustment that have been made in April 2020 due to outbreak of COVID 19 pandemic that caused many death around the globe. From May to mid-July candidates of national official's examinations, sit for their certificates examinations. Each ministry prescribed official texts book lists as recommended by national commission in charge of the selection of the books before the beginning of each academic year.

1.1.2 Contextual background

Cameroon has been struggling to ameliorate its educational system and equally ensures to insert youths with holders of diplomas in active life. This desire starts from its evaluation, evaluation that presents frequent children's' repetition irrespective of the educational system and order or cycle as well as a low rate of retention. In primary cycle, the repetition is pivoting around 30% in 1980, 28 % in 1990; 24. 8% in 2000, 26 % in 2002, 26% in 2004. (RESEN 2001, 2003 and 2006; DSSE, 2006). This shows a persistence repetition in basic education system. Primary education cycle is characterized by a repetition rate of about 25 % (DSSE, 2006, p.53). Bernard, Simon and Vianou (2005, p.22) confirmed that, during the 2002-2003 school year in Cameroon, " about a quarter registered in schools were repeaters " and " 60 % of the pupils completed primary school". Concerning the retention rate, this is one of the direct consequences of repeaters rate, in 2005 that was 55% in primary school cycle and 65.3% in secondary school cycle DSSE (2006, p.38). Similarly, within the same age limit respectively in primary and secondary schools stood 45% and 34.7% abandoning their studies before the end of the cycle. Different rapports analyses of the educational system (RESEN, DSSE, Etats généraux de l'éducation,) illustrating « structural characteristics » classroom repetition, the question is to find out whether repetition is beneficial to the learner in particular and to the educational system in general as being asked. Bernard et al. (2005, p.23) answered, « Repetition is an act of injustice and delays scolarisation ». In order to reduce drastically the repetitions rate and implement the 1996 constitution that guarantees the right to education to each child. In compliance to law No 98/004 of 14th April 1998, Section 4 stipulates that, the general goal of education at the nursery, primary and secondary education is to "train children for their intellectual, physical, civic and moral development and smooth integration into society bearing in mind prevailing economic, socio cultural, political and moral factors”. On basis of this goal, some objectives of education were enumerated with the vision that Cameroon will be an emergent country by 2035. The government has taken a number of measures. Such as it elaborated the key pillars of the Strategy for Growth and Employment Paper (Document de Stratégie pour la Croissance et l’Emploi- DSCE in 2009, then the Strategic Paper of Education Sector and Training(SPEST,2013-2020) in French ‘Document de Stratégie du Secteur de l’Education et de la Formation’ (DSSEF, 2013-2020). The Strategic Paper of Education Sector and Training (SPEST, 2013-2020) was the government educational policies vision paper as stated in the Constitution. The SPEST embodies a continuum of the policies. The SPEST priorities are also confirmed in the vision document “Cameroun emergent à l’horizon 2035” report, which also includes early childhood development (ECD) programs as a priority. It is outlined in the Government’s Education Sector Strategy (GESS) or Stratégie sectorielle de l’éducation(SSE) (2006) and focuses on promoting access and equity, improving quality and relevance, strengthen sector governance and management, and adopting financing mechanisms for education and training, as it also addresses institutional aspects, and modalities for monitoring and evaluation (M&E). In January 2020, the Strategy for Growth and Employment Paper (Document de Stratégie pour la Croissance et l’Emploi- DSCE(2009) was revised and completed by National Growth Devopment Strategy in French ‘la Stratégie Nationale de Developpement (SND 30)’. It is a referenced document that guides government’s action as far as development is concerned for the next decade. Each ministry in charge of education and professional training is entitled to mould human resources, which will be able to realise the Cameroon’s vision of development.

In order to achieve this goal of development, the Ministry of Basic Education started by sensitizing teachers on the negative effects of the alarming repetitions. Collective promotion within each of the three levels in primary schools has been adopted. The new vision of evaluation since 2006 has been practiced and from 2018, competency based assessment has gradually replacing the new vision of evaluation. Thus, one of the major alternatives has been on the emphasis of competency-based assessment practices. There is need for an urgent adequate response and a comprehensive approach towards learners’ new assessment in respect to the CBA with hope to not only evaluate but also improve on leaners to demonstrate learning in general and mathematics competence in particular.

1.2 Statement of the problem

Mathematics is a knowledge that is indispensable to the educated man Rampal & Subramanian, (2012) regarded mathematics as a killer subject reason being that most students to not perform well in mathematics at the beginning of the school year. Some authors nationwide and internationally enumerated challenges as a cause for poor educational achievements. Others researchers have conducted empirical studies trying to provide solutions in order to improve attainment of learners' mathematic competences in particular and school attainment in general. Despite this, the problem persists. For instance, literature revealed that, at the international level, Cameroon is position at the bottom line of Trends in International Mathematics and Science Study (TIMSS) and Program for International Students Assessment (PISA). International large-scale assessment tests such as the Program of International Student Achievement (PISA) and the Trends in International Mathematics and Science Study (TIMSS), as well as various national standardized tests, have shown the effectiveness of testing basic cognitive skills, and are considered reliable and valid.

In addition, archives from the regional delegation of Basic Education for the Centre indicated that many pupils perform poorly in Mathematics as years unfold. For instance, the worst subject candidates performed poorly during the 2020 session First School Leaving Certificate (FSLC) and CEP examinations as compared to others subjects was mathematics as indicated in tables 1and 2 below despite the fact that, a large number of children claimed to have passed both CEP and FSLC examinations. The Table 1 shows 85.44% general passed rate for the francophone subsystem CEP examination as against 31.31% passed rate in mathematics problem solving as indicated in Table 3 below. Similarly, for the English speaking subsystem in the 2020 FSLC examination session as indicated in table 1, candidates scored 99.02% general passed rate against 60,33% passed rate in mathematics paper 1 and 70,57% in mathematics paper 2 as indicated in Table 1 below.

Table 1: The Centre region of Cameroon results' analysis in CEP and FSLC 2020 session

Types of examinations	No enrolled			No sat			No passed			% passed		
	B	G	T	B	G	T	B	G	T	B	G	T
CEP	38529	37 960	76 489	37 690	37 213	74 903	31 804	32 197	64 001	84,38	86,52	85,44
FSLC	11296	12 752	24 048	10 968	12 336	23 304	10 788	12 289	23 077	98,35	99,61	99,02

Source: regional delegation of basic education for the centre

Table 2: Results analyses per subjects of Anglophone subsystem 2020 FSLC session in the Centre region of Cameroon.

No	Subjects	No Registered	No Present	No Passed	% Passed
1	Mathematics 1	24061	23353	14090	60,33
2	Mathematics 2	24061	23353	16482	70,57
3	General paper 1	24061	23353	22215	95,12
4	General paper 2	24061	23353	21864	93,62

Source: regional delegation of basic education for the centre

Table 3: Results analyses per subjects of Francophone subsystem 2020 CEP session in the Centre region of Cameroon.

No	Subjects	No Registered	No Present	No Passed	% Passed
1	Dictée-Questions	**76 679**	**75118**	**35 762**	**47,60**
2	Production D'écrits	76 679	75118	63 523	84,56
3	Calcul Rapide	76 679	75118	50 972	67,85
4	Résolution de Problèmes	76 679	75118	23 526	31,31
5	Grammar and Vocabulary	76 679	75118	41173	54,81
6	Reading Compréhension	76 679	75118	47496	63,22
7	Dictation	76 679	75118	60750	80,87

Source: Regional Delegation of Basic Education for the Centre

Most pupils thus fail in mathematics subject matter based on traditional standardized final examination that simply measures discrete knowledge due the fact that, teachers invest much effort to prepare their children to pass examinations and lay less emphasis on individual learner's demonstration process. Regrettably, the subject has consistently experiences poor and negative learning out comes at an interesting rate. This state of affairs in the subject in both classroom and official assessment is a worrisome concern to all stakeholders of education. In this study, the researcher continues to generate concerns among the majors' stakeholders (educationists, parents, government, Examinations bodies and pupils). The government has so far tried to review, school curricula and implemented the CBA from nursery to primary schools levels of basic education in September 2018-2019 school year. Thus, one is left to question the relevance and implementation of the traditional primary school mathematics assessment practices, which apparently fails to improve leaners to demonstrate learning societal goals as well as the national and economic challenges facing the country. Hence, there is need for how do Competency Based Assessment practices as stipulated in the 2018 curriculum influence the attainment of primary schools pupils' mathematics competences in the Centre Region of Cameroon?

1.3 Purpose of the study

In view of the above problem, this study seeks to identify the types of competency-based assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of Mathematics competence amongst primary schools' pupils in the centre region of Cameroon.

1.4 Objectives of the study

Specifically this study seeks to achieve the following objectives:

1. To investigate how diagnostics assessment practices, related assessment activities and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon.
2. To investigate how formative assessment practices, related assessment activities and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon.
3. To investigate how continuous assessment practices, related assessment activities and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon.
4. To investigate how summative assessment practices, related assessment activities and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon.

1.5 Research questions

1.5.1General research question

How does competency- based assessment practices, related assessment activities, assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst primary schools' pupils in the centre region of Cameroon?

1.5.2 Specific research questions

1. How does diagnostics assessments practices, related assessment activities, and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon?

2. How does formative assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon?

3. How does continuous assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon?

4. How does summative assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon?

1.6 Research hypotheses

H_{01}: Diagnostic assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

H_{a1}: Diagnostic assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

H_{02}: Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

H_{a2}: Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

H_{03}: Continuous Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

H_{a3}: Continuous Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

H_{04}: Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

H_{a4}: Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

1.7 - Justification of the Study

In view of Cameroon vision to be an emergent African country by 2035, the building up of a new curriculum took in consideration the International, Continental and National instruments as reviewed earlier in the introduction of this thesis. Cameroon educational system has experienced pedagogic evolutions from Content or Subject based approach in earlier 1980, Objective-based Approach (OBA) within 1980 to 1996, from 1996 to 2003 it was New Pedagogic Approach (NPA) otherwise called Inferential Thinking Approach. From 2003, Competence-based Approach (CBA) was gradually introduced in secondary education meanwhile fully introduced in basic education (nursery and primary schools) in 2018 still present date. School programs were drafted according to competency-based curriculum based on the development of competences. The Ministry of Basic Education intended to develop the knowledge, skills and attitudes of learners' profile under its authority with the expectation that, at the end of the primary school cycle, the learner should have acquired seven national core skills and exhibit the four broad-based competences.

The seven National Core Skills are:

1. To communicate in the two-official languages, (English and French), and the use of at least one national language;
2. To use basic notions in Mathematics, Science and Technology;
3. To practice of social and citizenship values;
4. To demonstrate the spirit of autonomy, a sense of initiative, creativity and entrepreneurship;
5. To use basic Information and Communication Technology concepts and tools;
6. To practice lifelong learning; and
7. To Practice Physical, Sports and Artistic activities

The four broad competences are Intellectual, Methodological, Personal and Interpersonal, and Communication Competences CPSCES- Level III (2018 p.12).

The researcher interested so much on the second National Core Skills, which is to use basic notions in Mathematics, Science and Technology. One of the key missions assigned to the Ministry of Basic Education (MINEDUB) is to guide the development of knowledge, skills

and attitudes in the learners and to set the foundation for learning with emphasis on Science, Technology, Engineering and Mathematics (STEM) Cameroon Primary School Curriculum English Subsystem - Level III: Class 5 & Class 6(2018 p.3). It reveals STEM education policy as the backbone of future local careers specialists in scientific, technical and engineering domains. Much of mathematics as we know it today has developed in response to practical challenges in science and technology, in the social sciences and in economics. Odumosu, Oluwayemi & Olatunde(2001) in Chinyere, Ihekwaba & Unamba(2016 p.76) regarded mathematics as the bedrock of any science and technology Scientific theories are always expressed in mathematical language. Adeyegba(2005) in Odumosu(2012) observed that there is hardly any area of science that does not make use of mathematics concepts to explain its own concepts, theories or models. Altbach(2002) in Chinyere, Ihekwaba & Unamba(2016 p.76) supported the fact the progress of science could be determined by the extent to which mathematics has entered into its methods and contents. Nations thus, need mathematics to sustain scientific and technological development in other words, the design of many of the technologies that we use today developed from the results of mathematical research. As the Organization for Economic Cooperation and Development (OECD, 2007) noted: "*The performance of a country's best students in mathematics and related subjects may have implications for the role that country will play in tomorrow's advanced technology sector, and for its overall international competitiveness. Conversely, deficiencies among lower-performing students in mathematics can have negative consequences for individuals' labor market and earnings prospects and for their capacity to participate fully in society" (p. 323).*
Learners therefore, require mathematical competences or skills involving in the above domains as a prerequisite for the emergence vision of Cameroon by 2035.

No wander Mathematics competence is a cortical determinant of the post-secondary education and career options. Filling this closing gap will ensure a potential transition of learners from primary to secondary schools with a sound mastery of problem solving and understanding basic notions in mathematics and the knowledge, skills acquired should be properly applied in real life situations in order to not only improve their attainment in mathematics competence but also improve numeracy competencies standard.

The competence based approach pedagogic (CBA) introduced by the Ministry of Basic Education (MINEDUB) in the 2018/2019 academic year subsided a change of paradigm in education. New challenges associated with **teaching, learning, evaluation and assessment practices** and **the legal framework** are dealt in schools. The school and its stakeholders must therefore be tooled to be able to handle this novelty: conducting learning processes in terms of competencies, but also assessing learners in terms of competencies. As a matter of facts, the researcher interested in the implementation of Competency-based Assessment practices, which is a progressive tool in replacement of the old format of new vision evaluation introduced in 2006. For classroom teachers to be acquainted to the implementation of the new tool, pedagogic seminars and animations were organised in both nursery and primary schools levels nationwide by experts from the Ministry of Basic Education (MINEDUB) under the supervision of the general inspectorate in charge of pedagogic. Emphasis was led and even continues today, on the construction and the implementation of assessment instruments or tools that are used to assess competences. These assessment instruments or tools are:

- Stating a competence;
- Designing real-life situations;
- Marking guides;
- Broad sheets;
- Form and content of the report booklets.

In the course of in training service seminars and pedagogic animations in schools, emphasis was equally laid on the in depth understanding of some these terminologies that seem strange to most teachers on the field. They were didactic situation, task, problem situation, integration situation, contextualized or complex integration situations integrated learning themes (ILT); criteria assessment, score rubric, remediation activities, Project-Based Learning (PBL), Cooperative Learning (CL), Flipped etc. Despite in training service seminars and pedagogic seminars based on CBA, teachers continue to evaluate level 3 pupils based on the new vision evaluation implemented in schools in 2006 by Article 9 of ministerial text N° 315/B1/1464/MINEDUB of February 2006 in Cameroon. To equip teachers with more skills on competency-based evaluations, the Minister of Basic Education, on March 21st 2019 signed a press release adjourning Competence Based Evaluation practice for class six pupils' First School Leaving Certificate Examinations (FSLC) examination. The press release specified that, the 2021 session of FSLC would respect the competency-based assessment but the researcher observed that the 2021 session FSLC examination continued with the old format of new vision evaluation introduced in 2006.

Before the implementation of Competence-based Approach (CBA) at the school level, the evaluation of student learning was the responsibility of the teacher. Academic performance was measured weekly and monthly tests and termly examination to determine the progress of learning of the learners. At the end of the year, results were interpreted into learners' achievements by the school for promotion purposes. At the national level upon completion of the primary school cycle, officials of the Ministry of Basic Education organize national examinations such as Government Common Entrance into Secondary and First School Leaving Certificate Examinations for certification purposes for the English subsystem education. Many stakeholders of education criticized national system of assessment pointing out that, it failed to give what happen to the individual students from the beginning of schooling to the time of evaluation. In other words, pupils past work/ assignments and others forms of evaluations based on attitudes are not taken into consideration, a part of marks pupils obtain in the written phase of FSLC final certificate examination at the end of primary school cycle in Cameroon. Learners were evaluated based on essay types questions and structural multiple-choice questions (MCQ). The idea of using multiple-choice tests for evaluating students' achievement is no longer acceptable. Hossein Farhady(2003) quoted Herman (1992) 'Life is not multiple-choice. As children and adults, we must be able to apply what we know to create solutions, approach and solve novel problems, and communicate effectively to name just a few areas that call out for other than multiple-choice assessment' (p. 3). Evidence of student achievement for evaluation should be collected over time from three different sources –observations, conversations, and student products. Multiple sources of evidence increase the reliability and validity of the evaluation of student learning. "Student products" may be in the form of tests or exams and/or assignments for evaluation (Growing Success, 2010). According to Fafunwa (2010), national examinations create a wrong impression when in possession of paper qualification, which is the certificate obtained is more important than the ability possessed.Meanwhile, Ellery (2008) asserted that assessment is a key factor that affects student-learning methods in formal education, the traditional method of assessment promotes passive learning, surface and it is teacher-centered.

In the past, student learning was often viewed as a passive process whereby students remembered what teachers told them to remember. Consistent with this view, assessment was often thought of as the end of learning. The student was assessed on something taught previously to see if he or she remembered it. The assessment methods depended on paper-pencil exams and usually comparable normative pupils' performances. The traditional assessment approach only measures what learners, have achieved from the objectives as stated in the syllabus. According to Blank (1982) the old traditional instructional approach depends on teachers lectures and demonstrations therefore teacher-centered, students only receive little feedback from the teachers. Teachers group learners to spend the same amount of time on each unit of instruction and usually based on textbooks reference materials, and other materials that do not meet the requirements of employability. Students rarely know what they are learning; the program is built based on chapters, unit blocks, and other segments of the book, which gives some meaning only to employability. This view led to assessment that reinforced memorization as a principal learning strategy. As a result, students had scant opportunity to bring their intuitive knowledge to bear on new concepts and tended to memorize rules rather than understand symbols and procedures Brown, G., Bull, J. and Pendlebury, M. (1997).

This passive view of learning is not appropriate for the mathematics students need to master today. Assessment should enhance learning and support good instructional practice. To develop mathematical competence, students must be involved in a dynamic process of thinking mathematically, creating and exploring methods of solution, solving problems, communicating their understanding—not simply remembering things. Assessment, therefore, must reflect and reinforce this view of the learning process. Georgette C. M (2017 p. 16) quotes Gauthier Bissonnette and Richard, (2008) that, different educational stakeholders were urged to *'pass from the paradigm of teaching to the paradigm of learning'*. School programs were drafted according to competency-based curriculum based on the development of competences. The underlying philosophy of the CBA requires that learning should be based on the potentials of the learner. The focus is on learning and not on teaching. The learner should be responsible for his/her own learning. Competence has usually been described as an encompassing knowledge, skills and attitude the problem is how to ensure that competence based teachers teach and assess all the three. The new curricula give the teacher, the latitude to use the methods or pedagogic strategies that enable them to easily attain their objectives and develop competences in the learners. The essence of CBA lies in its shift away from typical school practices. In other words, Competence Based Education (CBE) teaching methods differ from traditional teaching methods in pacing, structure, and goals. The end goal is not for students to "cover the content," pass a test, or prepare entrance into professional schools or a specific career, but rather master skill sets that will allow students to successfully pursue their goals, no matter what they choose to do in life. These features of educational objectives and assessment approaches are absolutely lacking in positivistic oriented curriculum practices. Positivistic oriented curriculum practices offer behaviorist notions of teaching-learning activities that focus on imparting the certain mathematical facts, concepts, skills and knowledge to the learners. Then obviously, the process of assessment is restricted to measure those facts, skills, concepts and knowledge to determine whether the students are able to recite and reproduce these mathematical attributes (Romberg,1993).

The weakness of the traditional assessment approach had prompted Cameroon to the adoption of competency-based assessment (CBA) as an alternative method. Evaluation reform obliges all stakeholders to adapt to the recommended model and thus review assessment practices that will enhance the success of a greater number of pupils. It has been recommended to lay emphasis on the learning success and to ameliorate the context it takes place. The assessment of competences thus required a renewed approach where knowledge, abilities and attitudes are integrated (Baartman et al., 2007). A comprehensive assessment of how well a country is performing in education must therefore look at the cognitive, affective and attitudinal aspects in relation to the development of competence. Katie L .McClarty and Matthew N. Gaertner(2015 p.3)in (Meng S .T .(2020) defined competency-based assessment as the gathering and judging of evidence in order to decide whether a person has achieved a standard of competence. In the same vein, Álvarez and Villardón (2006) defined competency-based assessment as the set of activities that are part of a systematic process of gathering information, which must then be analyzed and interpreted, in order to issue judgments on the actions carried out by the subject, the community, or the evaluated institution. Necessarily, it should make use of a variety of different assessment strategies and tools (e.g., Chester, 2003; Dierick & Dochy, 2001; McConnell, 2004; Maclellan, 2004), to better assess performance in authentic activities that should be as similar as possible to the contexts in which the competences will be implemented. Smith and Keating (2003 p. 135) shared the view that, one cannot really assess competence from performance. Performance is not the same thing as competence, though it is taken to be an indicator of competence. A person’s competence is something that lies behind what he or she can actually do. Noddings (1984) argues that, if we view competence as a set of observable behaviours, then the same set or list of observable behaviours should be observed by anyone deemed competent in the same field disputed the notion of competence being linked to performance. Norris (1991, p. 336) argues that: *“Competence appears to circumvent the issue of what people need to know, it shifts the balance of power firmly in the direction of practice and away from theory”.*

Many primary school pupils fail mathematics and have negative attitude towards it because, the teaching of mathematics is problematic than any other subjects. A number of pupils and students cannot read and face a lot of mathematical problem solving in school and in society for real life situation. Meanwhile, Parents value mathematics more than other subjects do. The Consortium International Development Education (CIDE) in evaluation of learning outcomes conducted by the Program for the Analysis of Education systems (Programme d'Analyse des Systèmes Educatifs de la CONFEMEN – PASEC) in 2014 confirmed that reading and mathematics skills in Cameroon were quite modest highlighting the persistent quality issues.

To develop mathematical competence, students must be involved in a dynamic process of thinking mathematically, creating and exploring methods of solution, solving problems, communicating their understanding not simply remembering things. Assessment, therefore, must reflect and reinforce this view of the learning process. As far as mathematics competence assessment is concerned in Cameroon English primary school curriculum context , learners are evaluated based on the disciplinary competences or terminal learning outcomes against evaluation criteria as labelled in Table 4 below.

Table 4: Illustrates Terminal learning outcomes and evaluation criteria

Terminal learning outcomes	Evaluation criteria
- Solve problems involving sets and logic	- Group ,match and classify objects and numbers in different attributes
- Solve problems involving number operations	- Correct representation of sets, symbols and figures
- Solve problems involving measurement units	- Correct use of symbols, signs and diagrams
- Construct different geometric shapes	- Ordering and consistency
- Categorize statistics on graphs	- Appropriate use of operations and formulae
- Use mathematics skills in daily life	
- Show interest in mathematics	- Associating quantities, figures and words
	- Proper use of mathematical tools
	- Solve meaningful daily life problems

Source: Cameroon primary school curriculum English Speaking Sub System Level III: Classes five and six (2018 p. 27).

If a grade one teacher is expected to assess the above-mentioned, terminal learning outcomes attempts are made to clarify, as detailed as possible, the competences, the procedures to achieve the competences, the expectations from the learners, the ways their work is evaluated, and their responsibilities towards their own progress as stipulated in specific outcomes of mathematics competences. Sometimes the results of assessing students are reported on a numerical scale reflecting quality of learning through a quantitative score or mark. Higher grades reflect higher levels of learning or competence acquired; whereas lower grades reflect a deficiency or incompetence related to the target content. It is in this perspective, the researcher thus interested into the investigation of how competency-based assessment practices influence attainment of mathematics competence amongst class six pupils in the Centre Region of Cameroon. The conceptual and theoretical reviews have enabled the researcher to delimit diagnostic assessment practices, formative assessment practices, continuous assessment practices and summative assessment practices.

1.8 Significance of the study

The findings of the study will be beneficial to the following people:

Firstly, teachers diagnose leaners' previous knowledge at the beginning of each lesson. This helps them to gather information on pupils' understanding. Information gathered help teachers to identify areas of strength and weakness across the school, and adjust teaching to meet identified learning needs for improvement of pupils' learning. Teachers are aware of assessment practices pupils claimed they never practice in class and which certainly if they start practicing them will enhance pupils' Mathematics competence attainment. Teachers would improve competency assessment skills.

Secondly, much of the information in the physical and social world is mathematical in nature and so it is necessary to be mathematically competent to analyse effectively the information. People without this mathematical competency will be at a great disadvantage in dealing with this information to make reasonable decisions affecting their work, their life and their society (Spannberg, 2011). Since, pupils are the leaders of tomorrow and we need to equip them with appropriate mathematical competences, which will enable them to compete favourably with those in other countries. The proposed instructional and competency mathematics assessment strategies would benefit pupils to improve their mathematics competence attainment so that they should be more competitive, employable and self-reliant.

Thirdly, parents and other stakeholders would get joy and sometimes-financial benefit when their children no longer fear mathematics, but achieve the necessary credits required for further education and employment.

Last but the least, researchers would benefit by gaining more knowledge on curriculum evaluation, learning theories and research skills. The researcher, as an experienced teacher, will also benefit by applying new gained knowledge on curriculum models and curriculum evaluation to enhance effective teaching, learning and evaluation of primary schools pupils' mathematics in particular and others subjects in general.

Finally, Cameroon has adopted Competency Based Education (CBE) expecting to produce individuals who are creative, critical thinkers capable of employing themselves and who can compete effectively in the labor markets. The country would also benefit in the areas of scientific, technological and economic advancement, which produces the quantity and quality of educated people sufficiently equipped with the requisite knowledge to solve the societal problems, meet the challenges of development and attain competitiveness at regional and global levels for its emergence vision by 2035. In fact, the Ministry of Basic Education (MINEDUB) would use this study as a guide in formulating relevant education policy regarding pupils' evaluations that can improve pupils' Mathematical competences. Hence, among other things, the results of this study will contribute for improving the mathematical competency of pupils leading to successful implementation of science and technology, which is a prerequisite of its future citizens to lead Cameroon to be an emergent country by 2035. The study will also serve as a springboard for similar studies.

1.9 Delimitation of the study

The researcher has delimitated the study on three aspects:

1.9.1. Content

The content delimitation is based on the topic of the research, which in this case, it is **Competency Based Assessment practices and attainment of Mathematics competence amongst primary schools pupils in the Centre region of Cameroon.** This topic has five variables and it is made up of four independent variables and one dependent variable.

(i)-The Independent variable **1(IV_1)**:

- Diagnostics assessment practices, related assessment activities and assessment tools/instruments used by teachers in the attainment of mathematics competence amongst class six pupils are from the measurement and evaluation field of study.

(ii)-The Independent variable 2(IV2):

- Formative assessment practices, related assessment activities and assessment tools/instruments used by teachers in the attainment of mathematics competence amongst class six pupils are from the measurement and evaluation field of study.

(iii)-The Independent variable 3 (IV3):

- Continuous assessment practices, related assessment activities and assessment tools/instruments used by teachers in the attainment of mathematics competence amongst class six pupils are from the measurement and evaluation field of study.

(iv)-The Independent variable 4 (IV4):

- Summative assessment practices, related assessment activities and assessment tools/instruments used by teachers in the attainment of mathematics competence amongst class six pupils are from the measurement and evaluation field of study.

(v)-The Dependent variable (DV):

- Attainment of mathematics competence is based on scores obtained from the Mathematic Competency Test administered to class six pupils under this study. Moreover, it is from the psychological field of studies due to students' abilities and pedagogical field due to expected learning outcomes of Mathematics.

1.9. 2- Time span

The researcher had inspiration of this work far behind in 1995 while working on a similar topic for the award of Teacher's Grade one Certificate (CAPIEMP) in Government Teacher Training College (G.T.T.C) Kumba and during the second attempt in 2013 for the award of partial fulfilment of a Bachelor Degree in Education (B.Ed) from the University of Buea. However, in each attempt, the topic based on Parents' socioeconomic status and their children performances in English Primary schools of Obala municipality, found in the Centre region of Cameroon. However, the studies did not experience sceptical true reliable hypotheses testing due to his limited knowledge in appropriate statistical technique. Recently, the topic has been reformulated 'Teacher Effectiveness and Form5 students' abilities in Mathematics of

Anglophone secondary schools in Obala Municipality' in partial fulfilment of Master's degree in education. Similar studies were carried due to the unsatisfactory Mathematics performances of Form5 students from Government Bilingual High School Obala in the past 6 years .Mathematics has always been an important subject as a springboard in STEM education in the tertiary level. The researcher hence went a step further to reformulate the topic as **Competency Based Assessment practices and attainment in Mathematics competence amongst Primary 6 pupils in the Centre region of Cameroon.** PhD. program lasts for 3 years. Thus, the research has been programed from 2017 to 2021 at most.

1.9.3- Geographic area

This study was carried out in Centre region of Cameroon limited to two out of the nine divisions due to the proximity and the easy accessibility of these divisions to the researcher's residence located in Lekie division, which shares its boundaries with Mfoundi division. The head quarter of Mfoundi division is Yaoundé, which is Cameroon's political capital, and the head quarter of Lekié division is Monatélé. The researcher randomly selected 64 English-speaking sub system primary schools in both divisions. Data were from 5 class six pupils of each of the schools making a total accessible population 320 class six pupils.

1.10 Limitations of the study

The study has some limitations.

Firstly, Lack of previous studies in the research area. There were little prior research on the researcher's topic due to the fact that, assessment of mathematics competence using Competency Based Assessment practices is the most contemporary and novel issue in Cameroon since it was adopted in 2018. Many researchers have not yet focused research problem evolving in the domain because Competence Based Assessment is only a recent technique in Cameroon educational system.

Secondly, confounding factors such as gender, age and I.Q of the respondent s could have influence mathematics competence attainment of pupils. The researcher did not take them in consideration.

Thirdly, due to financial limits the researcher restricted the study on 2 out of the 10 divisions and 14 out 70 subdivisions in the Center region of Cameroon.

Finally, the study limited to social constructivist, behaviourist, and cognitivist and humanist theories of learning. Although researchers elsewhere have used them, this researcher is yet to come across sufficient literature on how they may work best for pupils' attainment mathematics competence using competence based assessment practices.

1.11 Action and Budgetary Plan

As for the budget, the researcher sourced and set aside a minimum of 500 000 FCA to cover transport costs, stationery, food and other logistics from when starting the study.

The researcher drafted a plan of action, which culminated in the draft timetable for 2017-2021 as shown below in Table 5. The researcher closely adhered to this timetable but only changed it because of unforeseen or extenuating circumstances. For instance, the pilot study purpose was to check the instruments from June 2019 were finally carried out in July 2019 and the data collection methods initially from August to November 2020 took place January 2021. The first three chapters' pre defence initially programed in November 2018 finally took placed in March 2019 during which the researcher was recommended to reformulate the topic in order to either suit curriculum or evaluation speciality reason being that, the initial research's topic was entitled the influence of teachers and infrastructural quality on students' achievement in senior secondary school mathematics. The panel of experts thought it was more of the psychological field because the researcher emphasises on teachers' quality perception as an aspect of the study. In September 2018, the Ministry of Basic Education adopted with an immediate implementation competence based approach with emphasis on competency based assessment practices. The researcher inspired from the recommended competency evaluation approach, which still seems strange to both teachers and pupils. After concertation with the researcher's supervisor, the topic was later modified and approved by the Dean, Faculty of Education as entitled: **Competency Based Assessment practices and attainment in Mathematics competence amongst class 6 pupils in the Centre region of Cameroon.** Head teachers of selected schools assisted the researcher during data collection after the pilot study. Data analysis, interpretation and report writing was done by the researcher alone. Table 5 shows the original draft timetable.

Table 5: Original Draft timetable for 2017- 2021

Research Topic: Discussion with supervisor	December 2017
Rough draft of proposal	January to April 2018
Typing and discussion of rough draft	May – June 2018
Final draft of proposal	July – August 2018
Write up of chapters 1, 2, 3	September 2018- ongoing
Presentation/defence of proposal	November 2018 later March 2019
Drafting research instruments	March _ April 2019
Discussing research instruments	April - May 2019
Field work: Pilot study	June 2019
Discussion of pilot study outcomes	July 2020
Fieldwork: Data collection Schools	August- November 2020
Data cleaning	November – December 2020
Data presentation	December 2020– January 2021
Data analysis and interpretation	February – March 2021
Write up of chapters 4, 5	April – July 2021
Theses Defence	December 2021

1.12 Concepts and operational definitions used in this study

Under investigated in this study, there are some concepts, which are defined in certain contexts specified in this study only. Therefore, these concepts have been addressed clearly to make sure that they are clear to the readers and consistent during the thesis. The Concepts are displayed in table 6.

Table 6 : Concepts and operational definitions used in this study

Concepts	operational definitions
Competence	**Competence** is a person's ability to carry out any activity based on life experience, acquired knowledge and skills observed by anyone deemed competent in the same field.
Competency	A competency is a measurable set of knowledge, skills, and attitudes that a person needs to perform a task effectively. As competency is task-based, the person may need to transfer the competencies to new situations and environment.
Competence Based Curriculum (CBC)	Competence Based Curriculum (CBC) is an adopted learner-centred pedagogy (project based learning, cooperative learning), diagnostic, formative, summative and authentic assessment approaches (performance assessment, comprehensive assessment and self-assessment), and emphasized development of competencies and application of knowledge in real life context.
Competency-Based Assessment	According to the researcher, Competency-Based Assessment (CBA) is the measurement of learner's competency against a standard of performance or predetermined criteria. It is a process of collecting evidences to analyze learner's progress and attainment.
Mathematics competence	In this thesis, the researcher defined mathematics competence as expected learning outcomes specified in terms of knowledge, skills and attitudes, which make it easier to measure mathematical competence against some valid evaluation criteria.
Attainment in mathematic competence	Attainment of mathematics competence is the ability pupils use knowledge, skills and attitudes acquired in mathematics competence to solve mathematics problems through operations, real-life situations and use the acquired mathematics competences for their personal development in careers aspirations.
Assessment practice	Assessment practice is a group of strategies where teachers, instructors appraise learners' achievements by collecting, measuring, analyzing, synthesizing and interpreting relevant information during the teaching and learning process in relation to curricula objectives set for their levels, and according to the procedures that are systematic and substantively recommended. e.g (Portfolios, Observation, Project, Interview with learners and parents, Quizzes, checklists)
Class six pupil	Class 6 is the final year class in the primary school cycle in Cameroon educational system. The primary school pupils in this class present their first school leaving certificate examination at the end of school year. This certificate is the first formal and the most important for the socio professional and academic achievement of a successful graduate.

1.13 Terminologies in the research

A number of specialized books, journals, seminal articles, and conference papers, currently defended theses, dissertations and other day-to-day classroom practices were scrutinized in an attempt to find a comprehensive definition of the numerous terms or concepts as defined by different researchers related to this study. It is avoiding confusion to people who are unfamiliar with the jargon of educational assessment. This section will thus illustrate the different meanings, usage and implementation for each term. These terms are measurement, testing, evaluation, diagnostic assessment, formative assessment practice, continuous assessment, summative assessment, competency-based assessment, mathematics competence, attainment in mathematic competence, real life situation or integrated situation, problem situation, etc.

1.13.1 Measurement

Gallagher (1998 p.3) defines measurement as a procedure to quantify the degree to which someone or something possesses a characteristic, quality, or feature. This can be done by counting the number of correct responses a student gives in relation to the total, or either by assigning a percentage, or by assigning a student a numerical score. Yet, not all assessment requires the measurement of students and assigning marks or scores to them. In the same light, Manichander (2016, p. 2) defines measurement as a process by which the attributes or dimensions of some physical object are determined. It is similar to learning when learning attributes can be measured in different ways through different instruments. Measurement, beyond its general definition, refers to the set of procedures and the principles for how to use the procedures in educational tests and assessments (Overton, 2012). According to (Bachman, 2004; Nitko, 1996; Airasian, 1994), they viewed measurement as a process by which one attributes a numerical score or mark to the attributes or dimensions related to the performances of learners during ability or aptitude tests in such a way that the learners' quality of performance is preserved.

1.13.2 Test

Mundrake (2000 p. 45) considers assessment, testing, and evaluation as terms used to describe the outcomes of the educational process.

Linn and Gronlund (1995 p.5) describe a test as "a type of assessment that typically consists of a set of questions administered during a fixed period of time under reasonably comparable conditions for all students".

1.13.3 Assessment

Information from student learning may help educators make decision on the way to change teaching and learning methods in order to improve student learning and education systems in general. Teachers usually assess students and use this assessment information to judge the quality of student learning for summative or formative purposes. Brown (2004 p. 304) defines **assessment** as *"any act of interpreting information about student performance, collected through any of a multitude of a means or practices".* Assessments are means of measuring, observing, and recording educational accomplishments in order to evaluate progress toward goals. *"In the classroom, assessment considers students' performances on tasks in a variety of settings and contexts".* It is the most general of the terms that describe how teachers gather and use information. This process usually involves a range of different qualitative and quantitative techniques. For instance, the mathematics ability of learners can be assessed using standardized tests (pen/ pencil and paper exam, oral exams, portfolios, and practical exercises, etc.

1.13.4 Evaluation

A document issued by The Organization for Economic Co-operation and Development (OECD, 2008) illustrates the relationship between assessment and evaluation in which assessment is used to track how the learning is progressing, evaluation helps to give overview judgement of one educational service. Evaluation is made based on judgements from assessment with the aim of improvement of the training system. Evaluation uses assessment to make a determination of qualification in accordance with predetermined criteria. Of course, evaluations may use information from tests and measurement. In most education contexts, assessment is a vital component of any evaluation. It is the process of judging the quality of content and programs offered to a group of students. High quality evaluations do not necessarily require the use of pen-and-pencil tests or examinations. Neither do they require the use of complex measurement approaches. Duong.A (2020 p.12) considers evaluation when a mark is assigned at the end of a given task, test, quiz, lesson or learning activity. According to Kizlik (2016), evaluation is regarded as a process by which teachers engaged their learners in order to provide information that will help them make a judgement in a given situation. According to Overton, 2012 Evaluation is the process, which determines whether students meet preset criteria or qualify for any education services.

From the praxis, the competence evaluation model requires the teachers, when they start the evaluation process, to tell the students which will be the expected goals or objectives. Similarly, the students must be taught to be critical with their own performance in order to collaborate in the construction of an awareness oriented towards self-evaluation. In other words, "they must have control of their own learning processes, of their strengths and weaknesses, to self- regulate their errors, strengthen them, and participate in the preparation of improvement plans” (Jaimes; Callejas, 2009, p. 43).

Roegiers.X(2004 pp 165-169) identifies four types of evaluation systems namely:

- Evaluation based on contents matters;
- Evaluation based on specifics objectives;
- Evaluation based on transversal competences;
- Evaluation based on basics competences.

The first two are what De Ketele & Dufays(2003)call “ evaluative practices based on content” and “evaluative practices based on specific objectives.” the third type “ evaluative practices based on activity, task or an integrated theme». The fourth “evaluative practices centered on integration objectives. This type of evaluation is what Roegiers.X(2004 p.168) denoted in English version as “ task based assessment” equally as “ authentic assessment”.

Wiggins (1990) defined authentic assessments as assessments that “require students to be effective performers with acquired knowledge” (para 5). McAlister (2000) reported that an authentic assessment must be representative and direct. Based on these principles, competency-based assessments must be representative by adequately assessing the constructs they are measuring and be direct by not including irrelevant criteria or information. Therefore, evaluation becomes one of the more significant stimulus for the development of learning as a tool and a practice that orient the involvement of the students to promote reflection, self-evaluation, and self-regulation of the apprehended competences (KNUST; GÓMEZ, 2009). Just as it has been stated by Scriven (2007), Hall and Burke (2003), and Kaftan, Buck and Hall (2006), in what is formative, the essence of the evaluation as an integral process of learning and the construction of knowledge is at play, provided a formative design is established that strengthens those educational processes. Knust and Gómez (2009) hold that, this viewpoint refers only to integral knowledge and to evaluative situations with an authentic character, giving preference to the processes more than to the results.

1.13.5 Competence

The term “competence” appeared in Webster’s dictionary in 1596. Competence in Weber’s sense meant legal responsibility with associated means of enforcement, whereas in both linguistics and psychology competence is understood to mean capability and readiness. The English Oxford Living Dictionaries (2016) defines competence as “the ability to do something successfully or efficiently”.in French language dictionary, “ it is a proven ability in a particular subject area as a result of the amount of knowledge possessed, and it can be assessed" (Dictionnaries de français Larousse, edit. Larousse, 2016). Some authors refer to Chomsky (1968) as the originator of the term competence. Chomsky, N. (1968) first introduced the twin concepts of competence and performance, he used them in a different context and with somewhat different meanings. Chomsky's contribution lies in the field of linguistics and his use of the term differs somewhat from that of educational researchers. Moreover, in the United States it was firstly used in the 60s in the context of performance-based education, which purpose was to train specialists who can successfully compete in the labor market (Berkaliev et al., 2007). Whitty, G., & Willmott, E. (1991) point out, 'competence-based and performance-based approaches to teacher education are by no means new' (p. 309). Competence was a goal of teacher education in the US from the 1970s. In the UK, the idea was mostly used in further education and vocational education from the early 1980s, but has since gained prominence in teacher education (Carr, D. (1993) Whitty & Willmott, 1991Whitty, G., & Willmott, E. (1991).

Stevenson (1995) postulated the idea that the term competence has evolved over time to imply different meanings in both vocational education and academic settings. He considered that the ordinary or everyday meaning of the word 'competence' has two facets: **the first denotes that a person has completed a task or fulfilled an occupation in a proficient manner, and the second denotes a desirable outcome.** For instance, a person may be described as a competent musician, athlete or teacher, but we are unlikely to describe someone as a competent murderer. However, Klieme, E. & Hartig, J. (2007 p. 14) suggest that the use of the term competence in the social sciences has three independent origins. The Russian scientist Khutorskoi (2002), considered the definition of competence in terms of the importance of education, calling them *"educational competences."* According to his definition *"educational competence–is a set of semantic orientations, knowledge, skills and experience of the student's activity, in relation to a certain range of objects of the reality, necessary for the implementation of personally and socially meaningful productive activity".* Khutorskoi divided them into:

Key competences–related to common (met subject) educational content;

General-subject competences–related to a particular range of educational subjects and educational areas;

Subject competences–private in relation to the two previous levels of competences, with a specific description and the ability to be formed in educational subjects.

In the context of educational testing, Messick (1984) defined competence *as 'what an individual knows and can do in a subject area however that knowledge and skill is acquired, whether through instruction or experience or whatever' (p. 217), and, later in the same paper, as 'what a person knows and can do under ideal circumstances' (p. 227).* In the same light, Le Boterf (as quoted in Perrenoud 2002) defined competence *as 'knowing how to mobilize'*. In the same vein, Roegiers.X(2004 p.352),defined competence as *'a possibility for a learner to mobilize a set of knowledge, skills and attitudes in order to solve situations. According to him, a learner exercises a competence in solving situations*. Similarly, Perrenoud (as quoted in Tarek 2010) considered competence *as situation where one is allowed to face a complex situation, build an appropriate response, without going into a register of preprogrammed responses*. According to Daigle (2006), *a competence is a 'knowing-how-to-act' complex based on the effective mobilization and combination of a variety of internal and external resources within a family of situations. To verify if the learner has acquired a competence, the teacher submits him or her to a novel situation in testimony to the competence.*

The 2006 EU recommendation provided a definition of competences as *'a combination of knowledge, skills and attitudes appropriate to the context', and more importantly the ability to apply them.* Key competences are those, which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment, and which constitute an integral part of an individual well-rounded competence-based education. Competence as an organizing principle of the curriculum is a way to bring real life back into the classroom (Jonnaert, P. et al, Prospects, UNESCO, 2007). It is thus a move away from the idea that curriculum is mainly implemented by having students reproduce theoretical knowledge and memorize facts (the conventional knowledge-based approach). Therefore, 'competence' is a broader concept than skill or competency (Tchibozo, 2011) and it encompasses knowledge, competencies, skills, abilities, capacities, attitudes, values, attributes and qualities necessary for lifelong learning (Halász and Michel, 2011) quoted in R E PC (2006 p.31).

The OECD explored the notion of competence in a report that compared educational standards used in ten OECD member nations. The report equated "competence" with "skills" made specific references to employers' needs and graduates' capabilities for employment, as had the European Community's 1993 report. Soon after, the OECD embraced the notion of competence, as reflected in the goals for PISA, assessments designed to measure not "mastery of the school curriculum," but rather "knowledge and skills needed in adult life" (OECD, 2000 p. 8). As it launched PISA, the OECD also initiated a multi-year reflection on "Defining and Selecting Competences" commonly called DeSeCo. The DeSeCo project published its first report in 1999 (Salganik et. al., 1999), an influential think piece in 2001 (Rychen & Salganik, 2001), and its edited volume on "Key Competences" in 2003 (Rychen & Salganik, 2003). The last presented "a holistic model of competence" (2003); its definition of competence aligned closely with integrated definitions that emphasize the ability to mobilize resources to respond to a real-life situation in a particular context.

1.13.6 Competency

In contrast to competence, which is usually considered in terms of knowledge, skills and attitudes acquired during the training and forming the content side of the training. The meaning of competency has been the subject of much debate, and the following examples of views regarding the meaning of the term 'competency' indicate the difficulty in obtaining a precise and universally acceptable definition. Therefore, one of the challenges related to competency-based education is there is no common definition of what a competency is, so programs must synthesize key features from different models and theories to develop program-specific competencies. Some have defined the term narrowly by using a single element of human performance. Others have allowed their definition to overlap several of the elements of human performance. Hoffmann (1999 p. 275) recognized this lack of clear definition. According to him, the term competency is multi-faceted. Hoffmann (1999, p. 276) considers that the term competency comprises three basic constituents: namely, Observable performance which focuses on the ability to performance; and Underlying Attributes which focus on the required underpinning **knowledge, skills and generic capabilities** that can be modified in response to vocational or social requirements. The first two of these constituents are suited to simple task-oriented learning programs in which the objectives are based on performance, conditions and criteria, with little need to place much emphasis on the third criteria. However, in more complex task-oriented learning programs, a much greater emphasis is required from the third constituent.

Strebler, Robinson, and Herron (1997) noted that, different meanings to describe competency have evolved through common usage, with some using the term to describe behaviors and others using the term competencies to denote standards or minimum standards of performance. Chappell (1996) suggests that the 'meaning and context' of the term 'competency' is determined by the person using the term. An important factor in defining the term 'competency' is the manner in which it is used. For instance, Watson (1993) considers that much of the debate in relation to competency-based learning programs relies on whether competency is perceived from a holistic or Cartesian viewpoint. That is to say- judge on their overall attributes or simply on their ability to carry out a set of individual tasks relating to the workplace whether a person's competency is. This method of categorizing competency as it relates to the workplace may stem from the fact that competency-based learning programs were first implemented in short, certificate level, vocational programs in which more emphasis was placed on task-oriented aspects of the program and less emphasis placed on cognitive requirements. Competency means properties, personality traits, determining its ability to perform activities because of the acquired knowledge and the develop skills and abilities (Azimov et al., 2009).

There is also a classification of I. A. Zimnyaya, which differentiated three main groups of competencies:

- Competencies related to himself as an individual, as a subject of life;
- Competencies related to the interaction with other people;
- Competencies related to human's activity, manifested in all its types and forms.

Chappell, Gonczi and Hager (2000) contend that behavioral demonstration dictates that competencies in a curriculum or learning program need to be described in ways that make them measurable.

Within the context of globalization in competency-based approach, UNESCO-IBE 1995-2019, defined the concept of competency as a pillar of curriculum development and a driving force behind the process of change. It is defined as "the development of complex capacities that enable students to think and act in various fields of activity […]. It consists of achieving knowledge in action, the result of a sound knowledge base that can be put into practice and used to explain what is happening" (Braslavsky, C.). It is this conception of competency that is conveyed today in the writings of the main French-speaking authors (Paquay, De Ketele, Tardif, Rey, Le Boterf, Perrenoud, Beckers, Roegiers, et al.).Owing to their direct hold on action, situational competencies go a step further than generic competencies. With respect to them, we can truly speak of "knowing how to act" (Perrenoud, 1997; Le Boterf, 2006). They call upon a multitude of resources to permit treatment of a complex situation linked to each of them.

1.13.7 Competency-Based Assessment or assessment in pedagogy of integration

Katie L .McClarty and Matthew N. Gaertner(2015 p.3)in (Meng S .T .(2020) defined competency-based assessment as the gathering and judging of evidence in order to decide whether a person has achieved a standard of competence. In the same vein, Álvarez and Villardón (2006) defined competency-based assessment as the set of activities that are part of a systematic process of gathering information, which must then be analysed and interpreted, in order to issue judgments on the actions carried out by the subject, the community, or the evaluated institution. In the same light, Benito and Cruz(2005, p. 15),emphasized that, competence-based assessment must consolidate the processes of:[...] effective acquisition of the numerous competences that define each situation requires the students to learn by doing. It would be impossible to guarantee that our students will learn to communicate if in our teachings there is no space for them to present their work. This all sounds very desirable, but we must not lose sight of classroom realities. Conceiving of competence as a 'disposition' implies that it is a latent construct. i.e. something that may not be directly observable. This is not a trivial task: designing situations or test items, which really do reflect the competence to be studied requires careful conceptualization of the competence. It is undeniable that in spite of receiving regular updates on their progress through frequent assessment, many students fail to make progress this is explicitly stated by Sadler (quoted in Torrance and Pryor 1998 pp.13-14). To Tobón, *"the competence evaluations [must] integrate the qualitative with the quantitative, because with words one cannot measure, and with numbers one cannot understand or explain" (2004, p.138), in the sense that both contribute to the improvement of the teaching-learning processes".* In a competency-based program, the assessments must provide valid and reliable evidence that students have mastered a specific set of competencies (knowledge, skills, and abilities). Because competency assessments are used to determine mastery and award credit, the value of CBE credentials hinges on the reliability and validity of those assessments. A number of factors may influence performance apart from competence, so it is important to be aware of these and, as far as possible, to reduce their impact. Again, all of motivation, knowledge, and competence as well as more transient factors such as fatigue or distraction jointly affect performance.

According to Mohammed, K. I. et al (2016 p. 58), viewed competency-based assessment is an important research topic, which might be divided into two open problems:

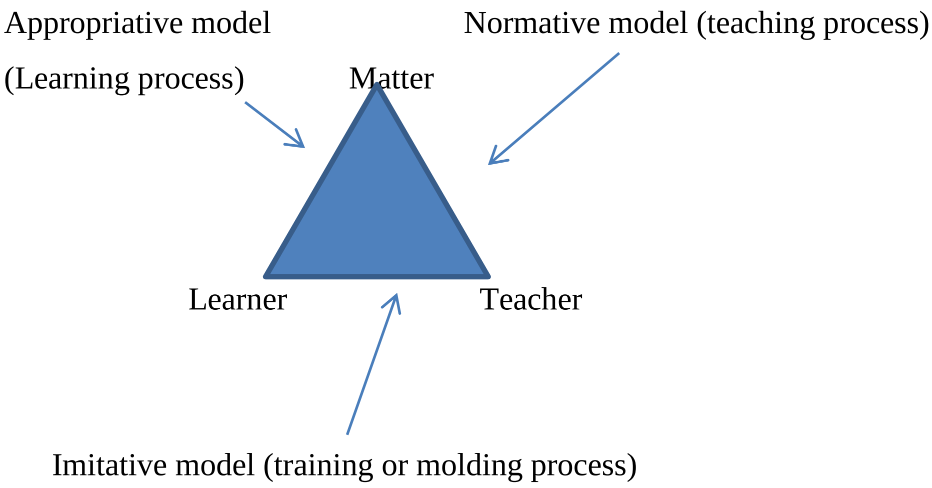
 (1) Assessment design, which includes competency modeling by test designers, it is about formulating a competency structure to assess and clearly link each competency to an appropriate situation, problem and material.

(2) Assessment implementation by test developers, it includes means and tools used to capture measurable attributes of competency. However, assessing competencies involves a complex range of learners' characteristics such us: knowledge level, style, abilities, cognitive skills, background, etc. The purpose of this study lays emphasis on competency assessment implementation which according to Mohammed, K. I. et al (2016 p. 58), includes means and tools used to capture measurable attributes of competency.

1.13.8 Problem situation

A problem situation is a learning situation. It is a means to learn and not result. A learning strategy engages learners. It constructs knowledge and should be mastered in a lesson plan. It is a global, complex and significant task.

Figure 1: Imitative model (training or molding process)



a) Appropriate model (Learning process) a problem rather problem situation becomes a proper lesson at the same time a source, place, and criteria of knowledge elaboration.
b) Normative model (teaching process), the problem is criterion learning, application for the learner and means of monitoring by the teacher.
c) Imitative model (training or molding process), the problem is an intellectual awareness.

1.13.8.1 Characteristics of a problem situation

1) There is a problem situation if there is a new problem clearly defined to the learner (which he or she at the beginning cannot solve); learners' resources are insufficient to solve the problem immediately.
2) It should be appropriated to the problem; the teacher does not intervene as an evaluator but as a resource person.
3) The problem should be included:
   -According to ZPD of Vygotsky
   -to the learning difficulty of Optimal Zone according to J.P.Famose;
   -to the learning steps of Optimal Zone
4) Learners should be able to construct a model or propose a solution emitting hypotheses from his/her conceptions and anterior resources.
5) Learners should probably verify hypotheses for eventual modifications.
6) Problem solution must permit a learner to decide whether a solution is correct or not. The learner should have means of validation and verification and the person taking responsibilities of the validation result. The teacher must be in charge to propose a stimulating environment for errors modifications.
7) The situation should be organized in manner that the resource to be developed by the learner should be an effective appropriate instrument that should solve the problem.

1.13.9 Mathematics competence

Mathematical competency refers to the ability to understand, judge, do, and use mathematics in a variety of contexts and situations in which Mathematics plays or could play a role Tadesse Walelign(2014 p.2) quotes Niss, (2002) in a research article. In the same light, the European Parliament Recommendations for learning 2006 defined Mathematical competence as the ability to develop and apply mathematical thinking to solve a range of problems in everyday situations. Moreover mathematic competence involves the ability and the willingness to use mathematics models (logical and spatial thinking) and presentation (i.e formulas, models, constructs, graphs and charts).

1.13 .10 Attainment in mathematic competence

English language learners definitions of attainment is the state of or condition of gotten or done something difficult: the act of attaining something that has been gotten, done, or achieved through effort. https://www.merrian-webster.com

Competency test used in school are finalized at assisting in the evaluation of student's attainment in content of a certain subject area in a certain country and in a specific class (Boncori, 1993). They can be standard referenced or criterion-referenced. In the first case, the scores are determined by comparing how well individuals achieved on the test to other individuals who took the same test. In the second case scores are compared to certain predetermined criterion (Popham, 2011) quote Alberto Crescentini & Giovanna Zanolla(2013 p.181).

1.13.11 Assessment practices

Abu Zeina, (1998, p.198) cited in(Abed E.R & Awwad F.M.A 2016 p. 67) defines assessment practices as a group of methods and practices that enables the assessor to collect data in order to form judgments used in taking the suitable decisions and certain judgments that help in evaluation . It should serve as a form of communicating feedback to both students' learning and teachers' teaching. Such information can be elicited through any of a multitude of means or practices and other measures recommended by the educational system-involving activities of teachers, students, a written test paper, an interview schedule, a measurement task using equipment, a class quiz ,paper and pencil assessment, observation, performance, communicative, and self-review. It is a part of the educational process where teachers, instructors appraise learners' achievements by collecting, measuring, analyzing, synthesizing and interpreting relevant information about a particular object of interest in their performance under controlled conditions in relation to curricula objectives set for their levels, and according to the procedures that are systematic and substantively grounded. O'Donovan et al. (as cited in Rust, Price, and O'Donovan, 2005) who argued substantiate the observation: *"One of the key issues underlying problems with assessment practice is that to truly understand the requirements of the assessment process, criteria and standards being applied, requires tacit as well as explicit knowledge" (p.2).* For example, it is difficult for students to learn from a chemistry teacher who cannot oneself setup and conduct an experiment. The power of students engagement and active participation among other things is enhanced by students prior knowledge, their readiness and chemistry teachers ability to involve students in assessment. Therefore, in order for social constructivist assessment to be realized in chemistry subject, as shown in the conceptual framework, there should be an active involvement of teachers and students in all stages of assessment such as designing and planning of CBA, creating assessment criteria and in providing feedback of the assessments. By doing so, students are assured on the effective attainment of the desired competencies in chemistry subject. Such competencies among others include critical thinking, communication skills, numeracy, and independent skills among others.

Van den Berg et al. (2016) explored formative assessment practices for primary mathematics education. Teachers integrated into their study practice three types of assessment:

i- a short-term assessment feedback loop,

ii- an intermediate assessment feedback loop, and

iii- a long-term assessment loop.

Each assessment feedback loop contained four elements: goal setting for instruction, assessment, instructional feedback, and evaluation. Although the results of the study showed that students increased their mathematical performance, there is a risk that at a larger scale many teachers will probably have difficulties with classroom management skills and the time that is required for tasks (van den Berg et al., 2016).

1.14 Chapter summary

Chapter 1 has presented the problem and its context. The background to the study and statement of the problem has been highlighted to education stakeholders. The purpose and significance of the study have been discussed. Research questions, research objectives, assumptions of the study, limitations, delimitations, ethical and legal considerations, and definition of special terms related to the study have been explained. The budget and periods given are only proposals, which can be adjusted according to needs of the research as it progresses. The next chapter (2) is a review of related literature covering, among others, aspects on the conceptual, theoretical and empirical reviews for this study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2. 1 Introduction

A review of related literature helps a researcher to put his/her research into proper conceptual, theoretical and empirical reviews. It also helps the researcher to identify what has already been done well, whether the recommendations are being implemented or not, and if it was not done well, what could be the missing gaps and how it could be improved. ; Improving students' proficiency in all school subjects is an omnipresent topic in educational and learning sciences. One of the key school subjects for which researchers strive to raise students' proficiency is mathematics. To reach high achievement levels in mathematics various angles of approaches can be, and have been, chosen. Approaches range from improving the mathematics curriculum or textbooks, developing better instruction methods and learning materials, to making teachers better in teaching mathematics by enhancing mathematics teacher education, or creating more challenging and attractive school settings and learning environments. Of course, all these factors are relevant in developing students' mathematical knowledge, skills, and understanding, but the factor that is often considered most important for students' achievement in mathematics is the teacher (e.g., Slavin & Lake, 2008). A Competency-based Education (CBE) focuses on the outcomes of learning by defining goals and processes to achieve those (El Falaki et al., 2011). The teacher not only initiates students' learning process by means of instruction and activities, but also provides guidance throughout the process, for instance through providing meaningful exercises and accompanying feedback. To be able to provide pertinent guidance during the learning process, teachers need to have profound knowledge of their students' learning progress (Moreland, Jones, & Northover, 2001). Not only this knowledge is necessary, it is even impossible to teach without it, because the teaching should build on and link to what the students already know. In other words, mathematics teachers need to have insight into students' mathematical thinking (Gearhart & Saxe, 2005). Administering standardized tests is but one way for a teacher to know about students' proficiency in mathematics. Teachers can also acquire insight in students' mathematical abilities by more qualitative and holistic assessments; for example, observing students in class and giving them open-ended tasks can provide teachers a far more reliable window for knowing their students' progress (cf. Black, 2014).

This chapter explores, in its conceptual framework, the competency based assessment practices discussed in light for the purposes of diagnostic assessment, formative assessment, continuous assessment and summative assessment. In prelude, Competency-based approach (CBA) or integration pedagogy definition and objectives is discussed for its clarification since the Ministry of Basic Education (MINEDUB) adopted this approach in the educational system since 2018-2019 academic year. Discussion of the purposes of results, the effect on teaching and learning methods, validity and reliability of assessment, record keeping and reporting of mathematics assessment practices are equally highlighted. In the theoretical framework, the chapter discusses the cognitivists, behaviourists and social constructivism as a possible philosophy for mathematics education and suggests how teachers and students can use this teaching/learning theory to develop good 'habits of mind' (Tuge, 2008) and be useful problem solvers and developers of their societies. Students may not see the value of learning subjects such as mathematics if the curriculum is not related to their societal-developmental needs. The empirical on its turn, reviews to get an insight into the study area and methodologies of others writers on the subject. This storehouse of knowledge has served as a springboard for the current study.

2.2 Conceptual framework

Jabareen (2009) defined conceptual framework as a network, or a plane of interlinked concepts that together provide a comprehensive understanding of a phenomenon. It shows clearly how variables relate, interact and its contribution to the whole concept. The researcher discussed the various approaches to evaluation otherwise known as models of evaluation and later on highlighted on the various evaluation strategies used in educational field to assess pupil's achievement. The researcher examined in detail the concepts of diagnostic assessment, formative assessment, continuous assessment, summative assessment and attainment of mathematics competence as indicated in a conceived schematic conceptual map diagram as presented in Figure 2. The schematic diagram presented in Figure 2 below shows the interrelationship of competency based assessment practices and attainment of mathematics competence amongst primary schools pupils in the Centre region of Cameroon. The conceptual review had revealed the need to investigate how Competency Based Assessment practices are used amongst primary schools pupils to influence mathematics competence. It had also shed light on the type of Competency Based Assessment practices, which improve pupils 'learning, and assessment of mathematics competence in schools. The nature of competency is expressed in four characteristics. First, competency is the integration or aggregation of many elements; Second, competency is revealed through activities; Third, the disclosure of competency must be effective, and the fourth is the context, the time of execution, or the area of competency.

Figure 2: *Schematic conceptual map diagram of the study*

Diagnostic assessment practices carried out by teachers and pupils:-

-Ask oral questions to check pupil's mathematics prior knowledge.

- Review of some lower skills/ competences through either multiple-choice questions (MCQ) or true and false (T/F) tasks

- Give oral feedback to pupil's responses.

- Correct pupils' persistent errors constantly.

- Plan remedial works in areas of mathematics pupils face difficulties.

Formative assessment practices carried out by teachers and pupils:-

- Organize integration activities that reflect communicated mathematics competence statement with criteria success.

- Use individual attitudinal questionnaire to assess pupils' behavior.

- Mobilize pupils to correct group homework (self and peer assessments).

- Mark and comment individual pupils' mathematics exercise books assignment.
- Organize remedial classes where pupils faced learning difficulties when correcting their books.

Competency based assessment practices

Summative assessment practices carried out by teachers and pupils:-

-Use real life situations or complex integration situations.

- Use Standardized and objectives types of questions

- Projects presentation by pupils

- Attribution of marks quota on pupils' mathematics practical activities (Portfolios)

- Keep pupils' progress report sheets for official's uses.

Attainment of mathematics competence

- Increased attainment/ competent

No increased of attainment /not

Continuous assessment practices carried out by teachers and pupils:-

- Respect monthly mathematics competency written tests calendar.

- Observe pupils 'attitude during drawing practices workshops and awards marks.

- Involve pupils in the selection of assessment criteria.

- Encourage mathematics' high achievers pupils to assist low achievers.

- Add continuous assessment's marks quota to the final mathematics competency evaluation at the end of term.

This work is mostly written in support of integration pedagogy by contrast, to the Anglo-Saxon approach, because; Cameroon opted for the integration pedagogy, which is widely spread in the Francophone competency, based literature. The researcher deemed it necessary to start by highlighting the shift from Objective-Based Pedagogy to Competency-based approach (CBA) or pedagogy of integration first.

2.2.1 A Shift from Objective-Based Pedagogy to Competency-based approach (CBA) or pedagogy of integration.

Literature reviewed that, Competency Based Education (CBE) had been developed in vocational training in Anglo-Saxon settings (e.g., America and Australia) during the 1970s, before it was extended to general education in 1990s. Blank (1982) emphasised that, Competency approach was specifically set for student achievement that have been identified as crucial in employability, student-centered teaching, providing high quality, good design, using the media to help trainees master the tasks given, have the time to respond during the learning process. It requires each individual trainee to perform their duties to a high level of proficiency in a job like before receiving credit for achieving each task, the performance compared to fixed standards. It is thus a move away from the idea that curriculum is mainly implemented by having students reproduce theoretical knowledge and memorize facts (the conventional knowledge-based approach). Based on these definitions, competence can be likened to the integral mobilization of a diversity of internal resources ('knowledge', 'technical skills', and 'social/interpersonal skills') and external (material and human) to solve a given complex situation. Even broad competency-based approaches are generally described as "integrated, holistic or relational" (Gonczi, 1997; Hager, 1995 as cited in Kerba, 1998, p.3).The latter has become a respectable occasion for integrating all the sub-competencies in a single activity by the end of a course of study. Competence as an organizing principle of the curriculum is a way to bring real life back into the classroom (Jonnaert, P. et al, Prospects, UNESCO, 2007).

Researchers such as Hirtt (2009), Peyser et al. (2006), and Roegiers (2008) confront the claims of these competency-based teaching models. Indeed, in his review of the background of the pedagogy of integration, Roegiers (2010) overlooks, as Hirtt (2009) specifies, the revolutionary works of Houston and Howsam (1971), Schmiedler (1973), and Burns and Klingstedt (1973), regarding CBE during the 1970s (p.2) . Peyser et al. (2006) identified two main integration schools of thought, the Anglo-Saxon and the Francophone. The major differences between these schools of thoughts relate to the way they conceptualize skill integration and transfer.

- According to him, the Anglo-Saxon integration framework is based on the reconstruction of the already mastered skills and knowledge to perform a real world task at the end of instruction, the aim of which is to acquire real life and survival skills; the Anglo-Saxon pedagogical community argues that students cannot integrate skills and knowledge until they are fully mastered. “Instruction first focuses on teaching the enabling skills in context and then on the application of the enabling skill to the life skill” (California CBAE, 1983 as cited in Savage, 1993, p. 20). This is to say that CBE equally starts with inculcating the basic tools of a given competency, rather than with performance-based tasks. The focus in English-speaking competency paradigm is on re-investment of specific behavioral elements of a competency. According to Auerbach, (1986); Chappell, (1996); Hyland, (1997); Richards,(2006, 2014); and Savage, (1993) the model is considered to be a reductionist approach, which means that, any domain of study is subdivided into specific objectives stated in terms of life skills (such as writing a check). Basic skills such as grammar, pronunciation, listening, reading, writing, and punctuation are derived from writing a check. These primary skills are taught in priori to equip the learner with the necessary tools to tackle survival tasks in the classroom. With regard to the Anglo-Saxon competency-based framework, the concept of competency does not include its applications to novel situations. As Ashworth and Saxton (1990) assert, it is likely to apply skills acquired in one context to another context, but this largely depends on the student personal capacities, not a product of the teaching framework. Therefore, they argue against this assumption indicating that a competency cannot be regarded as an isolated cognitive capacity detached from the context in which it acquired. Similarly, Auer Bach (1986) and Collins (1983) note that CBE does not guarantee skill transfer because it is more a training program than an educational syllabus, though assumingly CBE expects students to transfer the skills they acquired for solving other tasks than those set up for them in the classroom. Although other advocates of CBE (such as Chappell, 1996) claim that a competency is not demonstrable on a single occasion and that it can be displayed in changeable contexts, this advocacy remains hypothetical because in actual practice there are no activities specifically designed to encourage skill transfer.

The Francophone model otherwise named “Approache Par les Compétences”, in French appellation (APC) or “ pédagogie de l’ integration” respectively in English Competency Based Approach (CBA) or pedagogy of integration. Boutin (2004), an advocate of the French-speaking competency model, admittedly argues that the behavioral objectives of the world of industry exercised big influence on forming the first version of competency-based education that dominated American educational systems in the late 1960s. In the 1970s, De Ketele was still an active advocate of the American movement of the pedagogy by objectives that he tried to disseminate and popularize in French universities (De Ketele, 2000); nevertheless, he quickly perceived the limits of teaching discrete objectives. Roegiers (2010) makes a direct link between the objective-based pedagogy of Mager (1971) and Bloom (1971) with the works of De Ketele in the 1980s (p.61). Consequently, in 1980, he suggested the concept of "Objectif Terminal Global", which has later come to be termed as "Objectif Terminal d'Integration" (De Ketele, 1980 as cited in Roegiers, 2001, p. 84). The notion of terminal objective of integration has been operationalized by BIEF under the label pedagogy of integration (Roegiers, 2010). The concept of integration is considered in the integration pedagogy as the most important stage in the learning process (De Ketele, 1996; Roegiers, 2000, 2003, 2004; De Ketele & Gerard, 2005, and Miled, 2005 as cited in Roegiers, 2010, p. 81). The credit of integration-based pedagogy lies in its attempt to substantiate competency-based principles in existing educational curricula, not in discarding objective-based education. Therefore, the concept of competency promoted by the pedagogy of integration has been very enticing as an alternative pedagogy to traditional objective-based teaching; it holds a special promise that all countries went 'competency'. Integration pedagogy has progressed in the operationalization of terminal integration objective with similar intermediate tasks in varied situations within the classroom context, while CBE still operates at the level of terminal behavior, objective level (Ainsworth, 1977). The latter further argues that CBE is the late materialization of behavioral objectives in that a competency consists of a sum of enabling objectives (sub-sets of a competency) practiced in isolation and displayed visibly more inclusive tasks at the completion of instruction. The idea is to relate and integrate learning objectives at the end of a learning process than to teach and assess them in isolation. In his description of task analysis, Gagné (1965) underscores importance of articulating what he terms terminal objective that is, the final performance-based task in which students are assessed at the end of a course of study (as cited in McCowan(1998) pp. 25-26).

France's 1992 "Charte des Programmes" seems to be the first major policy document to incorporate the notion of competences into primary and secondary education for the implementation of Competency-based teaching. The "Charte des Programmes", a framework of principles for curriculum reform, grew out of the major Jospin reform of 1989. For analysts from inside France, the new principles represented evolution, not revolution, for they described the new curriculum as developing from the policy of pedagogy by objectives that had been in place since the 1970s (Ropé, 2000). The reform also proposed that pupils acquire interdisciplinary competences alongside, not in place of, disciplinary knowledge. The deeper change was that the reform expressed a shift in pedagogical thinking that had occurred in the late 1980s in France from content-centered to learner-centered instruction (Ropé & Tanguy, 1994). The Francophone school holds that students can learn to integrate and transfer skills by solving similar tasks in different contexts within the classroom. At least at early stages, integration pedagogy provides syllabus designers the opportunity to start with preliminary work on resources before inviting learners to solve complex tasks (Roegiers, 2010). Resources are introduced, structured, and practiced one after the other in carefully designed instructional sequences. This usually includes the study and practice of language basic skills and life skills relevant to a class of situations. The framework then permits students to practice skills and elements of a competency to reasonable levels of mastery through learning tasks before they are requested to perform target tasks. In integration pedagogy, learners can practice skills transfer horizontally through preliminary tasks before undertaking target problem-solving tasks. The frequency of complex situations during the learning process serves as milestones for gradual and secured transfer of integration skills. These intermediate tasks initiate students to problem-solving work; in Roegiers' (2010) view, they also consolidate skill retention and make learning gains more permanent. However, it should be noted that this procedure is temporary because, according to Roegiers (2010), students should progress during the learning process and get accustomed to skills integration. Later, they will be called upon to start solving problems right at the onset of instruction and learn resources while or after implementing the target task.

Actually, Roegiers (2007) suggests a curriculum structured into two major phases:

i. The first stage, learners work on enabling skills before facing them up with complex situations; whereas,

ii. In the second stage, they start tackling complex tasks, and consequently acquire and master the skills and knowledge intrinsic to the target task simultaneously.

In this way, this innovative curriculum framework combines in the long run both top-down and bottom-up learning/teaching processes. Roegiers (2007, 2010) conceptualizes pedagogy of integration round the integrative teaching/learning model called situations-as-end points.

He illustrates the major methodological differences between two chief integrative teaching/learning models currently in use: ***"situations-as-starting points" and "situations-as-end points*"** (Roegiers, 2010, pp. 77-78). Roegiers (2010) maintains, *"The learning of resources can be introduced through the objective-based principles …"* (p.81). If students are not ready or accustomed to problem solving tasks, and if teachers are only used to traditional teaching practices; they can maintain their learning styles and teaching styles respectively. Nevertheless, these old practices should not be perpetuated complacently; instead, integration experiences at later stages should teach them to acquire problem-solving skills and the spirit of teamwork and thus get rid of transmission model and analytic/reductionist methods. The former is typically exemplified in the communicative teaching approaches such as problem solving and project work, while the latter refers to the pedagogy of integration. The two models adhere to learning through complex tasks and problem-solving activities as opposed to teacher-fronted classroom practices.

1. situations-as-end points: integration pedagogy

According to Roegiers (2007, 2010) the pedagogy of integration is conceptualized round the integrative teaching/learning model called situations-as-end points. The latter task-based teaching approach suggests introducing complex situations at the end of a course of study in a form of a family of situations; but prior to tackling complex situations, the learner works on resources (knowledge and skills required by the complex situation) and carries out preliminary tasks. Simply said, resources relative to terminal tasks are, first identified then taught and practiced separately in complex intermediary tasks; and, finally reinvested in a group of complex meaningful certification tasks.

2. Situations-as-starting points

Learning within this pedagogical framework starts with the presentation of complex end tasks right at the beginning of a course of instruction. In this instructional design, resources are supposedly acquired through manipulating and experiencing with real life tasks without any prior explicit teaching of enabling skills and knowledge. Breen and Candlin (1980) communicative process syllabus reflects this pedagogical view in that the content of the course arises from the joint interaction among students while implementing authentic tasks. Although this view is supported by SLA research studies and it reflects the way people learn, it is hardly applicable in settings where students are not used to progressive teaching.

In fact, Roegiers (2007, 2010) argues in favor of superiority of situations-as-end points and thus of the pedagogy of integration especially with regard to a more precise definition of the learner exit profile, evaluation of learning outcomes, and frequency of graded problem-solving situations. According to him, learning within Situations-as-starting point's framework starts with the presentation of complex end tasks right at the beginning of a course of instruction. In this instructional design, resources are supposedly acquired through manipulating and experiencing with real life tasks without any prior explicit teaching of enabling skills and knowledge. However, Roegiers (2007) acknowledged that the two models are two sides of the same coin, he underscores the fact that integration situations-as-end points model is more appropriate for developing countries that suffer from lack of teacher training and didactic materials.

However, Hirtt, (2009) fail to recognize the differences between the Anglo-Saxon competency-based approach and the Francophone version of competency-based teaching-integration pedagogy or pedagogy of integration. The term integration used in competence-based education (CBE) it is not a distinctive feature of integration pedagogy. Hirtt (2009), claims that the French-speaking version of CBE is "neither original nor new" (p.2.), that is, it is not based on the pioneering works of De Ketele (1980) and the educational experts attached to UCL. Therefore, the CBA came into being because of two needs. First, the corporate world wanted a workforce having adequate training, and second, there was a need for pedagogical concepts centered on the individual result instead of abstract knowledge (Hirtt.N, 2009).

2.2.1.1 Fundamental objectives of competency based approach/ integration pedagogy

Rogiers (2004 p.106) identifies three fundamental objectives of competency-based approach:

i- He emphasized on the competencies that the student must either master at the end of each school year or at the end of compulsory schooling, instead of stressing what the teacher must teach. The role of the teacher is to organize the learning outcomes in the best way to bring their students to the level expected. In fact, the responsibility for learning is entrusted to the student who has to build his or her own knowledge through means made available by the teacher. The student becomes a learner who must suggest ideas first, have the desire to know and learn, organize work through using new technologies, assimilating new learning methods, and looking for new information (Boutin.G,2004). The new role of the teacher consists in encouraging the learners to acquire the knowledge, which must be facilitated but not mechanically transmitted, and entrusting the preparation of certain tasks to the students. The teacher becomes a "facilitator" who advises the learners, motivates and encourages them to be creative, ensures the planning and organization of activities, and suggests ideas without imposing them (Boutin.G,2004).

ii- He emphasized on the relevant of learning outcomes, in respect to everything student learn at school could serve them. To do this, it is necessary to move beyond lists of content subjects that have to be learnt by heart ... the competency-based approach teaches them to continuously relate their learning to situations that make sense to them and to use their acquisitions in these situations (p. 106). What characterizes the CBA (competency-based approach) is that teaching aims for new goals, which are not related to the content to be conveyed but rather to the capacity for action achieved by the student. The latter must be able to perform a particular task by mobilizing all resources (knowledge, technical skills, and behaviors) (Hirtt.N, 2009).

iii- Finally, it is a matter of verifying and validating the student's achievements in terms of resolving concrete situations, not in terms of the sum of knowledge and know-how that the learner often hastens to forget, and which he does not know how to use in real life" (p. 106).

2.2.1.2 Reforms of Competence Based Approach in other countries around the globe

The French school of thought of Competence-Based Approach started in France. An internal Ministry of Education report described France's 2005 reform as part of a wider movement by Canada ("particularly Quebec"), Britain, Belgium, Switzerland, Portugal and other European nations, and (supposedly) by "numerous states of the United States" which had, the report claims, "introduced the logic of competencies into their curricula" (Houchot & alii, 2007 p.10). Analysts writing from an Europeanist perspective attributed the French reform to influence from Europe, from international assessments like PISA, from the OECD's DeSeCo reports and from Unesco reports (Gordon & alii, 2009). Although the reform has been widespread, the reform is not global in the sense that large countries like the U K, Russia and India have not adopted competence-based primary or secondary curricula.

According to France's 1992 Charte des Programmes, a framework of principles for curriculum reform grew out of the major Jospin reform of 1989 seemed to be the first major policy document to incorporate the notion of competences into primary and secondary education. The document provided insights into why the discussion of competence moved into primary and secondary education. Because of high unemployment rates among young people, it noted the need to establish a link between academic training and the world of work).

For analysts from inside France, the new principles represented evolution, not revolution, for they described the new curriculum as developing from the policy of pedagogy by objectives that had been in place since the 1970s (Ropé, 2000). The deeper change was that the reform expressed a shift in pedagogical thinking that had occurred in the late 1980s in France from content-centered to learner-centered instruction (Ropé & Tanguy, 1994). The reform also proposed that pupils acquire interdisciplinary competences alongside, not in place of, disciplinary knowledge. Just as France revisited the notion of competences a dozen years later, the European Union later developed a framework of competences (EC, 2006). Unesco published a report developed by a commission overseen by Jacques Delors Entitled Learning: The Treasure Within (Unesco, 1996), the report emphasized *"learning throughout life"* and identified *"four pillars"* of education: learning to know, learning to do, learning to live together and learning to be. In the context of learning to do, it discussed a shift from "skill" to "competence", thus apparently defining competence more broadly than the OECD's 1995 report. Fore shadowing Unesco, the European Commission also argued that competences to be developed should include the ability to learn throughout one's life (p. 124). The European Commission under Jacques Delors' presidency equally issued a white paper on economic growth that referred in broad terms to "les competences fondamentales indispensables à l'insertion sociale et professionnelle" (basic competences indispensable for social and professional participation) (EC, 1993 p.124) that was similar to, although not identical with, the framework OECD (OECD, 2005).

In 1995, the OECD explored the notion of competence in a report that compared educational standards used in ten OECD member nations. The report equated "competence" with "skills" made specific references to employers' needs and graduates' capabilities for employment, as had the European Community's 1993 report. The OECD initiated a multi-year reflection on "Defining and Selecting Competences" commonly called DeSeCo. The DeSeCo project published its first report in 1999 (Salganik et. al., 1999), an influential think piece in 2001 (Rychen & Salganik, 2001), and its edited volume on "Key Competences" in 2003 (Rychen & Salganik, 2003). The introductory chapter of DeSeCo's 2003 report cites a list of 16 standards or "generative skills" developed by a commission. The last presented "a holistic model of competence" (2003, Chapter 2); its definition of competence aligned closely with integrated definitions that emphasize the ability to mobilize resources to respond to a real-life situation in a particular context. The OECD embraced the notion of competence, as reflected in the goals for PISA, assessments designed to measure not "mastery of the school curriculum," but rather "knowledge and skills needed in adult life" (OECD, 2000 p.8).

Experts of BIEF have worked jointly with the UN organizations of UNESCO and UNICEF and many other international organizations to reform the old African educational systems, (Boukhentache , 2016). Two international organizations published documents proposing competence-based education in the 1990s, the OECD and UNESCO.

i. OECD

The OECD, an economic organization, has become the most influential international organization in the domain of education since it developed PISA. In 1995, two years before it launched formal planning for PISA, the OECD explored the notion of competence in a report that compared educational standards used in ten OECD member nations. The report equated "competence" with "skills" made specific references to employers' needs and graduates' capabilities for employment, as had the European Community's 1993 report. Soon after, the OECD embraced the notion of competence, as reflected in the goals for PISA, assessments designed to measure not "mastery of the school curriculum," but rather "knowledge and skills needed in adult life" (OECD, 2000 p. 8). As it launched PISA, the OECD also initiated a multi-year reflection on "Defining and Selecting Competences" commonly called DeSeCo. The DeSeCo project published its first report in 1999 (Salganik et. al., 1999), an influential think piece in 2001 (Rychen & Salganik, 2001), and its edited volume on "Key Competences" in 2003 (Rychen & Salganik, 2003). The last presented "a holistic model of competence" (2003); its definition of competence aligned closely with integrated definitions that emphasize the ability to mobilize resources to respond to a real-life situation in a particular context. Of interest to the question of trajectories, the introductory chapter of DeSeCo's 2003 report cites a list of 16 standards or "generative skills" developed by a commission in the United States (Stein, 2000) source: for DeSeCo's identification of key competencies.

ii. UNESCO

Meanwhile, UNESCO published a report developed by a commission overseen by Jacques Delors (whose 10-year presidency of the European Commission had ended, and who had also contributed to the DeSeCo reports). Entitled Learning: The Treasure Within (Unesco, 1996), the report emphasized "learning throughout life" and identified "four pillars" of education: **learning to know, learning to do, learning to live together and learning to be.** In the context of learning to do, it discussed a shift from "skill" to "competence", thus apparently defining competence more broadly than the OECD's 1995 report. Fore shadowing

Unesco, the European Commission also argued that competences to be developed should include the ability to learn throughout one's life (p. 124). The European Commission under Jacques Delors' presidency equally issued a white paper on economic growth that referred in broad terms to "les competences fondamentales indispensables à l'insertion sociale et professionnelle" (basic competences indispensable for social and professional participation) (EC, 1993 p.124).

Although the reform has been widespread, just as France revisited the notion of competences a dozen years later, the European Union later developed a framework of competences (EC, 2006) that was similar to, although not identical with, the framework that the OECD would develop (OECD, 2005). The document provides insights into why the discussion of competence moved into primary and secondary education. However, the reform is not global in the sense some countries like the U K, Russia have not adopted competence-based primary or secondary curricula. Russia occasionally discusses English competences in higher education or teacher education. It appeared in 2008 that England was shifting to a competence-based curriculum, but the shift never happened. Back in 1988, England had moved away from the learner-centered instruction favored in its primary schools to a content-focused National Curriculum. Then twenty years later, in 2008, England adopted a new primary and secondary national curriculum that resembled a competence-based approach, although the British preferred the term "skills" (Gordon & alii, 2009). The reform was to include a cross-curricular "set of broadly cognitive and social skills"—specifically, that students become "Independent enquirers, Creative thinkers, Reflective learners, Team workers, Self-managers, Effective participators" (Gordon & alii, 2009 p. 309). England canceled a planned competence-based curriculum in 2010. However, the government changed in 2010 before the new curriculum was to be implemented, the new government suspended the changes, and by 2014 had proposed a different curriculum described by the Prime Minister as "rigorous, engaging and tough" (Coughlan, 2013).

In North America, Quebec's new programs of 2001 took a socio constructivist competence-based approach (Jonnaert, 2001 : 2). In Latin America, Unesco's regional office promoted reform through a series of meetings in the 1980s and 1990s, and meeting declarations made references to competences as early as 1993 (Unesco & Orelac, 2001), Mexico started with the pre-school curriculum in 2004, and then spread to the entire primary and secondary system in 2011. The French community of Belgium introduced competences into its primary and lower secondary curriculum in 1994 and 2001 (Belgium, 1994 ; Jonnaert 2001). Luxembourg also changed its curriculum (Jonnaert, 2001).

In East Asia, A UNESCO working paper indicated that South Korea was thinking about competence, but only at the level of “mere discourse,” not movement toward policy (Lee, 2014 p. 2). A UNESCO report said that China’s 2001 Basic Education Curriculum Reform Program represented “a fundamental shift… from discipline-based knowledge-centered curriculum to a learner-centered curriculum” (Zhou & Zhu, 2007 p. 53), and that it has added an *“integrated curriculum” to “discipline-based curriculums”* (p. 27). Roegiers (2001) referred to a 1996 textbook reform in Vietnam and to reforms in Kazakhstan. Japan launched a major curriculum reform the following year, in 1998. Keita Takayama saw the reform as a competence-based curriculum (2013) in line with the OECD’s vision, and certainly, the OECD described it favorably (OECD, 2012). Japan “rebalanced” its 1998 reform in 2111. Japan promoted the reform under the slogan (ikiruchikara) “zest for living”, referring to the hope that it would encourage an eagerness to learn. A new section of the curriculum, called “Integrated Study”, aimed to “foster children’s ability and quality to find a theme, think, judge and solve a problem on their own ; and enable children to think about their own life, urging them to explore subjects with creativity”(OECD, 2012 p. 188).

2.2.1.3 A Shift from Objective-Based Pedagogy to the Competence Based Approach in Cameroon.

Besides international conventions which range from the Jomtien Education Framework of 1990, the Salamanca Statement of 1994, the Dakar Framework of 2000 to the Incheon Declaration of 2015 precisely the fourth Sustainable Development Goal (SDG4). Returning to the early 1990s, the scene shifted from Europe to Africa, where competence-based discourse was taken up by Confemen (Conférence des ministères de l’éducation des pays ayant le français en partage, Ministers of Education in French language countries). In 1990, the World Conference on Education For All (EFA) which held in Jomtien, Thailand, made a clarion call for universal quality primary education. During this conference, emphasis was laid on access, equity and quality primary education for all. Apart from declaring that “Education is the fundamental right for all people, women and men of all ages throughout the world”, the EFA conference also underscored that active and participatory approaches are particularly valuable in assuring learning acquisition and allowing learners to reach their fullest potentials. It is, therefore, necessary to define acceptable levels of learning acquisition for educational programs and to improve and apply systems of assessing learning achievement.

A decade after Jomtien, in the year 2000, the World Education Forum held in Dakar, Senegal where the Dakar Framework for Action focused, among others, on "HIV/AIDS, early childhood education, school health, education of girls and women, adult literacy and education in situations of crisis and emergency". To expand further on the education agenda of Jomtien, the Dakar meeting, after careful evaluation, extended the scope of educational imperatives to include:

• Expanding and improving comprehensive early childhood care and education, especially for most vulnerable and disadvantaged children

• Ensuring that by 2015, all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have **access to and complete free and compulsory primary education of good quality**

• Ensuring that the learning needs of all young people and adults are met through equitable access to **appropriate learning and life-skills programs**

• Achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults

• Eliminating gender disparities in primary and secondary education by 2005 and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality

• Improving all aspects of the quality of education and ensuring excellence of all so that all, especially in literacy, numeracy and essential life skills, achieve recognized and measurable learning outcomes. The vision is to transform lives through education, recognizing the important role of education as a main driver of development and in achieving the other proposed SDGs. In order to meet up with these education milestones, Cameroon had to carry out major actions, which included the writing of syllabuses on HIV/AIDS, on Human Rights and on ICTs. Furthermore, the revision of curricula to align with the provisions of the Incheon World Education Forum became imperative. Nonetheless, faced with the problem of quality and the phasing out of the Cameroon Primary School Syllabuses for both subsystems, which date as far back as 2000, the building up of a new curriculum became a necessity.

In addition, the vision of the Continental Education Strategy for Africa (CESA 2016-2025), reorienting *"Africa's education and training systems to meet knowledge, competencies, skills,* *innovation and creativity required to nurture African core values and promote sustainable development at the national, sub-regional and continental levels"* has carefully been addressed in this curriculum. The present curriculum reform, taking its cue from these instruments, is an attempt to respond to current trends to provide an education, from early childhood that would address the needs of each child through the development of their mind-set. After analyzing the introduction and implementation of the new curricula for primary schools based on CBA, they realized that CBA was the most relevant method to enhance African education Confemen's Yaoundé summit of 1994 led to a proposal for reforms, published as Confemen (1995), which featured a call for a curriculum to develop pupils' competences. Under Confemen's mandate, the intergovernmental organization AIF (l'Agence Intergouvernementale de la Francophonie), now part of OIF (l'Organisation Internationale de la Francophonie), provided financial support for the development of competence-based approaches in 23 Francophone countries (Bernard, Nkengne, & Robert, 2007 ; Roegiers, 2008) ; OIF supported a pool of experts offering training in competence-based approaches for a decade beginning in 2001 (Roegiers, 2008). There was also support from Unicef, Unesco, and the European Union in various countries (Roegiers, 2008).

The Belgian organization BIEF (Bureau d'Ingénierie de l'Éducation et de la Formation, www.bief.be), created in 1989 by De Ketele and Roegiers, began supporting development of competence-based approaches in Africa and elsewhere in 1996 ("Notre histoire" at www.bief.be). The foundation of BIEF in 1989 and the financial assistance granted by UNESCO and UNICEF have encouraged the spread of the French-speaking version of CBI, rather than the Anglo-Saxon version in developing countries. Lenoir and Jean (2012), noted that, the financial and technical assistance supplied by powerful and influential international organizations has always been conditioned by the application of a given teaching approach. In order to undertake this pressing school reform in a secure way, most African countries have readily accepted the methodological assistance suggested by BIEF and the technical and financial support of international organizations. UNICEF wanted to improve the quality of basic schooling conditions especially for young girls in developing countries (De Ketele, 2000), experts of BIEF who have readily accepted the challenge of a macro-level evaluation of national wide programs of some developing countries, have undertaken the task of counseling and monitoring school reforms based on the pedagogy of integration.

In 1995, Cameroon organized a National Forum on Education. The Competence-based approach was introduced in French-speaking Africa in 1996 during the Conference of

Ministers of Education whose countries shared the French Language in Yaoundé (Bernard et al 2007). The Constitution of the Republic of Cameroon guarantees the right of the child to education. In 1998, The Law to lay down guidelines on Education in Cameroon was promulgated by the head of state Paul Biya; which states in Article 4 that the general aim of education is to ensure the intellectual, physical, civic and moral development of the child as well as its economic, sociocultural, political and moral integration in the society. From 2008 to 2009, Cameroon with four other countries carried out a study on curricula reforms. In view of becoming an emergent nation by the year 2035, the government developed the Growth and Employment Strategy Paper (GESP) in 2009 to provide major orientations to all sectors of the society. The document-tasked ministries in charge of education to develop the human capital required to attain this vision. The vision of the new curriculum falls in line with the SDG4, which seeks to ensure inclusive and equitable quality education and promote lifelong learning for all with focus on access, equity and inclusion, quality and learning outcomes within a lifelong learning approach. This is in line with the vision of the Education Forum that states that by 2030, all girls and boys should be able to complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes. Access to quality early childhood development, care and pre-primary education should be granted so that children are ready for primary education. By the same token, all men and women should have affordable and quality technical, vocational and tertiary education, including university; and the number of youths and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship should be substantially increased. CPSCES level three (2018p.12). The 2013-2020 Education and Training Sector Strategy Paper (ETSSP) clearly defines the missions of each sub-sector in the educational system.

It is in the light, competency-based approach to learning was thus introduced in secondary schools in the academic year 2012/2013 by the Ministry of Secondary Education for “6e” and “5e” classes. However, teachers received it with lot of resistance. By introducing this approach, it was hoped that teachers would teach using a more integrated approach that will help pupils become learners that are more competent. However, the practices of the teachers in the classroom seem not to give learners the opportunity to acquire competences**.** In the same perspective, the Ministry of Basic Education equally took a major initiation by introducing competence-based approach in 2006 in Cameroon Primary Schools. Article 7 of the ministerial Arête N° 315/b1/1464/MINEDUB of 21st February 2006 precise that ‘programs are focused to identify and to define each cycle, competences to be mastered by pupils at each level’. The new vision of evaluation was adopted in conformity to the ministerial decision N° 315/b1/1464/MINEDUB of 21 february2006 in respect to pedagogic reforms regarding to acquaint teachers with evaluation instruments necessary to a quality collective promotion elaborated for the evaluation of learners based on objective based pedagogy. In 2010: Another study on the Reform of the primary school curriculum was carried out. In 2014: Cameroon signed a convention with BID (PASZEP Project). An Elaboration of the Nursery and primary school curricula started from 2016 to 2017and some selected pilot schools in Yaoundé started implemented it. At the beginning of 2018/2019 academic year, new curricula were drafted and implemented in both nursery and primary schools of the country based on Competence Based Approach (CBA).

2.2.1.4 The aims of the curriculum

The new curricula shift from (content) objective based approach to the competence-based approach (OBA) through the Inferential Thinking Approach (New Pedagogic Approach) to the Competence based Approach (C B A) or integration pedagogic approach which presents new challenges to teachers at various levels. The underlying philosophy of the CBA requires that learning should be based on the potentials of learners. The learner should be responsible for his or her own learning. Focus is laid on learning and not on teaching. The aims of the 2018 New Nursery and Primary School for the English Sub-System Education ties with the 1998 law Laying down Guidelines for Education in Cameroon. It States in Section 4 that: “The general aim of education is to ensure the intellectual, physical, civic and moral development of the child as well as its economic, socio-cultural, political and moral integration in the society.” It equally aligns with world pedagogic evolutions and to the 21st Century economy that is technologically driven and skill-based. Science, Technology and Mathematics (STEM) and practical skills are the key driving forces for the fourth industrial revolution for the development of more productive citizens. As such the new curricula:

- Engage learners to be competent, Independent, more active, creative and cooperative learning processes with opportunities to develop their potentials;
- Produce skilled learners, capable of contributing to lifting Cameroon to an emergent country by 2035;
- Learners become actors of their Personal development;

- Empower teachers with pedagogic opportunities as well as the possibility to adapt the teaching-learning process to their contexts;
- Transfer classroom knowledge to real life situations;
- Develop not only pupils' knowledge but also their skills and attitudes.
- Participate in quarter, village, and community.

Problems expected to resolve

- Relationship between school performances and real life;
- Repetition problem;
- Ameliorate quality education;
- Integral development of our learners;
- Enhance teachers' knowledge and skills on pedagogic practices;
- Ameliorate school achievements ;

2.2.1.5 The Nursery and Primary schools' innovation of Cameroon context in the learning-teaching process

In fact, learning and teaching process in both the nursery and primary is based on a monthly theme, monthly schemes of work and a pedagogic project to be carried out during learning and teaching. Each theme is going to run through all the subjects in the curriculum, can last for about a month, and culminates in a project presentation event and/or other relevant pedagogic activities as the case may be. However, in cases where the theme does not or cannot be exploited for given contents, the concepts should be taught normally. The ILTs are presented per cycle and per level in Table 7 follows: To facilitate the development of knowledge, skills and attitudes, eight Integrated Learning Themes (ILT) have been identified to contextualize learning. They are the bases on which all the activities for a defined period will be carried out within the school year.

How to consolidate an integrated learning theme

An integrated theme is a theme around which learning will take place. Consolidating it entails a context, task and instructions (CTI).

Table 7: Integrated Learning Themes (ILT)

Nursery 1 and 2	Level 1and 2	Level 3
The school community	The home	Nature
The body	The village/town	The village/town
The family and home	The school	The school
Festivities/Celebrations	Occupations	Occupations
Plants	Travelling	Travelling
Animals	Health	Health
Occupations	Games	Sports and leisure
Travelling	Communication	The universe and space

Source: teacher's handbook for the Cameroon Nursery and Primary school curricula (2018 p.5)

i- The nursery and Primary school curricula

The new nursery curriculum contains 20 activities for nursery 1 (excluding painting and ICTs which are applicable only to nursery 2) and 22 for nursery 2 regrouped under five domains. These activities are carried out through project-based learning and cooperative learning related integrated learning themes identified in Table 7 above. Meanwhile the new primary school curriculum contains 10 subjects grouped under five domains. These subjects are equally taught through project-based learning and cooperative learning related to integrated learning themes identified in Table 7 above.

Stages of a lesson

Apart from the preamble, the lesson will comprise of an introduction, presentation and conclusion in three rows. As for the columns, we have the stage, matter and learning/teaching activities will be displayed.

Organization of activities

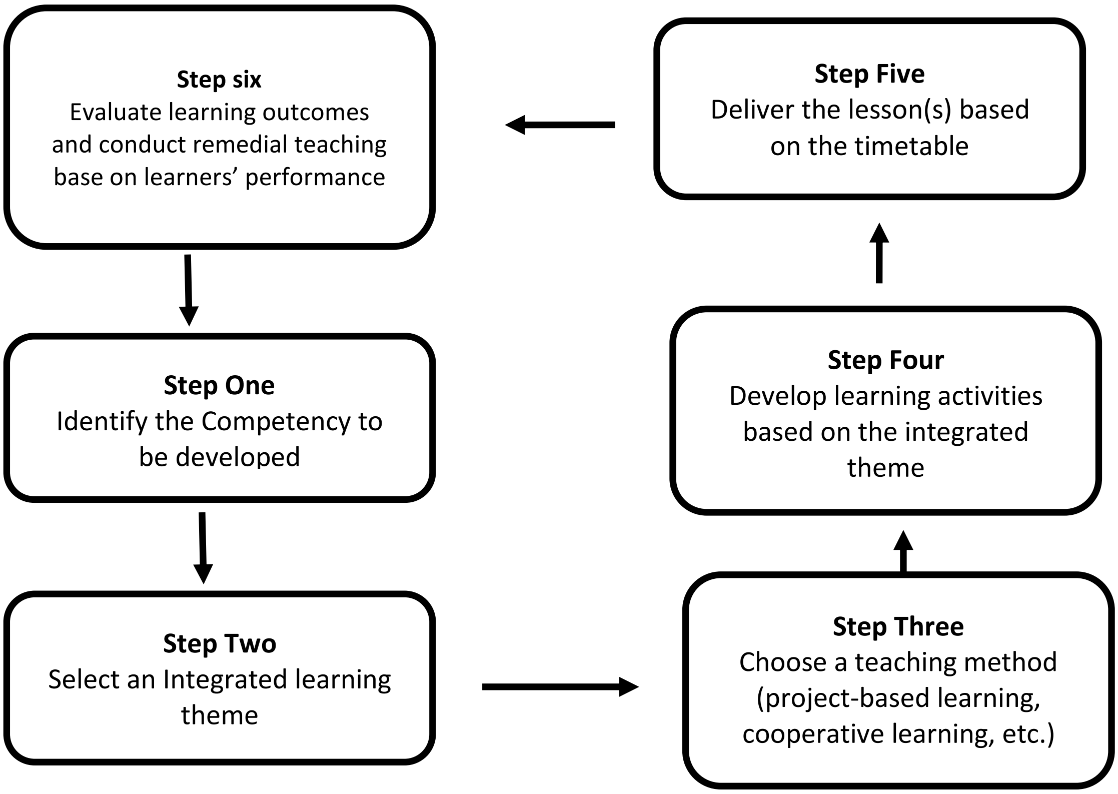
The curricula warrant that a child who enters the nursery and completes his primary school cycle should be able to acquire competences that will enable them to solve problems in their environment. That accounts for the fact that among the elements that constitute the different activities or subjects, there are Knowledge, skills and attitudes (KSAs) to be developed at the end of the project. These elements target all the activities needed to render that project feasible/achievable.

Tasks to be carried out.

- Identify the competence(s) to be developed, over a given period in a unit (this unit should be related/ based on a chosen theme, which should run through a given number of subjects);
- Conceive a project, together with your pupils;
- Use the monthly schemes to plan and organize systematic learning teaching as usual (taking into account formative evaluation);
- Plan and organize evaluation activities to be carried out;
- Plan and organize integration activities;
- Foresee evaluation activities on identified competences from the beginning and organize them (summative evaluation);
- Organize remediation or remedial works;
- Go to the next learning-teaching unit.

❖ **Teaching steps**

Figure 3: Illustrates a step by Step Guide in the Development and Implementation of a Skill-based Lesson.



The time officially prescribed for effective teaching learning is 36 weeks interspersed with two periods of breaks, each lasting for four weeks. The 36 weeks are counted from the 1st Monday of the month of September to the 2nd Friday of the month of June (deduction made after examining several school calendar years). The 36 weeks correspond to 1,224 hours/year making a total of 34h30 minutes of effective learning teaching per week. (Confer the new primary school syllabus). This may seem clear as a rule. However, it is very different when it comes to practice, since classes virtually stop throughout the national territory on May 20. **The effective learning-teaching time** lasts for 32 weeks in 1,104 hours/year, If the academic year envisages the start of official examinations as on 2nd Monday of June, in reality, Common entrance and the 'Concours d'entré' usually take place before May 20, warranting teachers to hurry over their syllabus coverage before this deadline. As such, not less than four weeks of effective teaching is sacrificed. On the other hand, out of the 1,104 hours, 144 are deducted for breaks and that leaves us with 960 hours of effective learning teaching in a one-shift system. As concerns the 32 weeks dedicated to learning teaching, the new program suggests 23 for effective learning teaching and 09 for evaluations/integrations/remediation. Given the percentages attributed to the different domains and their related subjects 960 hours have been distributed in conformity with the international exigencies.

- **Didactics of the new subjects**

The principle of flipped classroom in the teaching of national languages and cultures

The teaching of new subjects calls for new didactics that are appropriate to them. The teaching of National Languages and Cultures is difficult in the Cameroonian context where we have more than two hundred languages. However, the problem of teaching languages is not the same in the village and town. In the village, the language of the locality can be taught with the assistance of the education community but in town, teaching will resort to flipped classrooms. This pedagogy requires that for the effective teaching of a given theme, the teacher assign learners, some days before the lesson, to go and carry out some investigations and present their findings in the next lesson. In this manner, the learners become the teacher and the teacher becomes the learner. The weakness of this pedagogy is at the level of evaluating skills. However, focus is on the evaluation of competences not subject contents acquisition. Admittedly the nature of children does not predispose them to lying and even if they lie, their classmates will correct them since it is difficult to find a class in which each learner is the lone speaker of their language.

Technique: this is done depending on the availability and activity to be carried out. A radio or a television can be used as a medium for receiving information; For example, the teacher can ask pupils to watch a television slot (football, story, cartoon, series, etc) at home and back at school, the class holds a discussion on that. On the order hand, a tape can be used to listen to a song and learn the melody. In addition, a cell phone can be displayed for learners to study letters of the English or French alphabet.

Project based pedagogy

Project based learning is a teaching model that enables the learner to acquire knowledge, build knowledge and develop competences. The realization of a pedagogic project requires the learner to set objectives, progress with their peers within a specific time under the guide of the teacher towards the realization of a concrete product, which will be finally presented to a selected audience. Pedagogic principles are significance to the learner, active and responsible participation of the learner, open approach, collaboration and cooperation of pupils, concrete realization and integral development of the pupil.

Four conditions are necessary for a pedagogic project to succeed preparation, implementation, evaluation, publication.

The first stage consists of structuring the project in stages, specifying the contents, defining and distributing tasks, roles and responsibilities. Establishing a calendar of activities, defining rules for the proper functioning of the teams, identifying the method of collecting data and ICT tools to be used, determining the modes and criteria of evaluation and specifying the follow up of the project**.**

What is cooperative learning?

It is a form of organizing learning and work, which gives priority to peer interaction and teamwork. This teaching model targets the development of cognitive structures, social and interpersonal abilities and the making of learners responsible. This form of learning is beneficial to both the learner and teacher in that it:

- Facilitates the cognitive development of learners;
- Improves learners’ reasoning capacities;
- Uses more effective strategies;
- Improves learners’ aptitudes for generalization.

In the spirit of this form of pedagogy, the teacher plays the role of an observer, facilitator, mediator, and consultant. The basic principles are group size, the composition and formation of groups, the learner’s role, and positive independence, individual and collective, abilities.

❖ **Use of didactic material**

Choice of didactic material: the choice of didactic material has to be in line with the lesson to be taught. It should not be dangerous and should be adapted to the age of the learner.

Type of material: it should preferably be concrete; semi-concrete material is equally accepted.

2.2.1.6 The Learner's Profile

The Ministry of Basic Education intends to develop the knowledge, skills and attitudes of learners under its authority. At the end of the primary school cycle, the learner is expected to have acquired the 7 national core skills and the 4 Broad Competences in view of stepping into secondary school or engaging in other learning contexts or activities. Furthermore, the learner must equally have acquired key values in the five domains. On a similar note, they should show interest in learning all the subjects to guide the development of competences in the learners. To this effect, learners leaving Nursery and Primary School are supposed to acquire knowledge and develop skills and attitudes provided in the curricula to enable them:

1. Communication in the two official languages (English and French) and the use of at least one national language

Communication in English, in French and in at least one National Language implies the ability to use the four language skills of these languages. The learner should be able to listen, communicate orally, and be able to read and to write. The language competence is a prerequisite for access to other core skills.

2. Use of basic notions in Mathematics, Science and Technology

Introducing notions of Mathematics, Science, and Technology involves the acquisition of knowledge, skills and attitudes in these subject areas and the ability to use them to address challenges in real life situations.

3. Practice of Social and Citizenship Values (morality, good governance and budgetary transparency)

This involves inculcating patriotic, moral, citizenship values and values of good governance in the learners of both cycles to prepare them for a harmonious insertion into the society.

4. Demonstration of the Spirit of Autonomy, a Sense of Initiative, Creativity, and Entrepreneurship

Developing this competence in the learner calls for the assembling of multidisciplinary knowledge and skills in view of developing the learners' social integration skills, creativity as well as managerial and entrepreneurial potentials.

5. Use of Basic Information and Communication Technology Concepts and Tools

Generally, this core skill requires the use of information and communication technology tools in school and in society. It is related to healthy, safe and responsible use of various ICT devices for learning and for leisure activities. In addition to this, it develops logical and critical thinking, automated management of information (analyzing, summarizing, and assessing), and apt communication skills.

6. Practice of Lifelong Learning

This implies that the learner will demonstrate the desire and the will to continue education and organize self, especially through efficient time and information management.

7. Practice of Physical, Sports and Artistic Activities

This competence provides learners with a platform to develop their physical, psychomotor, artistic, personal and interpersonal skills as well as improve their wellbeing. It enables them to acquire knowledge, skills and attitudes required for their participation in various physical, psychomotor, sports and leisure activities in order to strengthen social harmony and ensure a healthy lifestyle.

Broad-based Competences

In addition to acquiring the National Core Skills at the end of Primary Education, pupils should equally exhibit the four broad-based competences namely:

1. Intellectual competences

Intellectual Competences include:

- exploiting information
- solving problems
- acquiring logical thinking and a sense of observation
- exercising critical judgement
- practicing creative and innovative thinking

2. Methodological competence

Methodological competences include:

• giving self-efficient working methods

• exploiting information and communication technologies

• organizing learning

• arousing the desire to learn each subject

3. Personal and interpersonal competences

Personal and interpersonal competences enable the learner to:

• develop his/her personality

• acquire abilities in view of his/her socio-cultural integration and individual fulfillment

• cooperate with others.

4. Communication competences

Communication competences enable the learner to:

• communicate in an appropriate manner in the two official languages

• communicate in at least one national language

The seven Core-Skills and the four Broad-based Competences are implemented through five learning areas (domains emphasis has been laid in nursery school on :

- Literacy and Communication (35%)
- Science and Technological Skills Development (25%)
- Practical Life (25%)
- Arts and Crafts (10%)
- Motor Skills (5%)

For the primary emphasis has been laid on:

- Basic knowledge (60%)
- Communal life and national integration (5%)
- Vocational and life skills (20%)
- Cultural identity (5%)
- Digital literacy (10%)

Source: Teacher's handbook for the Cameroon Nursery and Primary School Curricula (2018, pp. 3-7)

The teaching learning process requires continuous follow up and the educational progress of the learners need frequent assessment. According to Alausa (2004), the various dimension of learning activities of the learners should be assessed by various methods. The understanding is that the variety of assessment strengths the quality of education and fulfill the weaknesses each assessment techniques. The practice of Competency Based Assessment(CBA) has been recommended in basic and secondary levels education in Cameroon. Policy makers and educational administrators often view assessment scores as a measure of educational quality. Quality of education is related to how well instructors implement CBA appropriately and design strategies that enhance the implementation of CBA. The researcher reviewed mathematics assessment practices in some selected countries that could be beneficiary to the educational policy makers in the implementation of mathematics CBA practices.

2.2.1.7 Meaningful classroom-level assessment practices: examples of Selected Countries

The main objective of this section of the study is to explore mathematics assessment practices of the selected countries and if possible, for which Cameroon as an emerging African country by 2035, it educational policy makers could acquire experience. For the purpose of generating and exploring the textual data, the researcher reviewed the latest articles, policy documents, mathematics curricula freely available from the internet. The researcher deployed the procedures of combination of descriptions, analysis and interpretation of the textual data (Wolcott 1994, as cited in Creswell, 2012). From the analysis of the textual data, the researcher realizes that the assessment system has been implementing to assess the students achievement is determined by the deep-rooted thoughts or worldviews of education adopted by the authorities and nation at large. Teachers have been prompted by educational policy, teacher journals, and professional development initiatives to incorporate new assessment practices in their classrooms in order to develop a better understanding of student thinking and to provide appropriate feedback (Wiliam 2015). In order to build the scope and experiences on assessment practices in mathematics education the researcher therefore, focused on some selected countries around the globe: China, Finland, USA, UK and France purposively. The first is an emerging country for its economical, scientific and technological development and some of its provinces stood in the significant position in an international achievement tests. Similarly, USA continuously improves its position in latest versions of PISA and TIMSS and the Finland is one of the countries that would be able to draw an attention of research communities as it secures the remarkable position in an international comparative assessment tests. UK and France are the two colonial masters' countries which

Cameroon inherited the English subsystem education for the English speaking Cameroonians and the Francophone subsystem education for the French speaking Cameroonians today, adopted by educational policies markers. Moreover, each of the countries represents the different cultural traditions. Generally, China and USA represent the East-Asian and western cultural traditions respectively whereas Finland, France and UK are from European region.

Two broad categories: **post/positivist/traditional perspective and integral perspectives** of assessment in mathematics have been practicing in the selected countries. A description of some key features, attributes, aims and procedures of assessment system under these paradigms will be highlighted.

i. **Post/positivist perspective**

For instance, Chinese mathematics education practices have been guided by the Confucian tradition that has somehow similar attributes of positivist paradigm. Positivistic oriented curriculum practices offer behaviourist notions of teaching-learning activities that focus on imparting certain mathematical facts, concepts, skills and knowledge to the learners. Then obviously, the process of assessment is restricted to measure those facts, skills, concepts and knowledge to determine whether the students are able to recite and reproduce these mathematical attributes (Romberg,1993). The Confucius tradition acknowledged for developing the two basic skills among the pupils (Tu& Shen, 2010). It further incorporated the controlling and managing strategies in which students are urged to learn what teachers or authorities considered as significant for their future life (Tu& Shen, 2010).

Teachers and textbooks have been regarded as the ultimate sources of knowledge in which teachers are supposed to transmit their mathematical knowledge and concept among the pupils. When the aims of mathematics education and teaching-learning activities focus on developing the universal objective knowledge through transmissionism approach then obviously assessment system is limited to measure a so-called universal mathematical knowledge. It incorporates only standardized paper-pencil test for measuring and determining the students' attainments of the mathematical outcomes.

The unidimensional nature of paper-pencil test has not been able to measure the overall development of students. The declarative assertions of questions offer objectives solutions in closed form. It does not flourish the grounds for developing creative, critical and imaginative thinking. Similarly, its time-bounded nature largely limits to assess the memorizing power of students, algorithmic skills to solve routine problems and mechanistic approaches of proving theorems. Such conventional approaches of assessment system largely focus on measuring the lower level cognitive objectives: remembering, understanding, applying and analysing. Chinese mathematics education practices focus on learning more and more mathematical contents and do much drills or practices for being success on mathematics and puts pressure on their students to perform best in mathematics achievement. In this context, there arises a serious question: whether the aims of mathematics education is to solve the routine problem or prepare a conscious citizen who might contribute the countries for the deep democratic and socially just practices in immediate socio-cultural milieu and nation at large. A UNESCO report said that China's 2001 Basic Education Curriculum Reform Program represented "a fundamental shift… from discipline-based knowledge-centered curriculum to a learner-centered curriculum" (Zhou & Zhu, 2007 p. 53), and that it has added an "integrated curriculum" to "discipline-based curriculums" (p. 27).

Similarly, in America the current reform movement in mathematics started with the publication of Everybody Counts in 1989 (National Research Council, 1989). The overarching goal of mathematics education in United States of America (USA) was to prepare students to function as productive citizens in a highly industrialized and technical society (Wnag & Lin, 2009). It indicates that US mathematics education practices focus on **utilitarian values** of mathematics. The utilitarian views of mathematics offer the mechanistic, linear and reductionist model of teaching-learning activities and assessment system in which students are urged to solve the mathematical problems that are highly relevant to industrialized global markets. They view mathematics as pure and universal knowledge, and educational institutions intend to impart this knowledge into their pupils so that they can easily be sellable into markets. The US assessment practices of mathematics largely focus on the standard test. Students may take standardized tests such as the Scholastic Assessment Test (SAT) or the American College Test (ACT) for getting admission to university, although not all institutions rely upon these examinations (Dossey, Halvorsen, & McCrone, 2012). Moreover, the 'No Child Left Behind' (NCLB) Act of 2001 also recommends that every states should measure student progress in reading and mathematics in years 3 through 8 and at least once during years 10 through 12 (Dossey, Halvorsen, & McCrone, 2012). Most of the assessment practices have been influenced by psychological and curriculum reform traditions aimed to search for reliability, in the sense of accuracy of measurement, and curricular and content validity (Morgan, 2000).

Finally, US and China believe that cognition is bounded within human mind and learning as ultra-rationale and intuitional activities detach from the human socio-cultural perspectives and consequently give more emphasis on standard mathematical assessment for producing more reliable and consistent results (Luitel, 2009). Mark Roger Brown (2001) revealed that, the key component of the Standards was the call for a shift from the practice of rote memorization to a constructivist teaching style emphasizing discourse, worthwhile Mathematical tasks, and learning through problem solving (Battista, 1999). The structure of the proposed standards in problem solving» reasoning and proof, connections between content strands, communication, and multiple representations of problems that crossed all content strands reflected this thinking. The method of instruction was to shift from teacher lectures and rote memorization to the use of collaborative groups and hands-on manipulative activity to foster student learning (NCTM, 1991). Assessment was to shift from dependence on quizzes and tests, to the use of multiple assessments including writing, questioning (both in writing and oral, and observation to not only measure student progress, but to also assess how well the curriculum itself was being implemented (NCTM, 1995). These views draw on **cognitive, constructivist, and sociocultural views** of learning (Gipps 1994; Lund 2008; Shepard 2000, 2001). Gipps (1994) suggested that the dominant forms of large-scale assessment did not seem to have a good fit with constructivist theories, yet classroom assessment, particularly formative assessment, did. Further work has moved towards socio-cultural theories as a way of theorizing work in classroom assessment (e.g., Black and Wiliam 2006; Pryor and Crossouard 2008 as well as understanding the role context plays in international assessment results (e.g., Vos 2005).

ii. Integral Perspective of Assessment

Assessment system is governed and directed largely by the purposes of curriculum, which is further related to paradigms of education that determines the vision of the mathematics education. For instance, if the vision of mathematics education is to produce the creative and critical citizen, then the accompanying assessment policy focuses on authentic and performance based assessment that offer for demonstrating and performing the critical and creative works lead by constructivist notions of learning (Romberg, 1993; Lamichhane, 2017). It focuses on holistic approaches of assessment and tries to explore whether each students has developed the ability of solving non-routine problems independently that have been encountered during their academic, professional and personal lives as well. Moreover, it also devotes to assess the students from multiple perspectives: whether students are able to

communicate mathematically, reason creatively, and apply mathematics for solving the varieties of problems in an emerging situation. These features of educational objectives and assessment approaches are absolutely lacking in positivistic oriented curriculum practices.
Finnish mathematics educators and practitioners regard learning as one of the social process and believe that cognition is socially distributed (Cobb, 2006; Lerman, 1999) and thus incorporates the integral perspectives of assessment in which all institutional activities are assessed for the betterment of the mathematics practices. The Finnish education system thus acknowledges assessment as an integral part of mathematical activities in classroom always focuses on formative aspect of learning. The aim of formative assessment is to encourage pupils to learn mathematics on their own pace, provide the immediate feedbacks that facilitate students learning, and help to develop the positive attitudes towards the mathematics. To assist students in which they feel some discomfort in learning mathematics, diverse assessments tools: journal writing, assessment interviews, oral assessment, observations and portfolio assessments are used for the diagnosis of learning status of the students for the purpose of enriching teaching learning activities rather than ranking the students' position. Such a holistic approach of assessing the students' performances in mathematics help to develop the positive attitude towards mathematics and consequently increase the level of confidence in mathematics learning and self-efficacy believes of more viable components for the betterment of the mathematics education. The mathematical skills that Finland wants to enhance are somehow different from the general conceptions of skills. The mathematics skills include communication (both oral and written) skills, problem solving skills and calculation skills help to enhance the conceptual and relational understanding (Mendaglio, 2014). Teachers or school authorities have a right to design the curriculum according to their local context, needs and immediate environment. In this perspective, assessment is taken as formative process of learning. The Finnish assessment practices focus on ongoing learning process rather than external evaluation. After implementing the new approaches of assessment in 2010 (Finnish National Board of Education, 2010, as cited in Hendrickson, 2011), students take national standardized test at the end of basic education but the test score has not used to rank the students. It is used to determine the effectiveness of national curriculum and other policies of education.

Similarly, in England for instance, the Qualifications and Curriculum Authority (2006) directs teachers to use appropriate assessment approaches that allow for different learning styles and ensure that pupils are given the chance and encouragement to demonstrate their competence and attainment through appropriate means that are familiar to the pupils and for which they have been adequately prepared (p. 3). A study involving primary schools in England and France, for example, Raveaud (2004) found that in classrooms where all children did the same work, some children found themselves failing repeatedly from a very early age. In England, the researcher found that differentiation had reduced the actual occurrence of errors pupils made. In addition, England does not only take into account teaching and learning experiences designs but as well as appropriate the assessment system which provides for a range of ability, aptitude and learning styles (Lee and Henkhusens, 1996; Fletcher-Campbell, 2001; Lewis, 2001; Booth and Ainscow, 2002 cited in Hayford S.K p. 2).

2.2.1.8 Approaches to evaluation otherwise known as models of evaluation

Evaluators in carrying out their assignments have adopted different approaches. It is in the last couple of years that the core of the debate had moved towards the need of "defining evaluation model according to the purpose of evaluation, its object or the problem to be solved by the evaluated program" (Foss Hansen, 2005). Programs may find it valuable to identify what information currently exists in the program that can be utilized as well as what assessment methods have been used for past assessments through the following several guidelines:

- Collect information that will answer the program's questions
- Use multiple methods to assess each student-learning outcome
- Include both indirect and direct assessment methods
- Include both qualitative and quantitative methods
- Choose methods that allow the assessment of both strengths and weaknesses
- Utilize capstone courses or "second-year" projects/assignments to directly assess student learning outcomes
- Use established accreditation criteria/standards when developing the assessment plan

The Review further concentrates on five key issues for analysis:

- Designing a systemic framework for evaluation and assessment
- Ensuring the effectiveness of evaluation and assessment procedures
- Developing competencies for evaluation and for using feedback
- Making the best use of evaluation results
- Implementing evaluation and assessment policies

The above guidelines are adapted from University System of Georgia: Task Force on Assessing Major Area Outcomes, Assessing Degree Program Effectiveness (1992); and Western Carolina University, Assessment Resources Guide (1999).

Once an evaluation program has been designed according to its purpose, object or problem to be solved it is time to choose which method (or methods) to apply in order to estimate the worth and value of a program. Some evaluators claim that the choice of models must be based on the purpose of the evaluation for instance formative evaluation and stakeholder models if the evaluation is intended to create learning, summative and goal attainment model if it is planned the purpose is to control performance. Others advocate the choice of different combination of evaluation models due to the characteristics of the object to be evaluated; and finally those that argue that evaluation design should be determined because of an analysis of the problem that the object of evaluation is meant to solve. Johnson (n.d.) gives a summary of how David Payne classifies evaluation models, which he calls 'metaphors,' into four groups. These are:

- **Management Models.** Here the evaluator's task is to provide information to management or other decision makers to help them make informed decisions about programs or products. Examples in this group are Michael Patton's *utilization focused Model* or Stufflebeam's *CIPP Model.* Stufflebeam(1971) and Dave(1973) introduced the idea of context or environment in which programs are operated into the components which evaluators have to take into account in the evaluation program. Stufflebeam (2001) listed twenty-two models that he called 'approaches' but further divides them into four main groups namely:
- pseudo evaluations or approaches that promote invalid or incomplete findings (like opinion polls on politics, consumer satisfaction ratings on company products),
- questions/methods oriented approaches or quasi evaluation studies which emphasize technical quality by asking a few 'pointed' questions but narrowing an evaluator's scope (like Ralph Tyler's objectives centered model or Elliot Eisner's connoisseurship model),
- social agenda/advocacy approaches which strive, through program evaluation, to make a difference in society by advocating affirmative action and being client centered (like Robert Stake's responsive/countenance model or the constructivist model), and
- improvement/accountability approaches (like Daniel Stufflebeam's Context- Input - Process- Product (CIPP) model or Michael Scriven's goal-free model) that fully assess the

program's merit or worth and help evaluation personnel "... make and defend decisions keyed to meeting beneficiaries' needs." (Stufflebeam, 2001, p. 57).

Precisely, Stufflebeam's or CIPP Model (1971) summarized in **Table 8** and **Figure 4** below concentrates on:

1. Context evaluation, which objectives are:
   - To determine the operating context
   - To identify and assess needs and opportunities in the context
   - To diagnose problems underlying the needs and opportunities
1. Input evaluation's objective is to identify and assess system capabilities, available input strategies and designs for implementing the strategies
2. Process evaluation's objective is to identify process defects in the procedural design or its implementation
3. Product evaluation's objective is to relate outcome information to objectives and to context input and process information.

Types of decisions focus on decision-making as summarized in Table 9 in the following manner:

- Intended Ends(goals)
- Intended means(procedural designs)
- Actual means (procedures in use)
- Actual ends (attainments)

Table 9: Types of Decisions

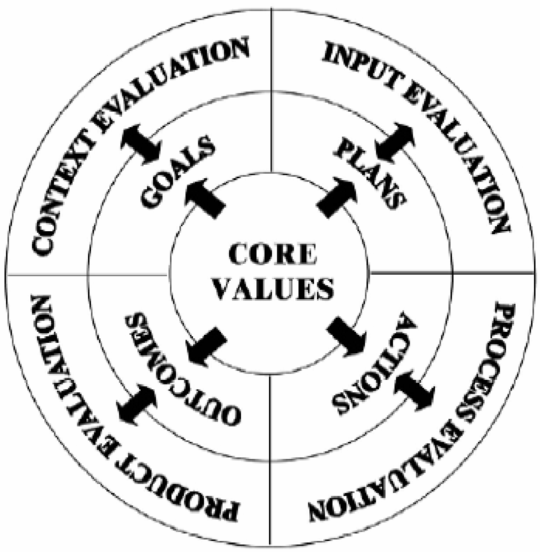
	Intended	Actual
Ends	Planning Decisions to determine objectives (Policy makers and Administrators)	Recycling Decisions to judge and react to attainments (Policymakers, Administrators Teachers, HODs and Principals)
Means	Structuring Decisions to design procedures (Administrators, Principals and HODs)	Implementing Decisions to utilize control and refine procedures (Teachers, HODs and Principals)

Table 10: CIPP

	Intended	Actual
ENDS	Context Evaluation Qn: What? Environment & Needs	Product Evaluation Qn: Have we? Attainments Outcomes - both quality and significance
MEANS	Input Evaluation Qn: How? Procedural Designs Strategies & Resources	Process Evaluation Qn: Are we? Procedures in use Monitoring & implementation

Source: Developed by Dr. G.A. Rathy, Assistant Professor, Electrical Engineering Department, NITTTR, Chenna.

Figure 5: CIPP View of Institutionalized Evaluation



• **Judicial Models.** Which are based on the 'hearing or court case metaphor' whereby two or more evaluators present their different cases, which are scrutinized by an arbiter who then gives the final verdict,

• **Anthropological Models**. Which rely on the qualitative research paradigm whereby evaluators enter the field to observe and take note of what naturally goes on in the program. Examples in this group are Guba and Lincoln's *Naturalistic Evaluation Model* or Robert Stake's *Responsive Model*. Stake (1969) or ATO model. According to stake's model, Antecedent is any condition existing prior to teaching and learning that may relate to outcome. Transactions involve activities occurring during implementation such as countless encounters of students with teacher, student with student, author with reader, parent with counsellor. Outcome includes measurements of the impact of instruction on learners and others. It makes possible not only to document the attainment or non-attainment of the program objectives but also to be able to explain why the objectives were or were not achieved.

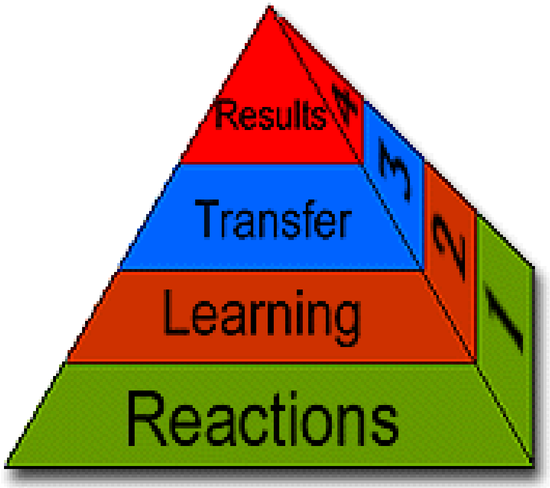
• **Consumer Models**. Which are primarily summative and which focus on the merit or worth of a product as judged by the consumer. An example in this group is Michael Scriven's *Key Evaluation Checklist.* Scriven(1967) observed that decision about a program can not only at the completion of the program but also while the program is still in process. This gave rise to his famous formative and summative model. Formative evaluation is carried out during the process of curriculum development. The evaluation results may contribute to the modification or formation of the curriculum. For example, results of formative evaluation may help in

1. Selection of program components
2. Modification of program elements

Summative evaluation – at its conclusion.

One model, which is straightforward and applicable to industrial as well as educational training is Donald Kirkpatrick's four level models presented in Figure 5 below (Owson, n.d.; Kirkpatrick & Kirkpatrick, 2009) . Guskey (2000) (in Owson, n.d.), adapted Kirkpatrick's model for evaluation of teacher professional development programs while Kirkpatrick himself has recommended using control group comparisons to assess a program's effectiveness at the two higher levels. Kirkpatrick's model is straightforward, it does not emphasize negotiation with decision makers and does not explore the why and how of results (Olorunlero, 2012). In Kirkpatrick's four-level model, each successive evaluation level is built on information provided by the lower level.

Figure 5: Kirkpatrick's Four Levels of Evaluation.



Source: Donald Kirkpatrick (1994).

Level 1 - Reaction

•Evaluation at this level measures how participants in a training program react to it.

•It attempts to answer questions regarding the participants' perceptions - Was the material relevant to their work?

•According to Kirkpatrick, every program should at least be evaluated at this level to provide for the improvement of a training program.

Level 2 - Learning

•Assessing at this level moves the evaluation beyond learner satisfaction and attempts to assess the extent students have advanced in skills, knowledge, or attitude.

Level 3 Evaluations - Transfer

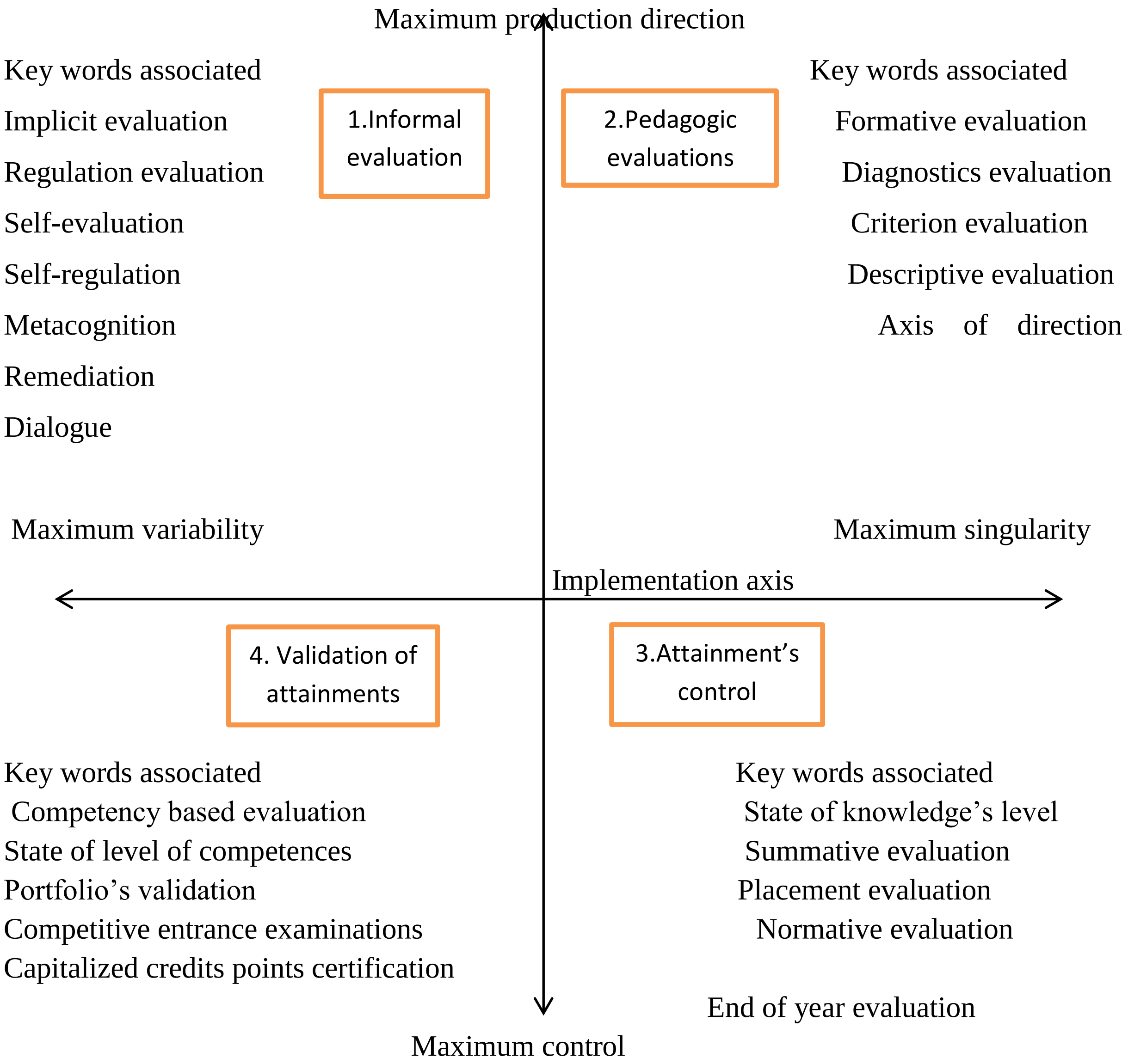
•This level measures the transfer that has occurred in learners' behavior due to the training program.

Level 4 Evaluation- Results

•This level measures the success of the program in terms that managers and executives can understand -increased production, improved quality, decreased costs, reduced frequency of accidents, increased sales, and even higher profits or return on investment.

According to Roegiers X (2004 p.97), there are four different evaluations' models of students' attainment in academics as presented in figure 6 below.

Figure 6*: Models of four different evaluation of students' attainment in academics.*



Source: Roegiers X (2004, 1er edition p.97).L'école et l' évaluation des situations pour évaluer les competences des élèves. De Boeck Université.

Each of the above-mentioned modes of evaluations has its own advantages and its limits. According to Roegiers X (2004 p.99), for the learner's responsibility optic, parts of informal and pedagogic evaluations are implemented to leaners. For continuous assessment optic, attainment's control evaluation should be based on pedagogic evaluation. In this case, it is less instrumented and it is of informal character.

2.2.1.9 Approaches to the assessment of pupils' achievement

Pupils, teachers, and others (e. g., stakeholders, parents, researchers) should know about what pupils are learning, what they are capable to do, and what decisions are made about them comes from the use of assessments (Brookhart, 2003; National Research Council (NRC), 2001). As part of their instructional practice, teachers periodically gather information on learner's progress through many ways. Teachers assess for various reasons (Airasian, 1994; Linn & Gronlund, 1995; Pelleringo, Chudowsky & Glaser, 2001). An understanding of fundamental principles of assessment design can be useful to teachers in their efforts to obtain high-quality information from students. The effectiveness of a method therefore depends on its purposes and design, as well as on schools and teachers' capacity to use it. Teachers may be rather flexible in their choice of methods, so long as they serve multiple purposes and follow the principles of validity, reliability and equity. Bentley E.(2021) identified five approaches to the assessment of pupils' achievement

2.2.1.9.1 Summative assessment or Assessment of learning

Summative assessment or Assessment of learning identifies where the pupil got to after teachers taught something. It assists teachers in using evidence of student learning to assess achievement against outcomes and standards. This can also help us understand where the gaps in program might be or where a student may need extra help in the future. It usually occurs at defined key points during a unit of work or the end of a unit, term or semester and may be used to rank or grade students. The effectiveness of this grading or ranking depends on the validity and reliability of activities and its effectiveness as an opportunity for learning depends on the nature and quality of the feedback. For example Cameroon educational policy has formally recognized that, primary schools pupils' assessment can either be internal and/or official end of year examination (Cameroon Primary School Curriculum English Subsystem - Level III: Class 5 & Class 6(2018 p.19). First, a consideration will be taken at the internal assessment of pupils' achievement.

i. Internal assessment of pupils' achievement

School or internal assessment fully depends on the teachers' creativity to assess the students. In school, based assessment teachers and pupils devote a large proportion of their class time to assessment activities (Stiggins & Conklin, 1992). For teachers to be able to do this effectively, the teacher needs to possess certain competency. Competency here is the skills an instructor shows on a job and the understanding they have got from their studies (Adodo, 2013). A competent instructor has the ability to put into practice in the classroom, the knowledge and skills acquired from the professional training.

ii. Official end of year examination

Cameroon educational has a number of examination bodies at each educational level. For instance, at the secondary level, the office du Bac is responsible for the general organization starting from setting, and marking of examinations questions to the publication of the Probatoire' and 'Baccalaureat' results for the Francophone subsystem education being it general or technical educations. Meanwhile, the Anglophone subsystem in managed by the GCE board being it general or technical educations for the award of GCE O/L and GCE A/L. However, the ministries in charge of basic and secondary educations continue to manage First School Leaving Certificate (FSLC), and the Government Common Entrance into secondary schools for the Anglophone subsystem and 'Certificat d' Étude Primaire(CEP) and 'Concours d' Éntrée en Sixième(6ème)' for the Francophone subsystem of education at the primary school level. The Ministry of Secondary Education organizes the 'Brevet d' Études du Premier Cycle' (BEPC), the Certificat d'Aptitude Professionnel(CAP), ' Brevet des Techniciens '(BT), Certificat d' Aptitude Professionnel des Instituteurs de l' Enseignement Maternel et Primaire' (CAPIEMP) and Certificat d' Aptitude Professionnel des Instituteurs de l' Enseignement Technique (CAPIET) for the Francophone. Successful candidates of the Anglophone subsystem are awarded Teachers' Grade One Certificates being it general education and technical education under the supervision of each directorate in charge of examinations and certification. A combination of internal assessment by examination would have given a more comprehensive view of pupils' achievement. The idea of combining some amount of internal assessment with the official examination was to ameliorate part of the shortcomings.

2.2.1.9.2. Formative assessment or Assessment for learning

Unlike summative assessment, the focus of formative assessment is finding out about how a student is learning before or during a program of study. This approach helps educators shape their teaching to evolve a student's knowledge and skills. Assessment for learning involves thus teachers using evidence about student's knowledge, understanding and skills to inform their teaching. It occurs throughout the teaching and learning process to clarify student learning and understanding. It is a broad strategy using multiple ways of gathering data about students but can include impromptu quizzes, student self-assessment or other types of assessment like diagnostic tests.

2.2.1.9.3 Diagnostic assessment

Assessment as learning occurs when students are their assessors. Students monitor their own learning, ask questions and use a range of strategies to decide what they know and can do, how to use assessment for new learning. It designed to find issues or weaknesses, to plug gaps or rethink educational approaches. It can be targeted at an individual student or you can put a diagnostics lens over an entire program of study, depending on what you need to find out.

According to Tomlinson (2008), Assessment of learning has a place in teaching. Robust learning generally requires robust teaching. In addition, Assessment for learning is catalysts for better teaching. In the end, however, when assessment is seen as learning for teachers, it becomes most informative and generative for students and teachers alike.

Tomlinson(2008)summarized these approaches as :

- Informing teaching
- Informing learning
- Judging performance

2.2.1.9.4 Benchmarking assessment

Based on results' interpretations, when the performance of an individual on the test is interpreted in terms of the performance of the members of the group who took the test (learners are compared against each other's), it is referred to **norm reference test.** The risk of this approach is that knowledge ends up being split into disjointed units and, whilst it might be clear that a student has learnt something, it might be harder to show how well they have learnt it. When learners are assessed not in competition against others instead based against a **standard criteria or benchmark.** The criteria used may be from a set of competency standards, learning outcomes or other performance outcomes; it is referred to criterion referenced test or **ipsative**. Assessment criteria should be used to define educational goals and learners should be involved in determining these criteria. Learners should have been used to assessment criteria early in the instruction process. It is important for learners to know and understand the criteria used for assessment and evaluation. Bench marking assessments can thus measure a student's performance against a set point; say a national standard or over a particular time. Bench marking assessment takes a broad view that allows you to see trends or movements. One may be able to judge if a student has fallen behind and that can in turn, inform a diagnostic assessment. Reach assessments and OECD'S PISA for school tests assessments are both examples.

2.2.1.9.5. Continual assessment

It is perhaps one of the most undervalued types of assessment. It can be formal or informal, based on the day-to-day experience of a teacher observing their pupils, for instance. Continual assessments let you observe and record learning as it happens. This can be useful when it comes to diagnose weak points or opportunities for extension in the educational journey.

Regardless of the assessment approach, what matters most is how the information is used to improve student learning.

According to Pellegrino et al.(2001), every assessment regardless of its purpose rests on three pillars otherwise referred to assessment triangle:

1- A model of student cognition**,** describes how students develop competence in an academic domain and how they organize their knowledge at different levels of development. In other words it is a model of how students represent knowledge and develop competence in the subject domain;

2- Observations, which are the tasks or activities or situations in which students' performance can be observed, scored, and evaluated for gathering evidence of learning.

3- Interpretation methods for drawing inferences from the performance evidence collected (Pellegrino et al., 2001, pp. 44–51).

These three elements cognition, observations and interpretation must be explicitly connected and designed as a coordinated whole. Whether or not they are made explicit, these elements are equally present in any instance of assessment, including formative assessment, and the quality of inferences derived from the assessment will depend on how well these three elements have been linked (Pellegrino et al., 2001). In formative assessment, a fourth element needs to be present: **effective translation of the interpretation** of assessment performance to instructional decisions and actions. One approach to assessment development that makes explicit, and links, the three elements of the assessment triangle is Evidence Centered Design (ECD) (Mislevy, Steinberg, & Almond, 2003; Zhang et al., 2010). ECD provides a framework for building valid and fair assessments. In this process, assessment developers identify the nature of the evidence that is needed to make a judgment about specified aspects of student learning; then, they examine any proposed assessment task to ensure that it does not preclude or reduce the opportunity for any student to participate in the task and show certain knowledge, skills, and abilities (KSAs). Sometimes an assessment task, including a formative assessment, may call on additional, unwanted (non-target) KSAs, and the task may end up eliciting evidence not only of the target KSAs but also of language skill or some other skill not related to the concepts ostensibly being assessed. In such a case, lack of proficiency with non-target KSAs can prevent the student from demonstrating proficiency with the actual targets of the assessment, limiting the assessment's fairness and the validity of interpretations derived from it. An example would be a task designed to evaluate students' understanding of a mathematical concept by having students solve a problem that is couched in many pages of text. Performance on the task would be influenced not only by the target KSA—that is, knowledge of the mathematical concept—but also by the non-target KSA—that is, ability to read extended text (Trumbull, E., & Lash, A. 2013 p.9)

2.2.1.10 Instruments used in evaluation strategies

Evaluation strategies are viewed here as being distinct from the evaluation approaches or models. Exploring various approaches of assessments in relation to students' learning; raising awareness about different paradigms of classroom assessment, in particular introducing a shift from conventional approaches to the alternative methods via competency based assessment; and advocating for students' involvement in the process of developing assessment tools/instrument. The competency based-curriculum involves children in a wide range of active learning situations including the development and practical application of skills and knowledge in doing, making, explaining, and solving, to achieve competence in essential life skills. One of the challenges of effective assessment is to ensure that there is a close alignment between the learning goals, the teaching and learning activities aimed at meeting learning goals and the assessment tasks used to assess whether learning goals have been met. Current best practice today includes assessment, which is aligned to the learning goals, which focus not only on content knowledge but also on process and capabilities. Successful teaching and learning which enhance proper evaluation of pupils' affective, cognitive and psychomotor components of mathematics curriculum can be attained if such teachers combine their experiences with professional training. There are ways, techniques or procedures of carrying out the evaluation. According to Sage Publications (2012), the evaluator should first prepare for the evaluation by setting clear goals and indicators, identifying target populations and selecting the best practices and technologies to be used. The evaluator then selects the methods or tools to be used. When selecting which assessment methods to use, consider what questions need to be answered, the availability of resources, and the usefulness of the results. Similarly, McTighe (2015) encouraged teachers to use a variety of formats for assessment, such as conferencing, observation, or performance tasks in other to demonstrate learners' knowledge, understanding and proficiency.

Learning outcomes have been grouped into three domains knowledge, skills and attitudes in each subject or discipline. Evaluation in education thus involves three components namely cognitive, psychomotor and affective through different evaluation instruments. Teachers as the implementer of the curriculum therefore should possess competency to evaluate pupils/students' cognitive and in the affective and psychomotor domains. Most teachers have continued to focus only on the cognitive domain to the exclusion of the affective and the psychomotor domains in pupils' evaluation. This implies that, the overall ability of the learner may not be assessed. Wole Falayajo(2016 p.6) summarized instruments and techniques that can be used for assessment of the three domains as presented in table 11 below.

Table 11: Instruments for assessing Cognitive and Non-cognitive outcomes

Instruments and Techniques	Cognitive outcomes	Affective outcomes	Psychomotor outcomes
Test	X		
Projects	X	X	X
Assignments	X	X	X
Observation		X	X
Rating scales		X	X
Anecdotal record		X	
Interview and questioning		X	
Sociometric technique		X	

Source: Ughamadu, K.A(1991)

Tony et al (2011) have grouped the assessment strategies, into several sections as follow:

- Observing: checklist, anecdotal.
- Questioning: Higher order, Factual, Open ended.
- Interviewing: structured, open.
- Testing: Diagnosis, performance based, pencils and paper, multiple choice, problem solving, attitude.
- Reporting: Oral, written, portfolio, investigation and modelling.
- Self-assessment: journals, reflecting prompts, self-questioning, peer questioning.

The Teacher's handbook for the Cameroon nursery and primary school curricula (2018 p.20) recommended the following assessment strategies/ instruments or tools:

- Portfolios
- Observation checklists(include cognitive, affective and psychomotor information)
- Interview with learners and parents
- Participation in projects and presentations
- General observations
- Quizzes
- Project presentations

Some of the instruments will be looked in more detail.

2.2.1.10.1 Instruments for assessing Cognitive domain

I. Tests based on conceptions

Test is the most often used instrument for the assessment of cognitive outcomes of learning. Tests are grouped on different basis. For instance, based on the conception of tests, when professional test makers conceive a test is referred to **Standardized Test** and when the classroom teacher conceives it, it is referred to a **Non-Standardized test or Teacher Made Tests**

i. Standardized tests

Standardized assessments can be designed and marked inside or outside individual schools (at national level), in order to ensure the consistency and comparability of questions, conditions for administering, scoring procedures, and interpretations (OECD, 2013). The practice of standardized testing is to monitor the progress of individuals and groups that has long influenced school education policy in several countries across Europe (Silfver et al., 2016) and elsewhere (Moss et al., 2010; Van der Kleij et al., 2015). Standardized tests, requiring multiple reasoning techniques, can capture a broader range of skills, such as digital competence, social and civic competences, as well as transversal skills such as creativity and problem solving, which are necessary to complete complex tests. In other words, standardized assessments are primarily designed for summative purposes, in line with a databased decision making (DBDM) approach in education (Van der Kleij et al., 2015). Standardized tests are mainly used for the assessment of competences related to core subjects (particularly mother tongue, mathematics and science). In Europe, for instance, the European Commission/

EACEA/Eurydice, (2012, p. 10) posts that standardized national tests focus on the basic skills, especially the teaching of the mother tongue (or the language of instruction) and mathematics, and to a much lesser extent science and foreign languages. This type of assessment mainly aims at measuring students' learning outcomes in terms of overall curriculum goals and standards (Black, 1998). Standardized tests assist you to make judgements about student achievement at certain relevant points in the learning process or unit of study (e.g. end of course, project, semester, unit, year). It can be used formally to measure the level of achievement of learning outcomes (e.g. tests, labs, assignments, projects, presentations etc.). It can also be used to judge program, teaching and/or unit of study effectiveness (that is as a form of evaluation). Pepper (2013) suggests that standardized tests should include the following items:

- structure and content that reproduce real-life contexts authentically;
- multiple steps requiring a chain of reasoning and a range of competences; and
- a range of formats allowing responses that require different competences.

Discussing the relevance of performance-based assessment approaches for gifted children, VanTassel-Baska (2013) noted that standardized tests are able to examine students' content mastery in key areas, such as in grammar and language mechanics. Moreover, evidence shows that in order to complete standardized tests, students need to employ a broad range of skills. On the other hand, tests can also help to address 'transversal' key competences such as digital competence, social and civic competences, as well as transversal skills such as creativity and problem-solving (Pepper, 2013).

Although they represent a predominant method of classroom assessment, standardized assessments face challenges in evaluating a full range of key competences and their complexity. Standardized assessments are often criticized for their inability to assess students in real-life contexts, because they require carefully controlled conditions (European Commission, 2012; Pepper, 2013). Shepherd and Hannafin, (2013) and Van der Kleij et al. (2015) added that standardized tests do not take into sufficient consideration things like classroom practice, student background, needs and circumstances. Moreover, other authors noted that the excessive reliance on high-stakes standardized testing exclusively could narrow the curriculum, classroom content and teachers' pedagogies (Putwain et al., 2012; Silfver et al., 2016; Turner, 2014).

Herrera et al. (2007) stated that while they have many uses, standardized tests nevertheless:

•Limit and negatively affect the quality of content-area instruction;

•Prompt teachers to narrow the curriculum taught in classrooms;

•Encourage “teaching to the test”;

•Push students out of the system;

•Divert classroom instruction to an emphasis on low-level content and basic skills;

•Increase the redundancy of instruction (Herrera, Murry & Cabral 2007, p. 13).

ii. Non Standardized or Teacher Made Tests

Adewale Gbenga.J (2016 p. 7) pointed three distinct steps a normal classroom test involves.

- **Planning:** at this step, instructional objectives to be tested are identified, selected from the subject matter of each subject and a table of specification (or test blue print) is prepared.
- **Construction of the test items:** it depends on the former the test maker wants the test is either an essay test or an objective choice test items.
- **Item analysis:** despite the fact that most teachers do not usually do however, at this step, the test maker is supposed to analyze item discrimination which is to show items that are pulling in the same direction as the entire test and whether there is coherence among items (internal consistency), how reliable and valid the entire test is. Psychometricians offer statistical strategies for enhancing validity and reliability of tests (Clare, 2000; Linn & Baker, 2001).

II. Tests Based On Response Format

Professional test makers depending to different mode of learners to respond the test conceive standardized assessment practices. When the response is free format, it is referred to essay tests, but when the response is more or less fixed then the test is referred to as an objective test (multiple-choice assessments) and attitudinal questionnaires.

i. Objective Test

This test is constructed in such a way that a question has a particular answer to which a certain mark is assigned. In this type of test, a direct question or incomplete statement is presented and a number of possible responses are given. The pupil is asked to choose one correct answer by either ticking or underlining. There many types of objectives tests:

- The supply test or completion (or cloze), like filling blank spaces
- Selection test, like True or False and matching types
- Multiple choice test

Multiple-choice assessment is one of the standardized forms of assessment commonly used in classrooms and in the context of national standardized tests, where students have the possibility to select correct answers from predefined lists. Some assessments also use multiple-choice items to measure critical thinking or collaboration skills. Multiple-choice assessments may be both paper-based and computer-assisted.

ii. Essay tests

This type of tests requires a pupil to write for a specific length on a given topic. Achievements of such outcomes like the ability to apply principles to new situations; analyses causes of events, synthesize or compose a piece of writing, evaluate of criticize can more effectively be measured using an essay type test than multiple-choice type. The essay test could be the **extended response type**, which covers a broader subject matter area, and allow pupils freedom in organizing and expressing their ideas; or **short answer test**, which require pupils to respond to, questions briefly. The short answer type can evaluate a wider range of cognitive outcomes than the extended type.

Each of the formats has its advantages and its disadvantages. For instance, essays require students to select, organise and integrate material on a given topic. They also test writing skill and the ability to develop an argument and use evidence to support it. When properly constructed, the multiple choices can be used to collect data on a wide range of cognitive outcomes. One of the weaknesses of essay format is the subjectivity of scoring which makes it less reliable. To minimise the weakness is to prepare a marking scheme. Meanwhile, Barlow and Marlot (2012) argued that multiple-choice tests can effectively provide more than a summative check of knowledge and skills, by analyzing examples of assessment of mathematics knowledge, the authors demonstrated that multiple-choice items could be used to guide instruction, communicate mathematical expectations, and develop student dispositions. However, multiple-choice assessments have been criticized by some authors for their tendency to promote a recall of information, and for not encouraging high-level cognitive processes, which could better related to key competences. In addition, Soland et al.(2013) argued that there are competences that cannot be assessed simply using multiple choice, such as complex problem solving skills or the ability to compose an essay. However, the OECD

(2013, pp. 175-176) indicated that well-designed multiple-choice items can assess higher-order knowledge but they cannot assess broader skills and competencies such as the ability to develop an argument or communicate effectively.

2.2.1.10.2 Instruments for assessing non cognitive domain

i. **Attitudinal questionnaires**

Major international surveys such as PISA, TIMSS and PIRLS integrate questions on students' attitudes to learning in their questionnaires. The assessment of attitudes as learning outcomes remains problematic for several reasons (European Commission, 2012b, p. 25). Research shows that students' attitudes towards learning can help explain their learning outcomes (Alexander and Winne, 2006; Stobart, 2008). Attitudes vary over time and between real-life contexts, but questionnaires provide only snapshots in 'test' contexts; and these snapshots are indirect measures, relying on the accuracy of learners' self-reports; and these self-reports may be influenced by the 'social desirability' of particular responses to questionnaire items, particularly if learners' perceive their answers as having consequences for themselves. Pepper (2013) suggests that attitudinal questionnaires tend not to capture various social contexts and complex emotional experiences, and therefore lack information related to learning outcomes associated with specific contexts. His review of the literature on self-regulated learning suggests that classroom observation and dialogue, as well as methods based on self-assessment of students' learning outcomes, are more relevant than questionnaires for the assessment of attitudes. However, valid and reliable teacher rating attitudinal assessment tools can help to assess diverse social-emotional competences. OECD (2015b) also suggests that assessments of social and emotional skills are often based on teachers' observations and judgment of students' everyday behavior in different contexts. On the other hand, a combination of various assessment methods such as self-assessment via questionnaires, and assessments via tests for formative or summative purposes, might be better able to assess social and emotional competences such as learning to learn (Ibid.). In their review of available school-wide assessment methods for social/emotional well-being of students, Haggerty et al. (2011) recommended the Devereux Student Strengths Assessment (DESSA) as a valid and reliable teacher rating assessment tool. The DESSA is a behavioral rating scale assessing social-emotional competences from kindergarten through eighth grade, assessing students' self-awareness, social-awareness, self-management, goal-directed behavior, relationship skills, personal responsibility, decision-making, and optimistic thinking (Ibid.).

ii. **Performance-based assessment**

Performance-based assessment is one of the examples used to assess a wider range of competences in a structured way. This type of assessment can serve as a method to measure students' performance as well as to support broader learning (OECD, 2013). Overall, performance-based assessment is seen as an effective method to measure wide-ranging competences and higher-order skills. Performance-based assessment is effective in responding to an individual learner's needs, because it can evaluate a learner's progress from his or her starting position. Performance-based assessments allow the assessment of pupils over a period and use a wide range of tasks. It includes assessment through specific tasks such as essays, oral presentations, portfolios, '3P assessments' ,computer simulations, group work, reflective diaries, projects, role plays, and interviews (European Commission, 2012a; Hao andJohnson, 2013; OECD, 2013). Because of the active nature of tools used for this approach, the learner can be placed in a problem situation and has the possibility of demonstrating his or her competences required to solve the problem (Tchibozo, 2011).

The main strength of the method is that it focuses on a learner-centered approach and on continuous monitoring of learners' progress. The method also promotes in-depth learning and assesses competences needed for 'real-life situations' (Hao andJohnson, 2013). However, in order to use this method effectively, clear definitions and a scale for competence development need to be included in the assessment practice, and the country-specific context should be taken into account (Hao andJohnson, 2013). They are seen as more effective than standardized tests in capturing more complex performances and processes (Hao andJohnson, 2013; Looney, 2011b, Pepper, 2013). Performance-based assessments are typically evaluated using an established rubric. In a research review of 75 studies, Jonsson and Svingby (2007) concluded that "the reliable scoring of performance assessments can be enhanced by the use of rubrics, especially if they are analytic, topic-specific, and complemented with exemplars and/or rater training" (p. 130). Analytic rubrics, which clearly define the dimensions of the task, should be used to measure competency performance. By employing a variety of methods, such as rubrics, project-based assessment and portfolios, this approach can help assess a larger variety of competences, skills and feedback, enables the assessment of broader learner competences.

1. **Portfolio:**

Portfolio assessment is receiving more and more interest as an effective method for assessing learners' progress (Pepper, 2013).Portfolio assessment is a systematic and longitudinal collection of student work that shows his or her learning process, progress and performances (Frejd, 2013; Pepper, 2013). In others words a portfolio is "a purposeful collection of student work that exhibits the student's efforts, progress and achievements in one or more areas. The collected data also help teachers monitor learners' performance in real-life contexts or tasks that represent real-life situations (Pepper, 2013). Portfolios can include students' texts (Burner, 2014), modelling tasks, diary notes, and written data of achievements (Frejd, 2013). The literature review implemented by Frejd (2013, p. 432) revealed that portfolios have a high potential to be developed as 'a valid and reliable assessment mode for [mathematical] modelling, but there are too few research studies focusing on these modes'. Portfolio assessment method can be beneficial for formative purposes (VanTassel-Baska, 2014). Teacher assessment and portfolio assessment are more commonly used to assess cross-curricular competences. Burner (2014) shows that portfolio assessment has potential benefits due to its process-oriented, authentic, integrated, interactive and learner-centered characteristics, and can lead to increased motivation and learner autonomy. It can be more challenging to apply this method for summative purposes. Moreover, Tchibozo(2011) argues that portfolio assessments may not be effective in assessing specific competences if clear judgment criteria of the performance are not developed. Other authors note that in order to make performance-based assessment effective, teachers need to apply a variety of methods, including oral communication and writing tasks (Hao and Johnson, 2013; VanTassel-Baska, 2014). Most of the portfolio assessment methods are now being digitalized.

2. **Project:**

Project is both a method of instruction and a technique of assessment. To foster a variety of students' skills, teachers often employ project-based learning. Kokotsaki et al. (2016, p. 267) define project based learning as 'an active student-centered form of instruction which is characterized by students' autonomy, constructive investigations, goal-setting, collaboration, communication and reflection within real-world practices'. Their systematic review shows that project-based learning can effectively enhance skills such as critical thinking, problem solving, communication, collaboration, and self-management (Ibid.). Project-based learning assessment refers to a broad approach, which measures a performance by encompassing rubrics, reflection, self-and peer-assessment methods (Kokotsaki et al., 2016). E-portfolios can also be integrated into project-based learning assessment; however, their application requires significant time for teachers to assess students' skills and provide constructive feedback (Spector et al., 2016). Projects are an extended piece of work involving inquiry based activities. Most projects require many manipulative skills. Project may be short or long term, undertaken by individuals or in groups where pupils can develop the habit of cooperation and have outcomes such as a report, design, artwork, working product. Projects usually help the learner to learn through problem solving and give the teacher the opportunity to assess their learners' originality and creativity. To assess a project, the teacher must ensure that the pupils know ahead of time the criteria that will be used in assessing the project taken in consideration the process and the final product. Applying assessment of project-based learning can be challenging because teachers often lack the guidance and toolkits to implement effective assessment. Project-based learning can effectively enhance skills such as critical thinking, problem solving, communication, collaboration, and self-management.

3. Holistic scoring rubrics

Some authors (Panadero and Jonsson, 2013; Tchibozo, 2011; VanTassel-Baska, 2014) advocate for holistic scoring rubrics to assess students' competences. Holistic scoring rubrics are comprehensive descriptive scales that enable scoring competences in problem situations task and allow mapping learning outcomes at the end of the curricula (Tchibozo, 2011). Holistic scoring rubrics are more commonly used for summative purposes. Rubrics ensure a clear scale to measure a specific learner's competence. Each pupil's competence is assessed following an elaborated instruction on what elements the specific competence should encompass. The method is unique in the way that the evaluator can evaluate a pupil in more complex situations (Tchibozo, 2011). For instance, specific competences can be assessed on a scale from 1 to 8 (Tchibozo, 2011) or according to degrees of 'none, little, some, adequate, good, and excellent demonstration of required ability, skills, or presentation' (VanTassel-Baska, 2014, p. 45). Besides the summative approach of the method, it can also serve for formative purposes. Schools also tend to use report cards for assessing learning skills and work habits (OECD, 2015b). For example, in Canada these skills include six categories – responsibility, organization, independent work, collaboration, initiative and self-regulation – for each of which the teacher gives ones of the four scores: 'excellent', 'good', 'satisfactory' and 'needs improvement', which are recorded in the report cards at the end of each grade (Ibid). Panadero and Jonsson (2013) describe several benefits that the use of rubrics can bring to mediate pupils' learning, including increasing transparency, reducing anxiety, aiding the feedback process, improving student self-efficacy, and supporting student self-regulation. The authors found stronger evidence for the effectiveness of the rubrics when pupils could assess their own progress.

4. Peer- and self-assessments or assessment as learning

Literature shows that self- and peer-assessment are largely adopted in assessment practice that applies principles from the constructivists' learning theory (Pollard et al., 2005). Some countries also started to experiment with the use of self- and peer-assessment for assessing transversal competences (Voogt et al., 2012). Peer and self-assessment is considered a powerful tool to engage students in active learning, reflection and raise their motivation and academic standards. Self- and peer- assessment when applied in classrooms can foster improvement of all pupils, including those who record lower attainments in class. Iron (2007) indicated that there would be strong evidence of learning progress if there were a comparison between lecturer assessments, peer assessment and self-assessment. Bennett (2011) supported this view and these factors because they 'help students develop internal standards for their work, reflect upon it, and take ownership of learning' (p.9). Successful teacher, peer and self-assessments are useful in building many key competences, such as initiative and entrepreneurship, learning to learn and social competence, as well as transversal skills such as critical thinking, creativity, initiative, problem solving, risk assessment, decision-taking, and constructive management of feelings (European Commission, 2012a). A combination of different assessment methods such as peer and self-assessments could better help to assess social and emotional competences as well as transversal skills, such as critical thinking, creativity, problem solving, risk assessment, decision-taking, and constructive management of feelings. Due to their collaborative nature, peer and self-assessments have a strong potential to enable students' deep learning (Black andWiliam, 1998a; Pepper, 2013). Social and emotional competences are also better assessed through multiple forms of assessment, including student self-evaluation, teacher evaluation, and parent evaluation where appropriate, and making use of various modes such as self-reports, checklists, and direct behavior assessment (Weissberg et al., 2015). Assessment formats, such as performance-based assessment, teacher, peer-and self-assessments, serve formative purposes as well, especially by boosting reflective activities and empowering pupils to assess their own performance (European Commission, 2012; OECD, 2013; Pellegrino and Hilton, 2012; Pepper, 2013). However, for these methods to be effective there is a need for careful planning and accurate teachers' feedback to enhance students' self-regulated skills necessary for these types of assessments.

4.1 Self-assessment

Student self-assessment is a central component of current conceptions of classroom assessment, particularly formative assessment (Brown et al., 2015) and a number of studies have demonstrated a positive association between self-assessment, learning and achievement (see Brown and Harris, 2013). In the same perspective, Black and Wiliam (1998) point out that assessment that involves pupils in their own self-evaluation is a key element in improving learning. Building a clear understanding of the learning goals enables students to self-assess their performance. Black and Wiliam (1998a) underline that self-assessment is essential for successful formative assessment. One of the foundational principles of formative assessment is to help students become actively engaged in assessing their own learning and taking action on that assessment. Self-assessment does not occur automatically; Rose, McNamara and O'Neil (1996), in considering the involvement of pupils in self-assessment, identifies the importance of providing pupils with a range of skills before they can take more responsibility for their own learning. Also, Rose, McNamara and O'Neil (1996) describes the skills of attending, completing tasks, and joint goal setting as essential components of 'learning to learn', and provides examples of ways in which pupils with learning difficulties have been encouraged to move towards achieving these requirements. According to the Assessment Reform Group (2002) in Clarke (2005), independent learners have the ability to seek out and gain new skills, new knowledge and new understandings. They are able to engage in self-reflection and to identify the next steps in their learning. The Assessment Reform Group in the United Kingdom in Wiliam (2011a) indicates that, if assessment were to improve learning, then students needed to learn to self-assess in order to make improvements, and that teachers needed to recognize that assessments could influence students' motivation and self-esteem.

Fan (2011) suggests three different approaches that teachers can use to implement self-assessment into their instruction. He lists the ability to recall, to summarize, to organize evidence, to reflect and to evaluate as prerequisites for effective self-evaluation. Teachers should equip learners with the desire and the capacity to take charge of their learning through developing the skills of self-assessment (p. 109).

In **structured self-assessment**, teachers have students complete pre-designed assessment survey forms during instruction to gauge how students perceive their understanding or as a summative survey at the end of a unit. Sample prompts might include "This topic is overall easy" or "I can complete homework for this topic most of the time by myself" (p. 281). In **integrated self-assessment**, students might complete a survey that is simply a part of a larger assessment package, with prompts such as "What were the mathematical ideas involved in this problem?" or "What have you learnt from this presentation [after presentation of an extended project, for example]?" (p. 283). In **instructional self-assessment**, teachers embed self-assessment into the typical classroom activities, perhaps even informally or impromptus. Interviews with students in classes that participated in a research study related to these components of self-assessment found that the activities promoted students' self-awareness and metacognition; they learned to be reflective and think deeply about their own learning.

Some researchers argue that student self-assessment should no longer be treated as an assessment, but instead as an essential competence for self-regulation (Brown and Harris, 2014). One of the challenges for self-assessment to be implemented effectively is that many students are not self-regulated enough to do it, which in turn can lead to inaccuracy (Brown et al., 2015). Inaccurate self-assessment might also be attributed to the social environment of classrooms, where the pressure to enhance or even protect one's own self-worth can result in overestimation of one's ability, or inaccurate self-reporting of grades or test scores (Ibid). Some of the self-assessment practices that can be used by students include **self-estimation of performance, self-correction, self-rating, rubric based judgements**, etc. (Ibid).

However, Rose, McNamara and O'Neil (1996) pointed out that in considering approaches to the greater involvement of pupils in self-assessment and the planning process, it is necessary to be clear about the purpose to be served by such an approach, and the practicalities of its implementation. Further, greater involvement of pupils in the management of their assessment and learning is dependent upon the development of teachers' confidence in their own abilities to maintain effective classroom management.

4.2 Peer assessment

To improve the learning process and outcomes, learners need to understand the main purposes of their learning and reflect on the feedback provided by teachers, and potentially by peers. Peer assessment is considered as a powerful tool to engage students in active learning, reflection (Dziedzic et al., 2008; McMahon, 2010) and raise their motivation and academic standards (Black and Wiliam, 1998a; McMahon, 2010). Kearney et al. (2015) revealed that 'students in the early stage of their tertiary education were able to judge their own work as

well as peers' work with reasonable accuracy'(p.12). In addition, thanks to peer assessments, students may change their perceptions of their capabilities, improve their work, and develop skills necessary for autonomous learning (McMahon, 2010). In particular, peer assessment has a strong potential to boost transversal skills and it enables giving feedback to larger number of students (Topping, 2009). Peer assessment strategies in the classroom can help learners develop critical thinking, meta-cognitive skills and deep thinking (Hou et al., 2007; Sitthiworachart and Joy, 2008). These aspects are especially important for developing transversal skills and the competence to learn. Peer assessment constitutes an effective way to improve the effectiveness and quality of learning, which can be as useful as gains from teacher assessments (Topping, 2009). Both the receiver and the giver of the feedback receive mutual benefit, since they can improve their self-assessment skills and consequently their learning to learn skills On the one hand, peer assessments are often considered as a means to save teacher's time. On the other hand, to smoothly implement this method, teachers need to invest a substantial amount of time for organizing, training and monitoring (Topping, 2009).
Clarke (2005) suggests that one reason that peer-assessment is so valuable is because pupils often give and receive criticisms of their work more freely than in the traditional teacher/pupil interchange. Another advantage is that the language used by pupils to each other is the language they would naturally use, rather than school language. Further, peer-assessment can involve a few minutes of pupils helping each other to improve their work.

However, teacher education in Cameroon does not emphasize assessment for learning in its programs, teachers may lack competence, knowledge, skills and confidence to foster self-and peer-assessments in classrooms.

5. Rating scale

Ratting scale is one of the techniques that can be used to assess affective behavior to an extent. For instance, a teacher may rate a pupil's punctuality based on the following judgments: Very punctual….Punctual….Sometimes….Late…Usually Late….Always Late…

6. Anecdotal records

These are brief narratives of some specific behavior of episode in the day to day of a pupil in the school. When kept over a period, these records can provide a reasonable good longitudinal picture of the changes that have taken place in the pupil. Wole Falayajo (2016 p.9) in a paper presentation points out the following necessary features of records:

- They should be composed of factual description of what and when happens under what circumstances.
- Each anecdotal record should contain the record of only one incident.
- The incident should be one that can be considered significant to the development and growth of the pupils.

Interpretation and recommendations should be separated from the report.

Teachers are free to use any method of evaluation as this a formative type of assessment, which carried during the teaching and learning process. Nevertheless, learners must be assessed fairly and at the same time taking into consideration that each learner has their learning styles. Consequently, all the learners may not always be at the same level of attaining the expected learner outcome. Teacher can evaluate students even by observing their activities in class. A student who care the cleanliness of classroom, help other students in studies can score good marks too as this is holistic approach to assess students. Besides observing, a teacher can have activities such as question and answering, presentation, project, creating products, practical, worksheet, quizzes, scrap book, portfolio and peer evaluation. Therefore, approaches to curriculum and instruction are more apt to be integrally link with, or even driven by, assessment practices and the forms that they take (e.g., Angelo & Cross, 1993; Huba & Freed, 2000; Wiggins & McTighe, 1998). Increasingly, practitioners in all educational levels, including teachers, administrators, policymakers, as well as system evaluators, are expected to understand the principles of assessment (and be certified in them via assessment) and to engage in sound assessment practices within and beyond the classroom (e.g., Elliot, 2003; NCATE, 2002; Schafer & Lissitz, 1987; Stiggins 1999; Wise, 1993).

2.2.1.11 Framework for Determining Mastery in Competence Based Assessment

According to Mohammed et al, (2016 p. 58), competency-based assessment is an important research topic, which might be divided into two open problems:

(1) **Assessment design**, which includes competency modelling by test designers, it is about formulating a competency structure to assess and clearly link each competency to an appropriate situation, problem and material. Bennett (2015) emphasized the need for the design, format and content of tests to reflect better the key competences they aim to assess in order to have a positive impact on teaching and learning. *'For a test to effectively exemplify key competencies, those competencies have to have been codified in a form that can serve as the basis for assessment design', so that the design of the assessment 'can reflect the key*

competencies and their structure, calling the attention of teachers and learners to those attributes'(Bennett, 2015, p. 379).

(2) **Assessment implementation** by test developers, it includes means and tools used to capture measurable attributes of competency. However, assessing competencies involves a complex range of learners' characteristics such us: knowledge level, style, abilities, cognitive skills, background, etc.

In the same perspective, Katie L .McClarty and Matthew N. Gaertner(2015 p.2) quoted Sally Johnstone and Louis Soares(2014) that, Competence Based Education models can take a variety of forms, but most programs include two common elements which are **competency framework** and **competency assessments**. The competency framework describes the "skills, abilities, and knowledge needed to perform a specific task." Competencies must be clearly defined, measurable, and related to the knowledge or skills needed for future endeavours, such as additional education or employment. Often, competencies are specific to a particular course or degree program. The second common element of CBE models is competency assessment. In reality, each approach (by content, objective, competency) of evaluation has its own way of assessing learning. As far as Competency-based approach are concerned, evaluations begin with a baseline situation and after the questions are crumbled and have nothing different from the questions asked in the tests designed according to the Approach by Objectives. The problems that man lives are not crumbled, they are global. Therefore, the questions to ask in evaluation situations must be global and not crumbled and it is up to the learner itself to crumble them in order to achieve his objective. The focus of this research is however on assessment implementation.

Following the literature earlier enumerated so far, there are three categories of competencies **- Know-How, Generic Competencies and Situational Competencies** that are in the course of being developed in the curricula, all three are in the running to be assessed.

i- **Assessment of know-how (expertise or knowledge)**

Since the introduction of teaching by objectives in education, the types of knowledge are assessed at school in accordance with relatively satisfactory systematic procedures, whether through questionnaires, exercises, MCQs or practice.

ii- Generic competencies

Generic competencies are qualities (capacities) linked more to the personality of the person (the learner) and to the types of context. They are nevertheless not bound with particular situations or specific tasks: this what makes their character "generic". One of the fundamental features of "generic competencies" lies in their crosscutting character: they transcend disciplines and, hence, are not associated with disciplinary situations or specific tasks. The generic competencies, like the spirit of analysis, the spirit of synthesis, the sense of observation, the sense of detail, etc., develop with age, but, above all, they develop in contact with a variety of stimulations and interactions between individuals and their environment.

How they are described varies very considerably from one country to another:

"'key competencies', 'soft skills', or 'employability skills' (Australia); 'key skills' or 'core skills' (United Kingdom); 'essential skills' (New Zealand); and 'necessary skills', 'employability skills' or 'workplace know-how' (United States)" (Clayton, Blom, Meyers & Bateman (2003), p. 15). In the school context, the quest is not to categorize these competencies but, above all, to show the role they play in learning processes. For instance, there is a list of nine generic competencies interfacing with disciplinary learning objectives in mathematics, which are the subject of a study in Hong Kong, namely collaboration skills, communication skills, creativity, critical thinking skills, information technology skills, numeracy skills, problem-solving skills, self-management skills and study skills (Leung, K.C., Leung, F. K. S., Zuo, H., 2013).

Three dominant dimensions of generic competencies can be identified:

- **the cognitive dimension**, concerning the competencies which cover to a great extent the cognitive aspects of a learning process; these are competencies which prolong the cognitive operations of taxonomies like that of Bloom (1969) or that of D'Hainaut (1977) (such as problem-solving skills, critical thinking skills, logic, etc.);
- **the methodological dimension**, concerning the competencies that cover the operational aspects of a learning process (e.g. information technology skills, learning to learn, motivation, study skills, self-management, planning and organizing, managing one's time, etc.). They are given a good deal of prominence in training because they are mostly linked to the "job of the learner";

- **the socio-emotional dimension,** concern competencies that cover the socio-emotional aspects of a learning process: collaboration skills, communication skills, creativity, citizenship, and so on.

The assessment of generic competencies in teaching is today the subject of very few instrumented devices. They are still often assessed through a subjective appreciation given by the teacher.

iii- The "situational" competencies

Situational competencies are linked to a family of situations. For example, the situational competencies of driving a car draws on knowledge (including the Highway Code and the various commands for driving the car), types of know-how (knowing how to use the gears, reverse, park, and so on) and life skills (being careful, courteous and the like). With respect to them, we can truly speak of "knowing how to act" (Perrenoud, 1997; Le Boterf, 2006). They call upon a multitude of resources to permit treatment of a complex situation linked to each of them. One category of resources of these situational competencies happens to be certain generic competencies.

An example of a situational (terminal) competency in mathematics is: "On completion of basic education, the learner must be able to solve a problem situation calling on the four basic operations, on the percentages and on proportionality". Unlike a generic competency developing throughout life, we can say at a given time that a situational competency is acquired in an individual because a certain number of signs (indicators) testifying to this competency are observed. This does not mean that, once acquired, it is going to remain acquired for life; it can be lost for instance if not mobilized. "Unlike the familiar battery, the competency only runs low if not used." (Le Boterf, 1995, p. 18).

Assessing situational competencies

A competency based-curriculum is based on the principle that all children are capable of achieving a set of skills (Franklin & Melville, 2015). Apart from technical and professional training, where these assessments are common practice, there is not, in the world of primary or secondary general education, any deep-rooted tradition of assessing situational competencies. In recent years, however, particularly in a number of French-speaking countries, they are beginning to be assessed by means of complex situations presented to the learner situations of producing a complex written submission, solving a problem, etc.

Furthermore, such complex situations are increasingly making their appearance on international standardized tests. In some European countries, including Switzerland, Belgium and France, competence is connected to unfamiliarity of tasks (Beckers 2002; Perrenoud 1997; Rey et al. 2003 .

The methodological difficulties linked to assessment of a "situational" competency"

The development of assessment of situational competencies at school raises a number of questions of **relevance, validity, feasibility and reliability.**

Their relevance

The main benefit of these assessments is that they are relevant, namely directly aimed at the tasks the learner will be required to handle. When they can be akin to an authentic assessment, these are highly relevant assessments since what is assessed is close to the activity to be carried out. When an authentic assessment is ruled out, recourse can be had to integration situations. Such recourse admittedly detracts from the relevance of the tests as against an authentic assessment, but does keep relevance at a very high standard when compared with a traditional assessment based on the restitution of knowledge or on mere applications of a notion.

Their validity

The validity of an integration situation is linked to several factors.

One factor that works in favor of the validity of a test in terms of an integration situation is the fact that the resources (knowledge, life skills, attitudes, etc.) are tested in a real-life situation, which makes the information gathered more consistent. For example, we are better able to check whether a learner has understood the concept of measurement. Other factors are linked to the test produced and, first, to the type of integration situation submitted to the learners. Is the learner obliged to mobilize central resources rather than secondary resources? In other words, do the resources that the learner must mobilize constitute central aspects of the competency to be verified or not? Treating an integration situation indeed requires the choice of a contextualized and hence specific situation. There is then a reduced variability in terms of resource sampling, even if one can design tests in such a manner as to target the foremost resources, for instance through recourse to emblematic situations (Perrenoud, 1997).

Another factor is the quality of the treatment of these resources required by the learner which is an articulation of knowledge and know-how that is asked of him or her, and not a mere juxtaposition of knowledge and know-how?

A third factor of validity is linked to the unprecedented nature of the integration situation, particularly when, for some disciplines, the number of integration situations is limited. There is therefore a risk that, at a given time, a situation put to a learner is not a first-time one.

For all these reasons, we can say that the validity of a “simulated” integration system is good, even if not optimal.

Their feasibility

The main limits to the practice of integration situations has to do with problems of time (hence feasibility): the time they require (1) for designing the test, (2) for doing the test, and (3) for correcting it.

Their reliability

In terms of reliability, there is quite an advantage for case studies, professional tests and all integration situations in general in as much as the learner or candidate is subjected to a singular treatment of complexity: what the learner produces is thus singular and so makes cheating difficult.

On the other hand, integration situations raise another problem do with reliability: that of correcting the copies. Indeed, for these tests made up of open questions, a sizeable gap is observed between various correctors (“agreement between correctors”), despite the recourse to criteria and indicators. The specialists have long put this gap at around 15% to 30% (Laugier & Weinberg, 1938), which estimate has not to date been disputed.

The OECD’s Education Policy Committee on his turn launches the Review on Evaluation and Assessment Frameworks for Improving School Outcomes in 2009 in order to provide analysis and policy advice to countries on how different assessment and evaluation tools can be embedded within a consistent framework to bring about real gains in performance across the school system. According to the review, student assessment relies on the following guides:

1. Aligning educational standards and student assessment

If the assessments do not well match the curriculum and the standards, then results have little value in judging how well students are learning and in diagnosing school or student needs. Hence, policy needs to give considerable attention to sound strategies to assess performance against standards. Part of the strategy may consist of developing large-scale standardized tests with a high degree of validity (i.e. the degree to which assessments and evaluations measure what they are intended to measure); Reliability, which is the consistency and stability of results across students' populations. Usability stands for how policy makers, school leaders and teachers make sense of and respond to assessment and evaluation results. Another possible strategy is to develop teacher capacity in assessing against standards, provide detailed guidelines on marking assessments and strengthen moderation processes between teachers and schools.

2. Balancing external assessments and teacher-based assessments in the assessment of learning

External assessment refers to standardized examinations that are designed and marked outside individual schools and normally take the form of a written test. Learning outcomes that can be readily assessed in external examination should be covered this way, whereas competencies that are more complex should be assessed through continuous teacher-based assessment. The major advantage of external assessment is its high reliability. It ensures that all students are assessed on the same tasks and that their results are measured by the same standards. Moreover, external assessment is usually conducted in supervised conditions, which ensure that the student has actually done the work being assessed.

Teacher-based assessment refers to continuous assessment that is designed and or marked by the students' own teachers. It is conducted internally in the classroom and counts towards a final grade or evaluation of the student. Teacher-based summative assessment may include different types of assessment such as teacher-made tests, classroom-embedded assignments, project work and portfolios. Typically, teacher-based assessment is presented in the literature as having higher validity than external assessment. Due to its continuous nature, teacher-based assessment often allows important achievements to be measured that could not be captured in a final examination, such as extended projects, practical assignments or oral work. However, external assessment is often criticized for having lower validity than teacher-based assessment. It tends to be in the form of a written test under supervised conditions, so that only a limited range of curriculum goals can be covered. It can also have detrimental effects on teaching and learning. The risk is that teachers may end up focusing on test-taking skills, especially when high stakes for their students are attached to the test results.

However, teacher-based assessments are often perceived as unreliable. Test items and grading standards may vary widely between teachers and schools, so that the results of internal assessment will lack external confidence and cannot be compared across schools. There might also be a high risk of bias in teacher-based assessment, i.e. the assessment is unfair to particular groups of students. In addition, strategies to improve the reliability of teacher-based assessment include using scoring guides, negotiated scoring criteria, external benchmarks, training for teachers, multiple judgements and external moderation. Another approach is to develop on-demand assessments, where teachers can draw from a central bank of assessment tasks and ask students to take the assessment when they consider that they are ready. This indicates that a combination of teacher-based and external assessments would be most suitable to ensure maximum validity and reliability.

2.2.1.12 Principles of competence based evaluation in the educational field

One of the most generic definitions of education is the process of encouraging an individual with the desired behavior. The most significant elements of this process are the learner, the education program and the teacher. In the course of education, the teacher acts as the element that makes other elements meaningful and has the biggest impact on realization of the education. The teacher is the person who is in continuous interaction with the learner, implementing the education program, managing the teaching process and assessing the learner as well as the education. This situation requires primary school teachers to possess competency based on a **multi-disciplinary** and **interdisciplinary** understanding. Owing to the fact that each subject taught by the primary school teachers necessitates different disciplines and approaches, it is also essential to determine the special content competencies related to the subjects being taught.

Thus, one of the founding principles of the Competency-based approach is **interdisciplinary**. Interdisciplinary approach requires knowledge, skills and attitudes from several subjects. The Larousse dictionary defines interdisciplinary as the character of what establishes relations between several sciences or disciplines. The interdisciplinary approach aims to develop the ability of learners to represent a problematic by using, from different points of view. Interdisciplinary finds its place perfectly in primary education because; only one teacher who dispenses all subjects in its class. It has also been applied in 6e and 5e Forms of secondary education in our country since the 2012/2013 academic year so far, an echo of proper implementation has not been clear just the fact that at secondary school level, each teacher handles his or her specialized subject. It is a question of identifying and developing activities, which actually involves the student in a learning process by following the stages of questioning, problem formulation, investigation (experimentation, research), synthesis of knowledge, linking and perspective .The researcher deduces from the latter approach that interdisciplinary mobilizes knowledge and skills structured according to a specific situation and purpose.

Secondly, a **multidisciplinary program**: under-base of the Competency-based approach**.**
To emphasize the importance of the multidisciplinary program, we refer to DJIHOUESSI, C., B., who writes: "The multidisciplinary program allows a mutual contribution of the disciplines and helps to perceive the disciplinary specificities to avoid confusions. In the implementation of this multidisciplinary program, the learner feels more reassured because of a theme; its advantage is that it offers teachers of the disciplines concerned a formal framework of encounter and exchange. The researcher will focus here on interdisciplinary, on the need to implement a multidisciplinary program and on the modification of teachers' schedules as sine qua non conditions for the implementation of the multidisciplinary approach skills.

Thirdly, **changing Timetables:** Need for implementation of the Competency Approach

Since CBE is based on mastery learning and individualization of instruction, it is impossible to pre-specify and accommodate for scheduled weeks of integration because not all students will reach the prerequisite level of adequacy by this time. In essence, students in this instructional approach are not constrained by time; the only valid criterion for moving on from one unit of instruction into another or scheduling evaluation opportunities is mastery of outcomes. Nevertheless, in their pursuit of practicability of CBE, experts of BIEF have sacrificed time flexibility for more opportunities for the practice of skill integration during the learning process. The number of disciplines could be reduced and groupings should be allocated with hourly quotas. In addition, teachers and teaching staff can define the timetable either for the duration of the school year or for intermediate periods corresponding to the school calendar according to the needs of the pupils. Indeed, the objective of the time group recommended is to allow flexible answers depending on the particular situations of the class or the needs of the children. Therefore, when the choice of a mode is made, the timetables must be elaborated accordingly. However, setting up time-honored integration practices runs counter the principle of time flexibility inherent to CBE. The latter underscores the primacy of outcomes over time (Spady, 1977).

In fact, in order to assess a wide range of key competences and adequately reflect the educational context, assessments in competency-based education programs should be authentic assessments. This means that the student will be evaluated based on their ability to act instead of being assessed in terms of the knowledge that does not affect the real situations they face. The assessment must allow for clear demonstration of outcomes of learner's performance. A judgment of competence can be based on a range of assessment activities. This means that decisions about whether a person is competent are based upon evidence demonstrated, produced, gathered or provided by the person to be assessed. Evidence must be collected to show that a candidate has met every single performance criterion. The person to be assessed is involved in the process of assessment. Assessor and the person being assessed have the scope to negotiate the form of assessment activities. Competency-based assessment supports the underpinning principles of adult learning in that there is no pass or fail; rather a person is assessed when they believe they are ready to be judged for their competence. Only two judgments can be made that is Competent/Not yet competent.

2.2.1.13 The features of Competence Based Assessment

Assessment is defined as the process of collecting evidence and making judgments about whether competency has been achieved to confirm that an individual can perform to the standard expected in the workplace **(**standards for RTOS 2015 glossary on target work skills). In others words, assessment is the process of passing judgements on learners' knowledge, skills and attitudes with the sole aim of making decisions about their education. Furthermore, assessment is a means of objectively informing parents, guardians and policy makers on learners' progress in school. Assessment becomes a means of diagnosing learners' difficulties in order to provide a solution to them. According to the standards, the features of competence-based assessment include:

- Criteria based.
- Evidence based.
- Binary judgment.
- Participatory process.
- Choice of assessment pathway.

2.2.1.14 Competence Based Assessment in Cameroon context

It is worth noting that in the teaching/learning process, knowledge, skills and attitudes are evaluated in relation to the specific objective of the lesson during and after the lesson by different approaches. In reality, each approach (by content, objective, competency) of evaluation has its own way of assessing learning. Evaluations begin with a baseline situation, after the questions are crumbled, and have nothing different from the questions asked in the tests designed according to the Approach by Objectives. The problems that man lives are not crumbled, they are global. Therefore, the questions to ask in evaluation situations must be global and not crumbled and it is up to the learner itself to crumble them in order to achieve his objective.

At the end of a teaching unit built around an integrated theme, evaluation should be carried on competence that was identified at the beginning of teaching. At the end of the fourth weeks, integrations activities based on the new nature of the consolidation task/activity and the complexity of the activity/task used to consolidate the integrated learning theme (ILT) should be taken in consideration. An integrated learning theme is a theme around which learning will take place. Consolidating it entails a context, task and instructions (CTI). Advantages of the integrated learning themes approach are many: It avoids problems related to the compartmentalization of subjects; the lack of link between the disciplines; it is an economical and effective approach because the contents are arranged so as to avoid the repetition of certain contents.

The 2018 curriculum recommended diagnostic, formative, and summative evaluations through three forms (oral, written, practical) based on the implementation of competence-based assessment in both nursery and primary schools levels. As far as Competency-based approach are concerned, competences are evaluated and not subjects. The Primary School Curriculum for English Subsystem Level III: Class 5 & Class 6 (2018 p.19) outlined the following tips of competence-based evaluations or assessment:

- Diverse tools should be used to collect information about the learner in order to moderate and increase learners' chances of learning from one another.
- Information can be gathered about learner's progress through many ways. This can be done through: observation checklists; learner's self-assessment; daily practical assignments; samples of learner's work; learner's willingness to participate and contribute in projects/conferencing; oral and written quizzes; portfolios; Integration activities; willingness to be involved in class and school activities.

- Nevertheless, learners must be assessed fairly and at the same time taking into consideration that each learner has their learning styles. Consequently, all the learners may not always be at the same level of attaining the expected learner outcomes.

- At the end of the term examinations, the learners are assessed through an interdisciplinary related real life / complex integration situations following some predetermined evaluation criteria. For every situation, the teacher specifies the criteria (correctness of approach, pertinence of answers) and indicators. Strictly speaking, a true criterion-referenced system would test whether every individual is (or is not) capable of achieving each one of the criteria contained within the curriculum framework. The 2/3 rule consists of constructing the assessment test in such a way that the learner has three opportunities to show his or her mastery of each criterion. It is considered that the learner masters a criterion when he demonstrates his mastery of the criterion on at least two occasions out of three. This threshold is referred to as the minimal control of the criterion. The mastery corresponds to the success of all the opportunities to show his mastery of a criterion. All three opportunities must be real opportunities, it is necessary to ensure that criterion 2 can be positively assessed if the learner is mistaken in criterion 1. If for example, criterion 1 is the criterion "choice of the right mathematical tool" and criterion 2 is the criterion "correct use of the mathematical tools in situation", it is necessary to be able to pronounce on the correct use of the mathematical tools by the learner (criterion2), even if he has mistaken tool (criterion1). Otherwise, we have a criterion that is absorbing (in the case of criterion 1).

In brief, an integration situation should comprise of:

- Evaluation criteria that are well labeled with clear and specific indicators for each of the criteria. If the assessment criteria are not well defined to those that have to be assessed, the ultimate is that it will cause stress, anxiety and failure of tests and examinations, which can actually impede the learning of some students.

- The complexity of the activity/task used to consolidate the ILT. The teacher has to situate the learner by giving the context under which the learner is supposed to work then give instructions and finally provide the task the learner is supposed to carry out(SIT: Stimulus , Instructions, Task).
- The new nature of the consolidation task/activity;
- The clarity of the task and instruction

Steps in evaluation of competences

The evaluation of competences comprises three phases.

Phase 1: pupils are asked to accomplish a challenging task requiring the choice and combination of a number of significant procedures, which they are supposed to acquire at the end of a learning sequence in one level (level 1, 2 or 3) or the primary school cycle. It is important for this task to have a cross curricula character and be functional.

Phase 2: the same task is given to pupils but this time the challenging task is divided into elementary parts whose instructions are explicit and presented in the order in which they should be carried out in order to realize the main challenging task. The learner has the latitude to determine the procedure for each of these elementary tasks. This notion can be associated with the concept of "extended performance". When one cannot resort to an "authentic" professional situation, the person to be assessed needs to be confronted with a complex situation, close to a professional situation that he or she will be called on to handle or, failing that, a case study. These situations pursue another function, different from (but complementary to) the situations used for learning resources: the didactic situations, or again the "learning tasks". The target here is for all learners to be able to perform the envisaged tasks hence to be competent.

Phase 3: a series of simple tasks is given to pupils. For example, do additions, conjugate verbs, do subject-verb concord. These tasks are elementary procedures, which were used by the learners to carry out the challenging task of this phase.

NB: Each challenging situation should be new to the learner and it should require diverse knowledge. Challenging does not mean difficult. Rather it means requiring many resources (knowledge, skills and attitudes). The complexity of situations, both in everyday life and in the workplace, is often such that the adoption of an interdisciplinary approach at certain points of learning seems inevitable. These equally include higher thinking order skills (Bloom's Taxonomy).

From results outcomes of the evaluation phase, learners are not ranked according to performance as in norm-referenced assessment instead on criteria referenced.

The key strengths and weaknesses of norm- and criterion-referencing are:

- ✓ With norm-referenced methods, where students are competing for limited higher education or employment opportunities, stakeholders can easily select the highest attaining students.
- ✓ Norm-referenced grading methods may be unfair if the students are not all from the same reference group.
- ✓ A high norm-referenced grade does not necessarily equate to minimum competence. Similarly, a failing grade does not necessarily prove that the student is low performing. This is especially true of small reference groups.
- ✓ Criterion referencing can provide detailed information about what a student knows and is able to do.
- ✓ Criterion referencing can lead to knowledge and skills being broken down into such small pieces that they become disjointed.
- ✓ Criterion referencing can lead to wider variations in pass rates year-on-year as expert judgements have a limit to their accuracy in terms of distinguishing between two adjacent marks.

Information gathered in assessments and evaluations are used to shape strategies for improvement at each level of the education system.

- At the classroom level, teachers gather information on student understanding, and adjust teaching to meet identified learning needs.
- At the school level, school leaders use information to identify areas of strength and weakness across the school, and to develop strategies for improvement.
- At the policy level, officials use information gathered through national or regional tests, or through monitoring of school performance, to guide investments in training and support for schools and teachers, or to set broad priorities for education.

Harlen (2006) justified changes in assessment practices into four purposes namely: diagnostic, formative, summative, and evaluative and Roegiers X (2004) identified four different evaluations' models of students' attainment in academics as shown in Figure 5 above.

Roegiers X (2004 p.90), stressed on evaluation of students' level of attainment on two axes namely: Axis of direction and implementation axis (researcher' translation). Roegiers X (2004 p.90) cites Authors like, Cardinet,1988; Deperetti,1991; De Ketele & Roegiers,1996; Perrenoud,1998; Ardoino, 2001 who agreed that one of the functions of evaluation is on production of meaning and guidance (direction axis). It is in the light to understand what can mobilize and hinder the various state holders to clarify on the goals, process and explain what is not functioning. Here, evaluation is view as an established project of actors who want to acquaint in order to react. Evaluation is thus a result of confronting actors put under tension. Roegiers X (2004 p.91) qualified the actors in two categories.

i. Actives Actors (teachers, students….) and

ii. Supervising Actors (policies makers, subsidiary powers)

However, he emphasized on another function of control. Control is an engagement to verify adequately what exists between the awaited outcomes and what has been observed. The essence is to be in conformity to the norms and render an account on administrative plan. Control can be internal or external in our educational system. For internal control, we may refer to promotion evaluation organized by the classroom teachers. External control refers to certificates evaluations organized and imposed by supervising actors from examinations board or ministries officials for the award of a diploma, certificate, and title.

Secondly, the implementation axis is related to evaluation practices. It reveals evaluation as a perpetual state of tension between variability and singularity. Variability is put forward in the process of evaluation with various approaches, instruments, moments, actors in a given time. That is it situates actors and their actions within a given time span. Meanwhile, singularity stands for the set of evaluations which attempts to clarify a particular aspect of a student's attainment level during quizzes or tests, examinations etc.. It is of more orientated, formative and the state of knowledge of a learner's level. The researcher focuses on four forms of assessment practices that include Diagnostic assessment, Formative assessment, Continuous assessment and Summative assessment in respect to the implementation of competency-based approach in Cameroon context, no emphasis was laid on Continuous assessment in the actual new curriculum.

2.2.2 Diagnostic assessment

2.2.2.1 Definitions of diagnosis and diagnostics assessment concepts

1. Diagnosis

In education, diagnosis assumes different meanings and is approached frequently from different perspectives. Considerable variability exists with respect to the definition of diagnosis in education. Diagnosis may assume an instructional definition in which assessment results provide information about students' mastery of relevant prior knowledge and skills within the domain as well as preconceptions or misconceptions about the material. Teachers use this information to adjust instruction by identifying which areas students have and have not mastered. This results in varied instructional plans that are responsive to students' needs (Fuchs, Fuchs, Hosp, & Hamlett, 2003).

2. Diagnostic assessment or pre-assessment

Wiggins and McTighe (2007) assert that pre-assessments "include checks of prior knowledge and skill levels and surveys of interests or learning-style preferences" (p. 101). The authors maintain that, given the literature, a great number of students come to school with a misconception that they are not talented enough to perform a certain task, such as drawing a picture or writing an analytic memo (Wiggins & McTighe, 2007). The purpose of a diagnostic test is not to judge success or failure, but to draw up a list of weaknesses, which need to be addressed, and, equally importantly, to establish in which areas the student has been successful. In other words, diagnostic assessment essentially identifies learners' learning difficulties, thus acting as a bridge between the teaching that precedes it and that, which succeeds it. This is less about achievement than skill. For the reason the timing of diagnostic tests is usually before a course begins or at an early stage in a course, whereas achievement tests are more likely at the end. It can involve formal measurements (e.g. IQ/aptitude tests, fitness tests) that are used to establish a starting point or baseline OR informal measurements (e.g. observation, discussions, questioning). The function of the diagnostic assessment process thus is to provide information to teachers about what is not being learned if students are not making progress. Such assessment information is most useful when it indicates to teachers or students what needs to be done to progress learning. Because diagnostic assessments are only of genuine value when they provide a reasonably accurate estimate of students' status with respect to the curricular aims being measured, it is important for these tests to contain a sufficient number of items/tasks—per assessed curricular aim—to permit valid inferences regarding students’ current status. Diagnostic assessment or pre-assessment is therefore used to collect information for planning instruction and acknowledging learners’ needs. As Brown puts it, “diagnostic testing often requires detailed information about the very specific areas in which students have strengths and weaknesses"(Brown 1996 p.15). When diagnostic tests provide teachers with immediate, instructionally tractable information, they are a useful resource in the process of formative assessment. Diagnostic assessment is therefore one type of formative assessment, which often takes place at the beginning of a study unit in order to find a starting point, or baseline, for learning and to develop a suitable learning program. Diagnostic assessment may also serve to identify students who are at risk of failure, to uncover the sources of their learning difficulties and to plan for an appropriate supplemental intervention or remediation (OECD 2013 pp.140-141).

Although some authors view diagnostic assessment separately from formative assessment, the intention is that diagnostic assessments are used for formative purposes. Some authors also make a distinction between formative assessment and diagnostic assessment, but throughout this thesis, diagnostic assessment will be considered as one aspect of formative assessment. However, the time involved in administering, interpreting, and implementing changes based on these approaches may cause many educators to avoid using diagnostic tests to guide instructional decisions (Oosterhof, 2003). Summarily, the components of a diagnostic assessment are:

1- Happen at the beginning of a unit, lesson, quarter, or period.
2- Goal of understanding student's current position to inform effective instruction;
3- Identify strengths and areas of improvement for the student.

Low-stakes **assessments** (Usually do not count as a grade) 16 August 2018
Source :https://edulastic.com › blog › diagnostic-assessment

2.2.2.2 Role of diagnostics assessment in instructional decision-making

Clarifying the definition of diagnosis and diagnostic assessment is underscored by the critical role diagnosis plays within an instructional decision-making model. In an integrated assessment-instruction system, all students are screened approximately three times per year to determine which students are on-track for success and which students may be at-risk for failure in the domain (Ketterlin-Geller, Baker, & Chard, 2008). Once students are classified by risk status, students who have a high probability of not meeting the outcome goal are administered diagnostic assessments. It is assumed that students identified in this category have persistent deficits in their knowledge or skills that preclude successful engagement in the core curriculum. As such, students at-risk for failure typically receive supplemental instructional interventions designed to overcome these deficits. To determine the domain-specific topics in which remediation is needed, diagnostic assessments are administered to these students (Stecker & Fuchs, 2000). To aid in instructional design, diagnostic tests should measure students' competencies on components embedded within the theoretical model of learning (Gregoire, 1997). Such diagnostic assessments identify specific deficits or persistent misconceptions in students' requisite pre-skills or knowledge. Pre-skills or knowledge include those concepts or tasks that are required in order to complete successfully the targeted tasks within the instructional domain and are often referred to as attributes within the cognitive model (Tatsuoka & Tatsuoka, 1997).

2.2.2.3 Models for Diagnostic Assessment for Quality Control in Education

The following models are recommended for conducting/designing diagnostic assessment for learners' learning difficulties and general education diagnosis:

Item Response Theory (IRT) modeling will be useful for quiz/test form of diagnostic assessment as it can describe item performance at each level of student's ability. While **Empowerment Evaluation model** will be useful during interview and self-assessment forms of diagnostic assessment as it is aimed at 'helping people to help themselves' (Fetterman and Wandersman, 2007). For a holistic diagnostic assessment of the education system, **the CIPP Model** will be more useful as it takes in to consideration the context, input, process and the product of the education system as stated in the UNESCO'S diagnosis framework (GEQAF).

2.2.2.4 Framework for using Diagnostic Assessment for Quality Control

The process of using diagnostic assessment for quality control in education demands a holistic assessment of the learners and other variables. Chatterji cited in Nancy (2012), developed the Proximal Assessment for Learner Diagnosis (PALD) Framework to help teachers diagnose and mediate students' learning needs with the following stages;

1. Specify learning goals and objectives: the teachers should specify long and short-term learning outcomes in terms of knowledge, skills, attitudes, behavior or tasks that students would expect to master in a unit.

2. Plan classroom instruction and assessment: teachers should develop instructional plans and teaching strategies tied to specified learning outcomes. Design developmentally; diagnostic assessment (tasks/items) tied to ordered domains and culminating tasks.

3. Deliver instruction and embed PALD cycles to identify learner's gaps:

a. Communicate learning expectations to students at the beginning of the instructional cycle;

b. Embed self-designed assessments for diagnosis of learners needs;

c. Probe to identify learning gaps;

d. Conduct error analysis of student's responses to identify learning gaps;

e. Mediate, coach, re-teach and give concentrated feedback to students;

f. Give students planned practice to facilitate learning;

g. Encourage meta-cognition and self-reflection to facilitate learning;

h. Use formative assessment result to revise desired learning outcomes;

i. Use formative assessment result to improve instructional plans, teaching strategies and assessment tools;

j. Provide students with new or added instruction and continue formative cycles of instruction and assessment as new materials are introduced.

4. Administer end-of-unit assessment for summative decision-making at the end of an instructional cycle and move to a new unit of instruction.

UNESCO (2012) also developed a General Education Quality Analysis/Diagnosis Framework (GEQAF). The framework adopts a comprehensive and systemic approach to education. It acknowledges that the reality, the accountability to deliver quality and effective learning lies at all levels and in all aspects of an education system.

The GEQAF contains 15 analytical tools covering all key aspects of an education system taking into account the interdependencies and linkages between the various aspects.

1. Relevance/responsiveness: here they should take thorough analysis and textured understanding of the development context(s) of an education and training system as an inescapable starting point for determining the adequacy of education quality and the probability of learning effectiveness. The paramount question to be addressed by this toolkit is; have we ensured relevance of our education system to reach the desired level of education quality and learning effectiveness?

2. Life-long learner: the diagnostic assessment focuses on the issue of systematic development of learning opportunities so that learning becomes an activity accompanying people along their whole lifespan. The question is; have we integrated life-long learning into our education system and provide many opportunities for learning to our citizens throughout their life?

3. Learning outcome: the diagnosis here focuses on the learning outcomes as defined in the policy and the challenges in developing curricula that address learning outcomes for quality learning. The question is; what are the most important learning outcomes for the learners to acquire to face today 'sand tomorrow's world?

4. Curriculum: this diagnosis is carryout by scanning of the curriculum with the view to identifying the strong element To be built upon, as well as the weaknesses that hinder education quality. The paramount question is: does the curriculum we have in place enables us to impart on our learners the kind of competencies, values and attitudes we require for the type of society we envision to build?

5. Teachers: the diagnosis focuses on teachers as a critical sub-system that can support or impede achieving the goal of quality education for all. The paramount question to be addressed is: to what extend the teachers' sub-system has been a major factor in solving the quality problems we face in our education system?

6. Learning environment: an environment, which is physically and socially supportive, influences learning in many ways. It contributes to increase learners' participation, retention and achievement. The question is: have we assured every learner an environment that is both physically and psychologically enabling to his/her learning and thus conducive to improving the quality of education?

7. Teaching and learning: the diagnosis here focuses on how teaching and learning processes contribute to the quality and equity of general education. The paramount question is: do our teaching and learning processes facilitate or impede the attainment of quality education for all our learners?

8. Assessment: the diagnosis focuses on the extent the existing assessment system is part of the facilitating factors or impediment to reaching the desired stated goals of education quality. The question is: how well the existing assessment system is contributing to improvement of the quality of our education system?

9. Governance: the diagnosis here focuses on the extent to which educational inputs contribute to an equitable, efficient, relevant and responsive quality education, which depend on the overall quality and efficiency of governance and management.

10. Equity and inclusion: here the diagnosis focuses on the current situation of inequalities and exclusion in the education system. The paramount question is: how we managed to create an equitable and inclusive education system, which delivers quality education to each and all?

11. System efficiency: the way resources are allocated, managed and used at different levels of the education system is an important dimension and determinant of quality education system, the question To be addressed is: how can we improve the resources efficiency in our education system to improve education quality and equity?

12. Financing: a well-functioning education financing system is one of the key enabling factors for the delivery of quality education. The paramount question is: how well have we designed our education finance system to enable the achievement of equitable and quality education outcomes? Therefore, it is important to note that diagnostic assessment could be applied in all teaching and learning process (cognitive, affective and psychomotor domains) in identifying students' misconception in the content areas for remediation measures. DA could also be used for general education assessment for holistic quality control of education system.

2.2.2.5 Challenges of Use of Diagnostic Assessment for Quality Control in Education

Based on work in an action research project in diagnostic assessment, it is argued that there are two sets of problems associated with introducing diagnostic assessment in schools. The first concerns existing practice in the schools themselves. This includes practical problems such as the lack of existing assessment policies, lack of teachers' assessment skills and existing assessment practice, as well as sociological problems from both external and internal influences. The second set of problems came from diagnostic assessment itself and includes the appropriate foci, the origin of the foci, nature of feedback, reasons for assessment and management requirements Black, H D(2011 p.58).

Diagnostic assessment is an assessment that requires a lot of processes and procedures to make it effective. As such, lack of dedicated and committed teachers will constitute a serious problem to the setting, administering, marking and scoring of meaningful DA(Adebule, 2005).Lack of motivation of teachers on the part of government and other employers could also militate against the use of diagnostic assessment to improve students' learning difficulties. Non-inclusion of diagnostic assessment in the scheme of work in the curriculum or in the schools' academic calendar makes it less important and attracts less attention by the teachers as they focus more on formative and summative assessments. These could impede the implementation of effective diagnostic assessment by teachers in schools.

2.2.2.6. Types of Diagnosis assessment practices

In K-12 mathematics, **two types of assessment practices** are currently used to provide diagnostic information: **response analyses** and **cognitive diagnostic** assessments.

1. **Response Analyses**

Typically, response analysis involves teachers', and in some cases students' detailed evaluation of students' answers beyond simple dichotomous scoring of correct/incorrect. Two response analysis techniques are described below **skills analysis** and **error analysis**. These methods differ in their focus and intended use. Because of the flexibility in assessment design, these diagnostic procedures can be applied to a variety of tasks including homework, classroom-based quizzes, or standardized tests.

i) Skills Analysis

Curriculum-based measures (CBM) have a long history as a technically adequate measurement tool for students with special needs (Lembke & Stecker, 2007). CBM is an efficient system for gathering reliable information about student performance using quick probes that are easy to administer and score. Because of the ease of use and efficiency of mathematics CBMs, researchers have recently begun to explore the diagnostic capabilities of these measures by conducting skills analyses from student performance data. Skills analysis refers to the aggregation of performance data for different subskills in order to create students' skills profiles (Fuchs & Fuchs, 1990). Skill profiles describe students' mastery of the knowledge and skills in the tested domain. In others words, Skills analysis focuses on strengths and results in an evaluation of students' level of mastery of specific subskills. Skills analysis involves aggregating student's item-level responses to determine skill mastery associated with specific subskills. In mathematics, skills analysis is emerging as a means for diagnostic interpretation of curriculum-based measures (CBM) (Fuchs & Fuchs, 1990).

Although some studies indicate increased student achievement and better delineated instructional plans when teachers use skills analyses (Fuchs & Fuchs, 1990; Fuchs et al., 1994), several constraints in the assessment model may prohibit accurate cognitive diagnosis of student pre-skills and knowledge. From a psychometric perspective, CBMs have limited utility for making diagnostic decisions because of the domain sampling techniques used to create the measures. CBMs are most commonly created by sampling skills and knowledge representative of the year's curriculum (Lembke & Stecker, 2007). CBMs in mathematics are typically administered under timed conditions ranging from 1-6 minutes. Within this time span, most students (by design) are not able to respond to all items, thereby further limiting the sampling of student ability across the subskills or knowledge and limiting the diagnostic inferences made from sub score analysis. An additional concern when making diagnostic decisions based on skill analysis of mathematics CBM results that arises from this sampling approach is sub scores unreliability. As noted by Christ, Scullin, Tolbize, and Jiban (2008) "variability in test material decreases the dependability of measurement outcomes, because the number of items that represent specific domains is uncontrolled and inconsistent" (p. 203).

ii) Error analysis

Another commonly used method for identifying students' misunderstanding in mathematics is error analysis. Error analysis is the process of reviewing student's item responses to identify a pattern of misunderstanding. Error analysis focuses on weaknesses and helps teachers classify students' mistakes. In both cases, assessments elicit responses to specific types of items designed to assist in diagnostic classification. **Response analysis** is based on students' responses to instructionally relevant item sets and provides ongoing information about students' mastery and/or application of current knowledge and skills. Analyzing students' responses to problems can be used to adjust instruction to correct students' current misunderstandings; however, limited information about students' persistent and systematic thinking errors may be tendered from these analyses. Errors can be classified into two categories: **slips and bugs**.

Slips are random errors in students' declarative or procedural knowledge that are not the result of inherent misunderstandings in the domain.

Bugs represent persistent misconceptions about domain specific knowledge or skills that consistently interfere with students' demonstration of their abilities. Identifying bugs, i.e., persistent errors in student thinking, is the primary interest of diagnostic assessment. As an example of error analysis in mathematics, Ashlock (1994) classified computational-skill bugs into three basic categories: (a) wrong operation, in which the student uses an inappropriate operation when attempting to solve a math problem, (b) computational or fact error, in which the student uses the appropriate operation but makes an error involving basic number

2. Cognitive Diagnostic Assessments

An emerging approach to diagnosis for instructional decision-making relies on cognitive models of learning to determine students' persistent cognitive errors. Because cognitive models are based on empirical research on learning, they provide a foundation for understanding the pre-skills and knowledge involved in successfully engaging with the material (Pellegrino, Chudowsky, & Glaser, 2001). This foundation is used to structure remedial instructional opportunities and supplemental interventions for students with specific cognitive errors. As an introduction to the need and design of cognitive diagnostic assessment for instructional design, it is worthwhile to note briefly some historical developments.

Cognitive diagnosis is the merger of two major research fields,

(a) Cognitive psychology and (b) psychometric modeling

a. Role of Cognitive Psychology

Cognitive diagnosis requires the identification of the cognitive attributes that can be combined to form knowledge states underlying observed performance. Cognitive attributes are domain-specific pre-skills and knowledge that are needed to demonstrate mastery in the targeted construct (Chipman, Nichols, & Brennan, 1995; Leighton & Gierl, 2007). The cognitive model is a differentiating feature of this approach, and can be seen as "an architecture organizing the successive processes involved" in learning (Gregoire, 1997, p. 17). Attributes are typically isolated through careful task analyses, expert review, verbal protocols, and other inquiry methods for analyzing student thinking processes (Gorin, 2007). Once the attribute structure for the cognitive model has been determined, combinations of attributes that make up students' knowledge states can be identified. Knowledge states are well-specified combinations of attributes that form the basis of students' conceptions of domain-specific knowledge and skills. Knowledge states represent the level of mastery of a unique combination of attributes that characterize specific misconceptions or cognitive errors, ranging from competence in none to all of the attributes within the cognitive model. Theoretically, it is possible to have a large number of knowledge states depending on the number of attributes that can be combined. In practice, however, because students often approach problem solving in the domain with similar misconceptions, there are a finite number of plausible and testable combinations. Furthermore, the cognitive model constrains the class of theoretically reasonable knowledge states. Because knowledge states underlie students' persistent (mis)conceptions within the cognitive model, these form the basis for designing supplemental instructional modules for remediating these deficits.

Role of Psychometric Modeling

In educational measurement, it provides elegant solutions for item/test development, item parameter calibration, and accurate examinee scaling on unidimensional and multidimensional traits that are useful for developing cognitive diagnostic assessments. For instance, item response theory (IRT) and latent class modeling have resulted in an explosive amount of research over the past 50 years. With the advent of new estimation algorithms and desktop computing power, new and highly flexible psychometric models relating test responses to latent trait scales are routinely proposed in measurement journals. For example, Rudner and Talento-Miller (2007) applied Bayes' theorem of inverse probabilities (Press, 1989) to make diagnostic inferences based on response analysis procedures. Using items with known item response theory (IRT) psychometrics (e.g., item difficulty, item discrimination, item guessing), the Bayesian procedure requires a priori estimates of probabilities that a randomly sampled student will be in any one of the diagnostic classification categories. In addition, the procedure requires a priori estimates of item response probabilities given a mastery category. Posterior mastery classifications are made based on the (a) the observed scored response pattern, and (b) estimated priors (probability distribution of classification categories, probability of item response given mastery classification). As noted earlier, the response analysis application of diagnosis assumes a unidimensional trait structure in which items are associated with one, and only one, skill. However, when the purpose of diagnosis is to evaluate students' cognitive processing in domains that represent combinations of skills, more complex item sampling and statistical models are needed to make accurate diagnostic inferences.

In conclusion, the combination of cognitive psychology and psychometric principles in the design of cognitive diagnostic tests may promote valid diagnostic inferences about students' persistent misunderstandings and cognitive errors. Current and emerging research points to these assessment systems as valuable tools to guide instructional design and delivery decisions.

b. **Cognitive diagnostic** assessments have the potential to provide appraisals of specific student-level cognitive processes that are structured based on cognitive theory and statistical modeling of response patterns. The value of cognitive diagnostic assessments is for designing remedial instructional programs or supplemental instructional interventions for students who are struggling. To help practitioners differentiate between these assessment techniques and select the most appropriate tool for their uses, each of the approaches will be described and be discussed for their relative strengths and limitations for making instructional decisions. (See Table 11 for a summary).

Table 12: Comparison of diagnostic assessment approaches.

Diagnostic approach	Instructional use	Content reference	Score estimation	Classification
Cognitive Diagnostic Assessment	Identify persistent misconceptions to design supplemental instruction/ interventions	Theory of cognitive processing in domain	Knowledge state	Mastery of multidimensional cognitive attributes
	Identify skills that may be problematic to design review activities			
Skills Analysis	Identify errors students are making when solving specific problem types to design reteaching sequences	Broad skills across the curriculum	Skill aggregation	Mastery of unidimensional subskills
Error Analysis		Procedural knowledge across the curriculum	Distractor analysis	Error patterns

Source: Practical Assessment, Research & Evaluation, Vol 14, No 16 Page 3 Ketterlin-Geller and Yovanoff, Cognitive Diagnostic Assessment.

2.2.3 Formative assessment or 'assessment for learning'

2.2.3.1 Definitions of formative assessment or 'assessment for learning'

Definitions of formative assessment are multiple and uncoordinated (Taras 2007 p.365). Black (1993), who considers formative assessment as assessment for learning and not assessment of learning, advocates this definition. It is often claimed that the practice of formative assessment is rooted in Bloom's concept of "mastery learning," an instructional approach that espouses the use of assessments to gauge students' progress toward mastering a learning goal (Bloom, Hastings, & Madaus, 1971). Bloom suggested that, rather than waiting to assess students at the end of a unit (common practice at the time), teachers use assessments *"as an integral part of the instructional process to identify individual learning difficulties and prescribe remediation procedures"* (Guskey, 2010, p. 108). According to Guskey, Bloom borrowed the term "formative" from Scriven (1967), who used it to describe program evaluation activities conducted during the course of a program to give feedback on the program's progress so that it could be improved if need be. Similarly, Perrenoud, Ph (1991) defines formative assessment as all the assessments that help the learner to learn and improve. In other words, that participates in the regulation of learning. In the same perspective, (Black

2003a, b, c; Wiliam 1994, 2000a, b, 2000, Wiliam and Black 1996 p.8, Black et al 2003 p.2) refer formative assessment as a classroom learning and teaching pedagogy process.

There are many other definitions relating to formative assessment, including:

- Wiliam and Thompson (2008) observe, *"an assessment is formative to the extent that information from the assessment is feedback within the system and actually used to improve the performance of the system in some way"* (p. 61).
- *'as encompassing all those activities undertaken by teachers, and/or by their students, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged'* (Black & Wiliam, 1998, p. 7)
- *'the process used by teachers and students to recognize and respond to student learning in order to enhance that learning, during the learning'* (Cowie & Bell, 1999, p. 32)
- *'assessment carried out during the instructional process for the purpose of improving teaching or learning'* (Shepard et al., 2005, p. 275)
- *'Formative assessment refers to frequent, interactive assessments of student progress and understanding to identify learning needs and adjust teaching appropriately'* (The Organization for Economic Co-operation and Development, 2005, p. 21)
- *'A tool that teachers use to measure student grasp of specific topics and skills they are teaching. It's a 'midstream' tool to identify specific student misconceptions and mistakes while the material is being taught'* (Kahl, 2005, p. 11)
- *'formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes' (McManus, 2008, p. 3)*
- *'formative assessment ... is characterized by the intention to use ongoing assessment information to enhance learning and sitting within this concept lies the term feedback and feedforward' (Richardson et al., 2018, p. 9)*
- *'formative assessment is a planned, ongoing process used by all students and teachers during learning and teaching to elicit and use evidence of student learning to improve student understanding of intended disciplinary learning outcomes*

and support students to become self-directed learners(emphasize added)' (The Council of Chief State School Officers, from USA 2018, p. 2)

The final definition from The Council of Chief State School Officers (2018) seems to be the most complete and detailed statement in the way that assessment is planned to elicit evidence of learning. The most important aspect is that this definition focuses on the difference of assessment implementation in different disciplines; it specifically focuses on developing learners as self-directed. However, this definition does not mention to the importance of feedback compared with previous definitions. The definition of formative assessment used in this thesis is the combination of all these approaches which means shifting the learning forward by planning to obtain elicited learning evidence each disciplinary expected learning outcomes.

Phelan et al.,(2009) have placed formative assessment squarely within a measurement paradigm and paradigm of learning and instruction.

The following sections examine formative assessment within each paradigm because both contain concepts that are helpful to understanding effective use of formative assessment.

1. Formative Assessment within a paradigm of learning and instruction

Heritage (2010) suggested, formative assessment to be transited from the measurement paradigm to the learning paradigm in order to facilitate and support student learning. Formative assessment, or "assessment for learning", aims to deepen and shape subsequent learning rather than making a judgement about past performance (Black and Wiliam, 1998). Heritage has made significant contributions to the theory and practice of formative assessment, emphasizes the close linkage if not the inseparability of formative assessment, teaching, and learning (Heritage, 2010a). He situated formative assessment within a paradigm of learning and instruction in respect to a dual definition of formative assessment: which one is based on Sadler (1989) and has formative assessment as a focus on **product assessment** (Wiliam 2000 p.15, Black 2003c p.2**,** Black et al 2003 p15, p.121). The product definition taken from Sadler 1989 is straightforward: criteria are used to judge the quality of the work in question. Sadler's definition of formative assessment differs from the initial definitions of Black et al and by Black and Wiliam in that firstly, it has to do with learners in that it assesses their work and not teachers' classroom processes. Secondly, it is about the process of assessment (i.e. four steps) which relates to product and not about teacher methodology in the classroom.

The other is a **classroom learning and teaching pedagogy process** (Black 2003a, b, c; Wiliam 1994, 2000a, b, 2000, Wiliam and Black 1996 p.8, Black et al 2003 p2). The goal of any modifications to instruction is to enhance student learning. The literature on assessment and teaching expounds on the importance of formative assessment and its implications for instruction and its ultimate goal, that *"assessment...feed into actions in the classroom in order to affect learning"* (Wiliam & Thompson, p. 63). Similarly, Wiggins and McTighe (2007) argued that by embedding formative assessment in *"curriculum documents, and advice on how to use their results to adjust curriculum, a school...signals that such practices support effective teaching"* (p. 103). According to Bennett (2011), like other educational measurement, formative assessment is an inferential process in which teachers cannot be very sure what a student understands. He also noted that it is a process rather than a test because teachers use the results to adapt teaching to students' needs and use feedback to adjust current teaching and learning to improve students' attainments of targeted outcomes. Formative assessment is now seen as an integrated part of the teaching and learning process, rather than as a separate activity occurring after a phase of teaching. Formative assessment is carried out to make changes to the teaching methods of a course; *"it attends to the process of a program in order to provide immediate feedback which could lead to improvement."* (Davies et al. 1999 p.65).It is essentially a pedagogical approach consisting of frequent, interactive checks of student understanding to identify learning needs, provide feedback to students and adapt teaching strategies (OECD, 2005a).

Approaches to curriculum and instruction are more apt to be integrally linked with, or even driven by, assessment practices and the forms that they take (e.g., Angelo & Cross, 1993). The assessment practices need to be so well grounded in the instructional process that the information they reveal will identify whether and how instruction should be adapted to advance students' understandings. From this, it follows that formative assessment is part of teaching methodology and has more to do with teachers than learners thus seeming to contradict the initial definitions have. It assists teachers in modifying or extending their programs or adapting their learning and teaching methods. It is used to monitor students' ongoing progress and to provide immediate and meaningful feedback. This suggests that assessment is an integral part of instruction and that students have multiple and on-going opportunities to demonstrate their thinking to the teacher and their peers, so that this evidence of knowledge (or the lack thereof) can be used to move learning forward. The term formative assessment or assessment for learning thus indicates informal assessments that teachers might do as part of daily instruction as well as more formal classroom assessments used to assess the current state of students' knowledge. Therefore, formative assessment encompasses a variety of tools that provide feedback to teachers or students to help students learn more effectively. Formative assessment does not take the form of a particular instrument or task (Moss, 2008), but is defined by its purpose (Shepard, 2009), which is to help form, or shape, students' learning during the learning process. It is embedded in the normal day-to-day teaching and learning process and may include activities in both formal and informal formats such as classroom interactions, ungraded quizzes, effective feedback (oral and written feedback), peer feedback, questioning techniques, self-reflection, think-aloud, comprehensive approaches to teaching and learning featuring formative assessment; and student self-and peer-assessment etc. (Looney, 2011a). It is that part of everyday practice by students, teachers and peers that seeks, reflects upon and responds to information from dialogue, demonstration and observation in ways that enhance ongoing learning" (Klenowski 2009, as cited in Baird et al. p. 42). In the formative assessment model, teachers are responsible for identifying and communicating instructional goals to students in order to help them achieve intended learning outcomes. Teachers should also communicate these goals in learner-friendly language, so students can understand and participate in the completion of these goals. This requires teachers and students to make a change in their practices in engaging and integrating formative assessment in a constructive way in a collaborative and respectful learning environment.

2. Formative Assessment within a paradigm of measurement theory

This section discusses ways in which established thinking about measurement in general may contribute to conceptualizing and designing effective formative assessment, as well as ways in which traditional practices based on principles of measurement theory may not be applicable to formative assessment. The role of measurement theory with regard to formative assessment is somewhat contested; it is not altogether clear whether and, if so, how and to what degree accepted measurement principles should guide formative assessment (Bennett, 2011). Teachers are in an ideal position to adjust their methods to probe information that will resolve any discrepancies or to test competing hypotheses as to why students respond the ways they do. Formative assessment is the practice of building a cumulative record of student achievement. It usually takes place during day-to-day learning experiences and involves ongoing, informal observations throughout the term, course, semester or unit of study. Assessment in general accounts for *"supporting learning (formative), certifying the* *achievement or potential of individuals (summative), and evaluating the quality of educational institutions or programs (evaluative)"* (Wiliam, 2008, p. 59).

Interpretations of formative assessment vary widely, according to Wiliam and Thompson (2008), *"formative assessment is used to provide information on the likely performance of students" and "to describe and feedback given to students... telling them which items they got correct"* (p. 60). Meanwhile according to Filsecker & Kerres (2012, p. 3) formative assessment is part of a test which is a process that integrates test information with information from other sources. Black and Wiliam (2004) put more emphasis on the use of assessment to support learning; however, they also acknowledge the importance of using assessment for certification and evaluation. In addition, there is a rising consensus among educators that assessment should be used to diagnose students' achievement, measure their performance, sort students, etc. Moreover, Black and Wiliam (1998) raise the "scrutiny issue" of developing tests to collect relevant evidence of student progress: "good questions are hard to generate and teachers should collaborate, and draw critically on outside sources, to collect such questions" (p. 8). Following the view, Natriello (1987) proposed a model of evaluation processes in schools and specified the importance of purposes in starting the assessment cycle. The next steps in the cycle are setting of tasks, criteria and standards, evaluating performance, providing feedback and discussion on the impact of these processes on students. According to Greenstein (2010), the cycle of formative assessment starts with identifying the learning objectives, goals and standards; targeted instruction; data gathering; data analysis; and responding to data.

This oppose the way selected responses measure students' achievement, given students' scores instead of feedback. Torrance (2012) has emphasized the role of assessment for learning, and the role of feedback, translating theory of formative assessment into practice (Huba & Freed, 2000; Wiggins & McTighe, 1998). Then teachers use that information to provide feedback to pupils about their own learning and to plan future instruction. Feedback on student performance could help actively involve students in the learning process and adapt instruction to meet identified needs. Students should be provided with evidence-based feedback about particular qualities that are linked to the intended instructional outcomes, criteria for success and recommendation on what students can do to enhance their learning (McManus, 2008). Teachers should use varied instruction methods to meet diverse student needs and varied approaches to assess student understanding. However, pupils often lack the understanding of the targets of their learning and often are passive learners (Baird, 2014) the limits the effectiveness of learning, because understanding the main purposes of the learning is seen to be crucial for formative assessment (Black and Wiliam, 1998a).

Measurement theory also provides statistical methods to assess the qualities of inferences .In large-scale assessments of achievement such as statewide testing for school accountability reliability, validity, and fairness are examined in statistical studies that are based on measurement models about the factors that influence student performance on tests. Shavelson et al. (2007) argued, issues of reliability and validity in formative assessment are addressed over time, as teachers collect ongoing data about student performance and, as appropriate, make corrections to their previous inferences. These statistical methods would not be helpful in formative assessment conducted in classrooms, for a couple of reasons. First, they require performance information from a large number of students, on a large number of tasks, possibly from multiple occasions. In classrooms, a teacher might use a particular assessment technique simply to evaluate a few students in a brief segment of a class discussion. Second, the statistical analyses generally are built on theories of test interpretation that summarize the quantity, rather than the qualities, of student knowledge. Thus, the interpretations would focus on whether a student's test performance indicated that the student had acquired an adequate level of knowledge, rather than focusing on the nature of the student's reasoning or the patterns of thinking displayed by the student. It is this last type of information that generally is useful to teachers in understanding what students know and what they still need to learn.

2.2.3.2 Purpose of formative assessment

The intentions for designing and implementing formative assessment strategies include:

•To provide timely feedback to students, which they can integrate into their learning process. Several studies indicate that feedback is most effective when it is timely, is tied to criteria regarding expectations, and includes specific suggestions for how to improve future performance and meet learning goals (Wiliam, 2006; Hattie and Timperley, 2007; Swaffield, 2008).

•To help students to feel safe to take risks and make mistakes in the classroom. Students are thus more likely to reveal what they do and do not understand and are able to learn more effectively (Looney, 2011a).

•To diagnose student learning needs and differentiate teaching accordingly. In order to develop an appropriate teaching intervention, teachers need to assess students' learning needs and explore a range of potential causes of learning difficulties (Looney, 2011a).

•To actively engage students in their own learning processes so as to develop higher-order thinking skills and skills for “learning to learn’, and to allow students and teachers to engage in conscious reflection on the learning process (Earl, 2003).

2.2.3.3 Relevance of formative assessment

The formative evaluation according to SCALLON (2000) has as essential function the regulation of the learning during a course or a learning sequence. It is aimed at specific learning and refers to one or more pedagogical interventions. Whether formative evaluation is formal or informal, it always involves two things: the learner in his progression and the pedagogy envisaged in a context of teaching and learning. However, others argue for the use of assessment to enhance student learning and performance (Delandshere, 2002). It is affirmed that formative evaluation is part of a constructivist approach to learning and is a process of accompaniment. It is beneficial both to the learner and to the teacher and is more interested in learner approaches and / or product realization rather than learner performance criteria and/or of product success. The formative assessment, through the literature, involves a cycle composed of three levels:

1) Observation: the role of this stage is to construct a reality of learning, conditions, modalities and their results. According to Perrenoud, Ph.(2005), the observation is formative when it is used to guide and improve learning regardless of ranking, certifying or selecting the learner. It is rather to expose the state of knowledge and skills, instead of confining himself to be on a scale and compare it to other learners.

2) Intervention: it separates the symptoms to address the sources of the difficulties. It involves analyzing metacognitive knowledge that is very mysterious as stated by Perrenoud, Ph.(2005). Indeed, he believes that assessing competency by only observing the learners reach limits very quickly, especially in a training exercise: say "you can do better" does not help the learner to do it better. To be useful, the observer must identify, isolate mental functions or specific actions and identify their weaknesses.

3) Regulation: the concept of regulation has been developed to describe the mechanisms that provide guidance, control and the adjustment of cognitive activities, emotional and social as well as their relationship with a learner All.L,Cardinet J(1989).

L. Endrizzi, Rey O.(2008) states: *"the regulating of learning process involves all operations of the metacognitive learning and interactions with the environment that influence learning process in the sense of a defined objective.”*

2.2.3.4 Procedure to implement formative assessment

The recent revised definition of formative assessment by the Council of Chief State School Officers (in the United States) (2018) earlier mentioned above in this thesis has focused on the process and distinctive roles of teachers and students and the use of learning evidence. Formative assessment should be understood in its nature so that it is translated into practice efficiently and skillfully. In order to investigate the application and effectiveness of formative assessment, previous research has used a mixed method approach when they conducted observations (Yin et al., 2008), a single case study (Stewart, 2011), and experimental measurement. In related research, authors have used a pre-and post-test to determine the association between formative assessment attributes and student effects. They also examined the difference in value and systematic use of formative assessment strategies between experimental and control group teachers (Ruland, 2011; Yin et al., 2008).

It is in this respect, since 2008, the OECD outlined several steps as to how best to conduct formative assessment. These steps are as follows: Establishment of a classroom culture that encourages interaction and the use of assessment tools; establishment of learning goals, and tracking of individual student progress toward those goals.

Classroom assessment should thus be 'learner-centered, teacher-directed, mutually beneficial, formative, context-specific, and firmly rooted in good practice' (Angelo & Cross, 1993, p. 4). Koch, and Arden (2010, p. 400) noted that reform of assessment practices has meant a changing view of assessment from *"a view of assessment as a series of events that objectively measure the acquisition of knowledge toward a view of assessment as a social practice that provides continual insights and information to support student learning and influence teacher practice."* The practices identified by Black et al. (2004) resonate with the work of Suurtamm, through study of the assessment practices from a group of Canadian teachers, Suurtamm et al. articulated several practices reflective of this broad perspective in relation to assessment:

- Teachers used various forms of assessment;
- Instruction and assessment were seamlessly integrated as teachers built assessment into instructional tasks so they were constantly assessing students' thinking;
- Teachers valued and assessed complex thinking through problem solving; and
- Teachers used assessment to support their students' learning by providing students with appropriate feedback about their thinking, by helping them learn to self-assess,

and by using students' thinking to guide their classroom instruction (adapted from Suurtamm et al. 2010, pp. 412–413).

In work with groups of teachers throughout England, Black et al. (2004) identified four practices that teachers could use to engage in continuous and formative assessment as part of classroom instruction:

- questioning with appropriate wait time so that students have an opportunity to think about an acceptable response and so that worthwhile, rather than superficial, questions are asked;
- providing feedback without necessarily attaching a grade because attaching a grade can have a negative impact on students' perceptions of their work and cause them to ignore helpful feedback that informs students about what aspects of their response are strong and what might need improvement;
- helping students learn to peer and self-assess, both of which are critical components in assisting students to take ownership of their own learning; and
- Using summative assessments in formative ways by helping students learn to develop potential questions for a summative assessment and determine what acceptable responses might entail.

Heritage (2010), William (2010) and Ruland (2011) identified strategies of formative assessment. The strategies introduced in two different studies by Leahy and others (2005) and Wiliam, and Thompson (2007), shared similar five strategies principles when specifying to implement formative assessment:

The five strategies principles according to Wiliam, and Thompson (2007) are:

(1) Clarifying and sharing learning intentions and criteria for success;

(2) Engineering effective classroom discussion, questions, and learning tasks;

(3) Providing feedback that moves learners forward;

(4) Activating students as the owners of their own learning;

(5) Activating students as instructional resources for one another;

According to Leahy et al. (2005) as cited in Wiliam (2011a):

• Teachers should clarify learning outcomes and conditions for success and then share them with students.

• Teachers should engage students in classroom activities that provide evidence of learning.

• Teachers should provide feedback to help students make progress.

• Students should be resources for each other.

• Students should own their learning (adapted from p. 46).

In the same perspective, Wiliam(2017)based on the original work of William and Thompson (2008), has adapted the previous models of formative assessment and allocated each strategy in each agent's responsibilities: teachers, learners or peers (see Table 12).

Table 12: Formative strategies responding to agent's responsibilities

	Where the learner is going	**Where the learner is right now**	**How to get there**
Teacher	(1) Clarifying, sharing, and understanding learning intentions and success criteria	(2)Eliciting evidence of learning	(3) Providing feedback that moves learning forward
Peer		4)Activating learners as instructional resources for one another	
Learner		(5) Activating learners as owners of their own learning	

Table. 12 (Adapted from William & Thompson, 2008, p. 63)

William and Thompson (2008) presented this matrix describing the role of student and teacher in an ongoing classroom assessment model. Given the above criteria, formative assessment has facilitated a change in the practices of some instructors who are encouraged to develop their own assessment formats or to adapt the forms of assessment that help them gather helpful information about their students' progress .

At the same time, Heritage (2010a) proposed a different set of strategies relating to formative assessment.

1- Sharing learning intentions;

2- Collecting and eliciting learning evidence;

3- Providing feedback that moves learners forward;

4- Activating students as the owners of their own learning;

5- Activating students as instructional resources for one another

These strategies demonstrate a change in factor 2 of 'questioning' into the general statement, 'collecting and eliciting learning evidence'.

There are also five core practices proposed from the revised definition:

(i)Clarifying learning goals and success criteria within a broader progression of learning

(ii)Eliciting and analyzing evidence of student thinking
(iii) Engaging in self-assessment and peer-feedback

(iv)Providing actionable feedback

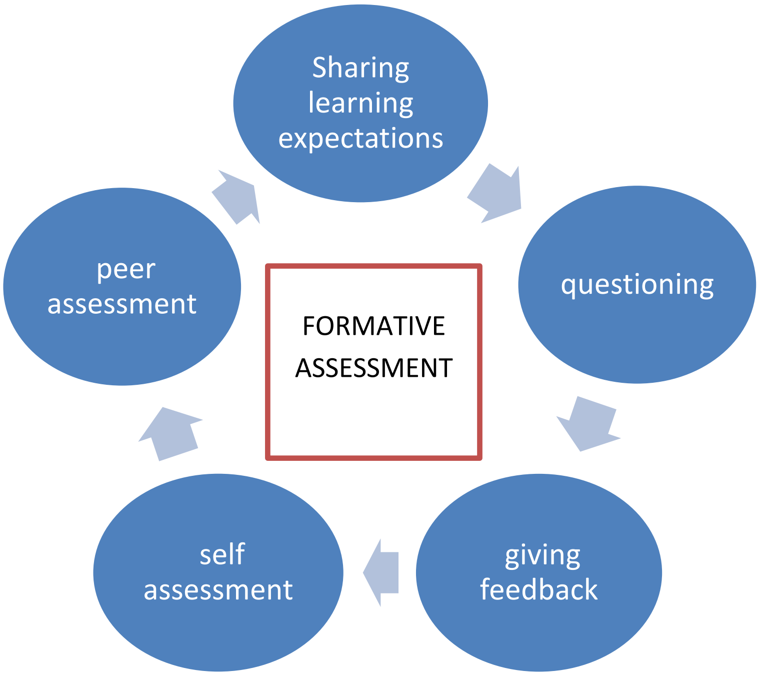
(v)Using evidence and feedback to move learning forward by adjusting learning strategies, goals, or next instructional steps

Most strategies mentioned by the authors emphasized the teachers' role as guides, instructors and facilitators. This research also emphasized five strategies to encourage teachers' implementation of formative assessment such as rich-questioning, comment- marking, sharing criteria with learners, and student peer-and self-assessment. These five strategies were once more emphasized in Black and Wiliam's work (2009), in which they also established three key processes in learning and teaching (establishing where the learners are in their learning, establishing where they are going, establishing what needs to be done to get them there). Four main themes in their framework are specified: teachers, learners, and the subject discipline; the teacher's role and the regulation of learning; feedback and the student-teacher interaction discussed in terms of levels of feedback, the fine-grain of feedback and differentiation; and the student's role in learning. It remains to clarify the meaning of 'instruction', and focus on making decisions on assessment, which should be better or better, founded (Black & Wiliam, 2009). Most research discussed three key factors in learning and teaching: establishing where the learners are in their learning; establishing where they are going; and establishing what needs to be done to get them there(Black & Wiliam, 2009).

The model used in this research is adapted from the factors suggested in studies by Black and Wiliam (1998, 2003, 2005, and 2009), Leahy and others (2005), Wiliam, and Thompson (2007), which concentrates on five main elements involving the role of lecturers, peers and individual students (Figure 7).

The model of five factors in formative assessment has been developed and applied widely including sharing learning expectations, questioning, giving feedback, self-assessment and peer assessment(figure7) (Black & Wiliam, 2009).

Figure 7: Formative assessment strategies tested in the research



Centralized in these five factors, other research has supplemented, added or subtracted other elements such as learning progressions, learning goals or targets, descriptive feedback, self- and peer assessment and collaboration (Ruland, 2011), in which 'questioning' has been removed and placed by 'learning progression' and 'collaboration'. In testimony, McManus, (2009) as critical features of effective formative assessment has identified the following attributes:

- **Learning Progressions**

  Learning progressions should clearly articulate the sub-goals of the ultimate learning goal

- **Learning Goals and Criteria for Success**

  Learning goals and criteria for success should be clearly identified and communicated to students

- **Evidence of Learning**

Formative assessment should not be viewed as an additional burden on the teacher but as a replacement for summative assessment, which may be unnecessary, particularly if the purpose of it is to provide feedback to the student (Jenkins, 2010). The point lies in elicitation of various types of evidence relating to students' achievement, teachers' perspectives, classroom practices or any difference in the culture of those classrooms (Bennett, 2011; Torrence 1993). Evidence of learning is elicited during instruction.

• Descriptive Feedback

Students should be provided with evidence-based feedback that is linked to the intended instructional outcomes and criteria for success

• Self- and Peer-Assessment

Both self-and peer-assessment are important for providing students an opportunity to think meta-cognitively about their learning

• Collaboration

A classroom culture in which teachers and students are partners in learning should be established.

This change makes sense with modern approaches towards the learning journey and collaborative problem-solving skills, which form students' identities (Bagnall, 2015; Le et al., 2018). Students are supported in every activity of studying and receive proper and timely feedback. In sum, Black and William (2009) counted 'questioning' as a factor of formative assessment while Heritage (2010), William (2010) and Ruland (2011), etc. do not consider this factor in formative assessment strategies.

According to Pepper (2013), teachers and learners should share a common understanding of learning outcomes relating to key competences. To internalize this understanding, both learners and teachers need to identify and understand three elements:

(1) The expected learning outcomes;
(2) Their present position in relation to those outcomes; and
(3) How they could close this gap.

Other researchers have discussed different strategies of formative assessment based on its various definitions. Most focus on the **teacher's pedagogies, feedback, self-assessment and peer assessment**.

The empirical study on self-evaluation strategies in math conducted by Ramdass and Zimmerman (2008), demonstrated that accurate self-reflection leads to enhanced students' academic achievement in math and more importantly, teachers carefully monitor improved self-regulatory skills, provided students' self-efficacy judgments. Pellegrino and Hilton (2012) notice that the feedback students receive is often neither timely nor informative, and due to this, students keep practicing tasks incorrectly. To mitigate these concerns, teachers are encouraged to give explanatory feedback to their pupils. Feedback could take the form of a dialogue, which 'should be thoughtful, reflective, focused to evoke and explore understanding, and conducted so that all pupils have an opportunity to think and to express their ideas'(Black and Wiliam, 1998a, p. 8). The authors also note that the means of class tests or exercises are important to track progress, but they should be frequent and short rather than infrequent and long. This provides an opportunity for teachers to give feedback in the middle of the learning process. Providing timely and clear feedback is highly important to help students learn. This represents an even more important element for those students that tend to fall behind their peers and lack the self-esteem to boost their skills (Black and William, 1998a).

Bonn (2014) showed that peer assessment practices could be effectively applied in primary school writing. The author discovered that pupils are able to give appropriate feedback if following conditions are met:-

If it is task involving and useful; if there is sufficient time given for them to act on it and discuss it with their peers; and if they are asked to reflect on how it has been used to improve the quality of the assessed work. Although the findings presented above show the strong potential of self and peer assessment, research focused on the school level reveals that the practical implementation of these methods could be challenging (Boon, 2014; Borghouts et al., 2016; Van den Berg et al., 2016). The literature also suggests that social processes, such as social loafing (failing to participate), free rider effects (having the work of others accepted as one's own), diffusion of responsibility, and interaction disabilities (Salomon andGloberson, 1989; Tchibozo, 2011), might influence peer assessment. This might result in a weakening of the reliability and validity of peer assessments: 'peer assessments can be partly determined by friendship bonds, enmity, or other power processes, the popularity of individuals, perception of criticism as socially uncomfortable, or even collusion to submit average scores, leading to lack of differentiation'(Topping, 2009). Wu et al. (2017) showed that adaptive tests are sensitive enough to provide information about an individual's ability, change processes and mediation strategies. In their research, they controlled three groups of 5thgrade students, who received:

(1) The adaptive dynamic assessment with individualized instruction;

(2) Individualized instruction without adaptive dynamic assessment; and

(3) Traditional classroom remedial instruction;

Those students who were assessed using adaptive dynamic assessment performed better than other pupils did, and those who received the individualized instruction (integrated in the ICT test) performed even better. As do all methods, CATs have their limitations. One of the main limitations of CAT is the demand for a high number of test questions, which increases development costs (Looney, 2011b). Another limitation is the lack of comparison of results between students; since tests are individualized and adapted to each student's responses (Ibid.). According to McLaren (2012), the use of e-portfolios for providing feedback to pupils brings positive results in supporting learning, teaching and assessment, and that it brings useful evidence for diagnostic and formative assessment purposes. Broadfoot and others (1999) cited five factors promoted by the Assessment Reform Group (from United Kingdom) which are needed in using assessment results in moving .These factors include:

(1) Providing effective feedback to students;

(2) Actively involving students in their own learning;

(3) Adjusting teaching to take into account the assessment results;

(4) Recognizing the profound influence assessment has on students' motivation and self-esteem, both of which are crucial influences on learning;

(5) Needing students to be able to assess themselves and understand how to improve. This model has focused on the role of both lecturers and students in their responsibilities in teaching, learning and assessment.

2.2.3.5 Challenges associated with implementation of formative assessment methods in the classroom.

Table 13: Challenges in implementing formative assessment in the classroom

Defining assessment	Some authors see all classroom assessment as formative and discuss summative assessments primarily in terms of external assessments. Some authors agree all classroom assessment can be formative, but only if students use the assessment information for formative purposes (Brookhart, 2001; Bennett, 2011). Furthermore, while the term 'formative assessment' has gathered much attention, the underlying theory is often forgotten, and is frequently reduced to a series of mechanical steps or tests that poorly resemble

	what formative assessment is ultimately about (Shepard, 2005).
Effectiveness	The quality of formative assessment depends on the strategies teachers use to elicit evidence of student learning related to goals, with the appropriate level of detail to shape subsequent instruction (Heritage, 2010; Herman et al., 2010). However, evidence shows that in some contexts teachers still tend to develop only superficial questions to probe student learning, and provide only general feedback. Teachers may have difficulty in interpreting student responses or in formulating next steps for instruction (Herman et al., 2010; Florez and Sammons, 2013).Furthermore, one of the challenges for implementing formative assessment methods, where students are the main assessors, is that many students are not self-regulated enough to do it well, which in turn can lead to inaccuracy (Brown et al., 2015)
Measurement	Educational measurement usually involves four activities: designing opportunities to gather evidence, collecting evidence, interpreting it, and acting on interpretations. Bennett (2011) argues that the literature on formative assessment pays scant attention to the interpretation of observations, which represents inferential process in this case. Formative inferences are often subject to uncertainty and subjectivity, related to perceptions associated with gender, race, ethnicity, disability, etc., and therefore can be biased depending on the teacher implementing it (Bennett, 2011).
Teacher preparedness	While many teachers agree that formative assessment methods are an important element of high quality teaching, there can be many structural barriers to integrating formative assessment into their teaching practice on a constant basis. This includes large classes, extensive curriculum requirements, and a lack of effective teacher education programs to support teachers' capacity and professionalism in formation assessment (Looney, 2011, Florez and Sammons, 2013).Furthermore, many teachers feel that they lack sufficient preparation to effectively put into practice assessment methods that they have acquired at the ITE level, in particular regarding formative assessment (Stiggins, 2005)
Coherence with the overall system	The effectiveness of formative assessment is limited by the nature of the larger system in which it is embedded and, particularly, by the content, format, and design of the accountability systems and the role of summative assessments (Bennett and Gitomer, 2009; Baird et al., 2014)

If these limitations are addressed, formative assessment has greater potential in supporting the development of key competences, especially the ones that are not easily measurable by traditional assessment practices. Teachers' feedback, and peer-and self-assessment, are better able to support 'deep-learning' (Crooks, 1988), promoting active interaction and continuity of learning experiences (Dixson and Worrell, 2016), and therefore, in nurturing transversal skills such as critical thinking and learning to learn (Pepper, 2013; Sargent, 2014). Moreover, since formative assessment happens during the process of learning, it has more potential to assess dispositions that can only be demonstrated in action, and therefore, be set in a meaningful context (Hipkins, 2007). However, when designing classroom assessment practices, one needs to take into account the existing challenges for implementing formative assessment, as summarized in Table 13 above, and to ensure that there are clear assessment criteria and guidelines for teachers and students engaging in peer-and self-assessment. Formative assessments thus, emphasize in-depth questioning and extended dialogues, self and peer-assessment, as well as feedback and guidance on improvement.

2.2.3. 6 Characteristics of formative assessments

Dixson and Worrell (2016) present the following characteristics:

Purpose: Improve teaching and learning; diagnose students' difficulties; and promote understanding of learning goals and criteria.

Time: Ongoing, before and during instruction.

Main actor: Done by both teachers and students. What is working? What needs to be improved? How can it be improved?

Examples: Observations, homework, feedback sessions, peer tutoring, self-assessment, questions and answers sessions, etc.

Cizek (2010) equally has synthesized current formulations into ten characteristics:

1. Requires students to take responsibility for their own learning;
2. Communicates clear, specific learning goals;
3. Focuses on goals that represent valuable educational outcomes with applicability beyond the learning context;
4. Identifies the student's current knowledge or skills and the necessary steps for reaching the desired goals;

5. Requires developments of plans for attaining desired goals;
6. Encourages students to self-monitor progress towards the learning goals;
7. Provides examples of learning goals including, when relevant, the specific grading criteria or rubrics that will be used to evaluate the student's work;
8. Provides frequent assessment, including peer and student self-assessment and assessment embedded within learning activities;
9. Includes feedback that is non-evaluative, specific, timely and related to learning goals and provides opportunities for the student to revise and improve work products and deepen understandings; and
10. Promotes metacognition and reflection by students on their work Source:Baird et al.(2014).

2.2.3.7 The role of feedback in formative assessment

The classroom process is much more complex and convoluted and is much more to do with who has decision-making power over whom and who decides what is right and wrong: in a social constructivist model of learning, negotiation of meaning, understanding and action would seem appropriate. Formative assessment is a valuable tool that enables instructors to provide immediate and ongoing feedback to improve student teaching (Shute, 2008). According to, Wiggins and McTighe (2007), formative assessment occurs during instruction, as part of instruction rather than a separate activity. Sadler (1989) refers formative assessment as a focus on **product assessment** (Wiliam 2000 p.15, Black 2003c p.2**,** Black et al 2003 p15, p.121). Sadler's article effectively describes and discusses formative assessment, of which formative feedback is an integral part and which takes place when the assessment has been completed: the tutor or the learner can carry out the assessment, but the learner must use the feedback. It follows, that, to understand the feedback, learners must also understand the difference between the initial assessment and what is required therefore, and learners need to be part of the assessment process. Even within Black et al 2003 there are two different processes of assessment offered which do not integrate or support each other.

"Such assessment becomes formative assessment when the evidence is used to adapt the teaching work to meet learning needs" (Black et al 2003 p2). They continue that formative assessment can cover different methods and different ways of using the feedback and that this can occur many times within one lesson: "It has to be within the control of the individual teacher and, for this reason; change in formative assessment practice is an integral and intimate part of a teacher's daily work" (ibid p2). Successful formative assessment consists of a sequence of two actions: the recognition by the learner of a gap between his or her current state and the desired goal, and, importantly, the action taken by him or her to close that gap (Black and Wiliam, 1998a). In this sequence, the teacher has a key role in interpreting the gap and communicating a message about it to the student, based on assessment information. In the context of formative assessment methods, students may use descriptive information (at an adequate time in the learning process) to make productive decisions about their own learning (Ibid.). Formative assessment can allow students to become 'formative decision-makers' (Brookhart, 2011, p. 4).

Covington's work believes no two children come to school with equal academic abilities and backgrounds, and there is no reason that they should not all have access to equally motivational feedback. The trick is to find out what is motivating for each student because teachers influence their learning process. According to Covington (1992), feedback is a message, so its effect is up to the information and the characteristics of teachers and students who send and receive the message. One student may find feedback on how to improve a paper with gratitude, while another might treat it as negative. Feedback plays an important role in assessment. Feedback is thus a keystone in assessment when it is timely (Covic & Jones, 2008; Sadler, 1998). Ramaprasad (1983, p. 4) defines feedback as *"information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way"*. Hattie and Timperley (2007) define feedback as *"information provided by an agent regarding aspects of one's performance or understanding" (p.81).* As cited in USAID-AED (2009)….. *"feedback is in formation, you give to student to let them know about their performance or achievement Feedback is not a simple number or symbol rather good feedback is descriptive of the students' work, is specific to the work and learning out comes and contains help for the student on how to improve. It describes to a student strengths, improvements needed, and way of improving."*

The quality of the feedback is a key feature in any formative assessment process (Black and Wiliam, 1998a), yet the learner also becomes an important factor in the assessment process. Teachers thus have a key role in supporting students to put effort into their learning activities. Feedback on assessments has an important role in determining further learning. Students are influenced by feedback from earlier performance on similar tasks in relation to the effort they invest in further tasks. Teacher feedback that is ego involving rather than task involving can influence the effort students put into further learning and their orientation towards performance rather than learning goals.

Teachers can maximize the effectiveness of feedback by giving it online to facilitate rapid feedback (Yorke, 2003). Take note Tomlinson (2014) described feedback as *"an ongoing exchange between a teacher and his or her students designed to grow as vigorously as possible and to help teachers contribute to that growth as fully as possible"* (p.11). In contrast, it is likely to have limited effect if feedback is given to students without requiring them to actively interact with it (Rust, 2002). Feedback provided using 'track changes' or 'insert comments' was highly memorable, with one student in a study quoting almost verbatim the wording of some comments (Crossouard & Pryor, 2009).

2.2.3.7.1 Types of feedback

The State of New South Wales, Department of Education and Communities, 2015 outlined the various types of feedback as indicated below;

I. Oral and written feedback

Oral feedback

Oral feedback usually occurs during a task. It is sometimes under estimated because it is less formal, but it can be a very powerful and effective tool as it can be provided easily in the 'teachable moment' and in a timely way.

Asking "What do you notice about ______?" or "How does this match the criteria?" stimulates students' thinking about their learning.

Written feedback

Written feedback tends to be given after a task.

Effective written feedback provides students with a record of what they are doing well, what needs improvement and suggested next steps. Students and teacher might use a log to monitor whether and how well the student has acted on the feedback.

Written feedback needs to be:

•timely so that it is paired as closely as possible with the event;

•written in a manner that is understandable for the student;

•action able so that the student can make revisions;

Written feedback needs to include:

•where the student has met the learning intentions and/or success criteria;

•where the student still needs to improve;

•a way to think through the answer for themselves;

II. Feedback during and after learning

Feedback during learning

Feedback during learning allows students to take feedback on board immediately and to try to realize improvement during the learning process. This is often more effective and productive to the learning experience than end-of task feedback measures (usually summative), which require students to remember the feedback and apply the recommended strategies to a future task.

Feedback after learning

Too often, for students to improve their work feedback is provided to students after learning. This often results in teachers making the same comments repeatedly and wondering why the student has not transferred the information to another context. For such feedback to influence subsequent learning, students must remember it, translate it into advice that is transferable across tasks, and apply it the next time they encounter a task in which this learning could apply. Generally, while strong students can often do this, struggling students find it more difficult.

Feedback during and after learning should:

•focus on what is being learnt (learning intention) and how students should go about it (success criteria)

•provide information on how and why the student has or has not met the criteria

•provide strategies to help the student to improve.

III. Evaluative feedback and descriptive feedback

Evaluative feedback

Evaluative feedback, in the form of grades or brief general comments, (e.g. "well done"), provides some information about learning, but does not convey the information and guidance that students can use to improve.

It can make the good students feel better (and at times complacent) and the less able students feel worse (and more certain that they will never be able to succeed).

In attempting to create a positive climate for learning, many teachers increase the level of praise that they give during feedback sessions.

Research shows, however, that praise needs to be realistic if the feedback is to be more meaningful. Regular, excessive praise often does more harm than good, leading to delusion or even frustration and resentment. To be effective, praise needs to confirm a child's own sense of reality.

The impact of feedback on learning achievement has been found to be low when it is focused on praise, rewards and punishment (Hattie & Timperley, 2007).

IV. Descriptive feedback

Effective feedback provides students with detailed, specific information about improving their learning.

This descriptive feedback is:

•linked to the learning that is expected (Where am I going?)

•addresses faulty interpretations and lack of understanding (How am I going?)

•provides students with visible and manageable 'next steps' based on an assessment of the work at hand and an image of what 'good work looks like' so that they can begin to take on the responsibility of self-assessing and self-correcting. (Earl, 2003). (What do I need to do to improve and how do I do it?)**.**

An example of descriptive feedback:

That's a good introduction because you have covered the main points we discussed at the beginning. Now … which points do you think you should expand on?

V. Informal feedback and formal feedback

Informal feedback

'Check-ins' are vitally important to providing effective feedback.

'Check-ins' occur when the teacher visits students as they are engaged in a task to make sure they are on the right track. 'Check-ins' can quickly and effectively steer students in the right direction or enhance learning.

'Check ins' can also occur when students approach the teacher to seek feedback. For longer projects, these could be determined in advance with allocated times for students to 'check in'.

VI. Formal feedback

Formal feedback can be provided through structured conferences with specific goals.

Teachers can meet with a few students a day or a week depending on specific projects, deadlines, and individual student needs.

It is important to set up these conferences in a structured way with a focus on individualized goals so both teacher and student make good use of their time.

Hints for student-teacher conferences:

•Look at student work beforehand

•Use a checklist or feedback form that students can use as a reference for making revisions

•Focus on two to three items that need work and show how to improve them

•Make time for the student to ask questions and give input.

When teachers use formal conferencing along with informal feedback, students are better protected from failure and set up for success.

VII. Peer feedback and self-feedback (reflection/evaluation)

Peer feedback

The use of structured peer conferences can provide students with the opportunity to give and receive feedback about ongoing work, especially when the focus is on improvement rather than grading. A positive aspect of the peer feedback process is that students get to see other students' work that can also deepen understanding of the learning goals. Left to their own devices to give feedback many students will use the time to chat, criticize the other students' work or get nothing done.

Teachers need to:

•model and role-play how to give feedback in a constructive way

•explicitly teach students how to provide effective feedback to each other

•hold students accountable for the comments, suggestions and feedback they give one another

•use scaffolds like peer feedback forms, which can be checked by the teacher to provide more structure to peer conferences. This also keeps students focused on giving the right kinds of feedback and lets them know what the expectations are for peer conferences.

Once students have had time to practice, know what the requirements are, and are aware of expectations, peer conferences can be an integral part of the feedback process. As with teacher feedback, peers can offer suggestions and comments on:

•what has been done well in relation to the learning intention/success criteria

•what still needs to be done in order to achieve the learning intention/success criteria
•how to achieve that improvement.

Self-feedback (reflection/evaluation)

This is the ultimate goal of feedback for learning.

During the provision of feedback, teachers have the opportunity not only to provide direction for the students, but also to teach them, through explicit modelling and instruction, the skills of self-assessment and goal setting, leading them to become more independent.

To help students reach autonomy teachers can:

- explicitly identify, share, and clarify learning goals and success criteria
- model the application of criteria using samples
- provide guided opportunities for self-feedback
- teach students how to use feedback to determine next steps and set goals
- Allow time for self-feedback/reflection.

2.2.3.7.2 Benefits of Using Formative Feedback

Indeed, Harper and Kuh (2007) noted that qualitative means of assessment can often bring to light issues that cannot emerge through conventional quantitative means. For this reason, qualitative feedback from students is primarily conducted, evaluated and used for formative, rather than summative, purposes (Franklin, 2001; Lewis, 2001). Abrami (2001) argued that qualitative measures should not be introduced into the summative evaluation of teaching because their reliability and validity cannot be easily assessed; Harper and Kuh (2007) argued that this concern, while not inaccurate, is not germane to the way qualitative information can and should be used in summative assessment. Inclusions of qualitative sources also indicate the value of collecting such feedback.

For Instructors:

1. Makes learning barriers visible to the instructor
2. Provides evidence of students current level of performance
3. Allows the instructor to adjust their level of instruction to fit with the students’ current level of learning

For Students (based on Nicol and McFarlane-Dick, 2006):

1. Provides students with the tools to take control of their own learning, i.e., become self-regulated learners
2. Enables students to be actively involved in monitoring and regulating their own performance
3. Can reduce uncertainty about their performance and can help correct misconceptions or inappropriate task strategies
4. Leads to higher motivation and more efficient task strategies

2.2.3.7.3 Characteristics of Effective Feedback on Written Work

McGarrell and Verbeem (2007) provided a summary of effective feedback characteristics to consider when providing feedback on written work and drafts:

Ask Probing Questions

By asking probing questions about key areas of their assignment/essay, instructors can encourage students to think more deeply about their work e.g. what do you mean by X?

Make it Personal

Personalized feedback is more likely to motivate meaningful revision.

Avoid Evaluative Statements

Be clear. Avoid using statements such as “good” or “interesting”. These statements will be confusing for students and they will not understand why that part of the essay was good but another part was not. Should you decide to use these statements be sure to explain why you are offering praise (or criticism).

2.2.3.8 Technical Quality of formative assessment

(Validity, Reliability and Equity of Assessments)

In addition to instructional and practical considerations, the overall technical quality of assessment practices is crucial. Technical quality refers to factors such as whether the assessment measures what its developers claim it measures, and whether it provides consistent and meaningful results across students, tasks, and versions (Soland et al., 2013).This is covered by three criteria: validity, reliability and equity.

Validity

In education assessment, validity is a central concept as it provides an overarching criterion for the quality of assessment strategies (Pepper, 2013). Validity is often described as ‘a judgement of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences and actions based on test scores or other modes of assessment' (Messick,1989, p. 13). Assessment designed for formative purposes would emphasize overall validity, assessing more performances in a wider range of contexts (Pepper, 2013). It is, therefore, the foremost technical consideration for any assessment, including the assessment of key competences. Much of the literature on the validity of educational assessments has tended to focus on assessments designed for large-scale and often high-stakes purposes in the context of educational policy. Only in the last decade have there been more attempts to discuss assessments intended to function much closer to classroom teaching and learning, including the design and validation of such assessments (Pellegrino et al., 2016). Irrespective of the level at which an assessment is intended to function, or of the framing of the assessment activities in terms of theories and models of learning and knowing, issues of validity remain paramount. Pellegrino et al. (2016) argue that three components of **cognitive, instructional, and inferential validity** need to be considered, regardless of the assessment's intended purpose and/or level of functioning relative to ongoing processes of teaching and learning.

In competence based approach, assessments must go through a validation process to ensure each assessment truly measures the competency (set of skills) it is designed to measure. Therefore, any measure of quality in a competency-based program must include evaluation of the validity evidence established for the program's assessments. Quality measures should focus on establishing levels of validity greater than simply demonstrating face validity of the assessment. Competency assessments should be subjected to a rigorous, research-based protocol to establish validity and ensure quality.

Standards for Educational and Psychological Testing (2014) described validity elements that are:

1. Clearly define the competencies;
2. Provide an explicit link between the skills measured by the assessments and those competencies;
3. Demonstrate that student behaviors or thought processes during testing reflect the competencies;
4. Relate performance on competency assessments with other measures of the same competencies; and

5. Document the empirical relationship between assessment scores and future outcomes (such as success in the workplace or attainment of a more advanced competency).

Validity has to do with the extent to which the interpretation of a student's performance and the actions based on it are appropriate and justified (Messick, 1989). Are the decisions made based on students' performance suitable and accurate? Fairness requires that validity does not change from one student group to another (Pellegrino et al., 2001). Competency-based programs should first establish content validity – answering the question, "Does the content of the performance assessment represent knowledge and skills relevant to the competency it claims to measure?"

One of the most common ways to establish content validity is to seek validation of the rubric through the opinions of external experts in the field (Jonsson & Svingby, 2007).

That means that,

(1) The test must fully measure the competency,

(2) The processes students use to complete the assessment tasks must be an authentic reflection of the competency, and

(3) Students would receive the same test results if they were to take a different form of the test scored by different raters.
These ideas correspond with validity evidence based on test content, response processes, and internal structure, respectively. According to the Standards, validity evidence can come from five sources:
(1) Test content, (2) response processes, (3) internal test structure, (4) relations to other variables, and (5) test consequences.
The first three sources of evidence generally reflect the test instrument itself, each will be briefly described in the following paragraphs.

Evidence Based on Test Content. Once program designers have clearly defined relevant competencies, they should collect evidence that their test content fully reflects those competencies. Specifically, providing validity evidence based on test content means showing the relationships between test questions or tasks and the defined competencies. Test developers must consider how well the breadth and depth of their test relates to defined competencies.

Evidence Based on Response Processes. Students' response processes—that is, the thoughts, behaviors, and actions required of a student to complete an assessment—are another source of validity evidence, usually gathered during initial test development.

Evidence Based on Internal Structure. A third type of validity evidence is based on the internal structure of the assessment—that is, how the assessment items or tasks relate to each other. Katie L .McClarty and Matthew N. Gaertner(2015 p.7)

Whereas the two others rely on data external to the assessment, although not all sources of validity evidence may be present for every assessment, programs can make a strong validity argument by integrating evidence from multiple sources. For example, it is important to show that a competency-based assessment does test the knowledge and skills associated with the specified competency (evidence based on test content). It is just as important, however, to show that students who score higher on the assessment also do well on other tasks, such as job performance, that require that competency (evidence based on relations to other variables).

Validity Associated with External Evidence.

While we just outlined three sources of validity related to the test itself—test content, response processes, and internal structure—this section describes sources based on external evidence. External-validity evidence is critical to supporting the claims that CBE programs can make about the relationship between their measures of competence and workplace success, and about comparability of graduates from CBE and non-CBE programs.

Concurrent Validity Evidence

Validity evidence based on relationships with other variables can come at two points. First, educators could compare assessment results with other measures collected concurrently.

Predictive Validity Evidence

In addition to concurrent validity evidence, predictive validity evidence is critical when assessment scores will be used to predict a future outcome.

Reliability

Reliability is '...often defined as, and measured by, the extent to which the assessment, if repeated, would give the same result' (Harlen, 2007, p. 18). In practice, though, assessments can find a balance between reliability and overall validity according to the assessment purpose. Accordingly, assessments designed for summative purposes would emphasize reliability, assessing a limited number of performances and range of the curriculum. Although validity and reliability are often seen as being in tension with one other, reliability is in fact one aspect of the broad concept of validity. For example, a test can be made more reliable by limiting its question types and response formats, making it more straightforward and easy to interpret. However, such a test would provide a narrow picture of the key competences needed for lifelong learning, undermining its overall validity. Alternatively, day-to-day teachers' feedback and peer- assessment can provide a broader picture of learners' competences and skills. However, if the formative assessment is subject to biased judgment (e.g., teachers or peers' preferential attitudes), this may compromise the reliability of assessment, as the interpretation and weighting of observations would differ (Pepper, 2013).

Competency assessments must clearly define outcomes of student performance to allow programs to make one of only two judgements – either the student is competent or not yet competent (Singapore Workforce Development Agency, 2012). The most common way to demonstrate validity evidence based on internal structure is through reliability. There are different ways to measure different types of reliability, including test-retest (where students take the same test form on different occasions), internal consistency (which measures the extent to which students respond similarly to items within a single test form), and inter-rater reliability (where two or more raters evaluate the same student performance on a test). Students should receive approximately the same score if they take a test multiple times, regardless of the test form administered or the raters scoring it. Using Cron-bach's alpha (a reliability statistic that ranges from 0 to 1.0) as a measure of internal consistency, for example, values above 0.80 are considered acceptable, although most standardized tests typically have values above 0.90. Robert F. DeVellis(1991).

Equity

Some authors argue that equity should be the third crucial feature of assessment (see e.g.,Binkeley et al., 2010; Kirova and Hennig, 2013). While ensuring equity, assessment often involves striking a balance between validity and reliability, and a variety of assessment approaches, in terms of design and functions (Looney and Michel, 2014). It is important that assessments allow all students to demonstrate what they know and can do without being unfairly disadvantaged by individual characteristics that are irrelevant to what is being assessed (Binkley et al., 2010). Equity emphasizes the social nature of assessment and highlights the need to consider differences that, while not the focus of an assessment could nevertheless influence the assessment. For example, assessments can be developed or modified to ensure that when a learners' disability is not relevant, it is not assessed. While there is research to show that learners with diverse needs are often recognized to be taking multiple and different pathways in their learning, less research focuses on the diversity of assessment practices used to measure, support and facilitate these students' learning (Bourke and Mentis, 2014). Bourke and Mentis (2014) highlight the importance of using an integrated assessment framework to accommodate the needs of diverse learners. Kirova and Hennig (2013) also emphasize the need for assessment practices to be linked to a socio-cultural theory of learning, and acknowledge that there are diverse ways of knowing and validating this variety. Assessment, if not done with equity in mind, privileges and validates certain types of learning and evidence of learning over others, can hinder the validation of multiple means of knowledge demonstration, and can reinforce the feeling of alienation and lack of sense of belonging within students (Montenegro and Jankowski, 2017).

In addition to these three criteria, the literature also highlights transparency, referring to the extent to which all participants –teachers/trainers, learners, assessors, parents, administrators and end-users -know and understand what is required in the assessment. Additionally, freedom from bias and usability refers to how policy makers, school leaders, teachers, parents and students make sense of and respond to the assessment results (OECD, 2013)

2.2.4 Continuous assessment (CA)

2.2.4.1 Definition of continuous assessment

Continuous assessment can be seen as a simple combination of two words *"continuous"* and *"assessment"*. The Longman Dictionary of the Contemporary English (2000) defines continuous assessment as *"continuing without interruption, unbroken"*. Assessment as the noun form of assess means *"the value or amount at which something is calculated, a judgment or opinion"*. A combination of the two words will then mean a connected unbroken process of assessing a learner up to a particular point in time. Oxford Advanced Learner's Dictionary (7thEdition) defined continuous assessment as a system of giving a student a final mark/grade based on work done during a course rather than on one examination. Equally, many educationists have defined continuous assessment in different ways based on their point of emphasis. Asabe (2007 cited in Abiy, 2013) defines CA as a classroom process that is integrated with instruction. Similarly, Falayalo (1986) and Juliet (2007), view it as an integral part of instruction, considers it as a mechanism whereby the final grading of learners on the cognitive, affective, and psychomotor domains of learning is made(cited in Abiy, 2013). It is likewise, Alade (2011) defines continuous assessment as a mechanism where by the final grading of students' cognitive, affective and psychomotor domains of behavior takes in consideration student's performance during the systematic and objective process with a view of using them to help the student. Nitko (2004), on the other hand, described it as an information-gathering tool that helps teachers select content and method of instruction. According to Nitko (2004), Continuous Assessment (CA)is an ongoing process of gathering and interpreting information about student learning that is used in making decisions about what to teach and how well students have learned (p.4). Yoloye (1991) also pointed out that continuous assessment is only a part of the field of educational evaluation. He further argues that continuous assessment is "a method of evaluating the progress and achievement of students in educational institutions" (Yoloye 1999). However, to Kellaghan and Greany (2003), that kind of assessment is subjective, informal, immediate, ongoing, and intuitive as it interacts with learning as it occurs. Continuous assessment would be graded tasks or activities (written assignments, tests, short oral presentations or similar) distributed throughout the course module and providing the opportunity for feedback, etc. In other contexts, this kind of assessment is also referred to as coursework; curriculum integrated assessment, or embedded assessment Bjaelde, O.E et al (2018 p.3).

Another definition by Airasian(1991) described CA as an assessment approach which should depict the full range of sources and methods teachers use to gather, interpret and synthesize information about learners. Continuous assessment can be regards as a method of ascertaining what a student gains from schooling in terms of knowledge, industry and character development, taking into account all his/her performances in tests, assignments, projects and other educational activities during a given period of term, year, or during the entire period of an educational level (Onuka, 2005, 2006). It is also a method of using the recorded performances of each pupil to help him or her improve on his or her achievement through guidance. According to Faleya (1986), continuous assessment is the periodic and systematic method of assessing and evaluating a person's attributes. Information collected from continuous assessment of students will help to understand better their strength and weaknesses in addition to providing a comprehensive picture of each student over a period. Broadly, Continuous assessment is a form of educational examination that evaluates a student's progress through out a prescribed course. It is often used as an alternative to the final examination system. Anyor and Abah (2014) viewed continuous assessment as a learning performance related to a course module and that is separated from examinations and accompanied by regular feedback. In mathematics, Continuous assessment can take various forms depending on the final objectives. Examples include observation of skills and attitudes, insight into a theoretical concept and so on. This can take place within various types of contact moments such as practical, workshops, lessons, placements, project cases etc. The National Policy on Education therefore has the characteristics of combining continuous assessments scores obtained as a result of internal assessment to determine the overall performances of each student. The combined score which is known, as the weighted score is believed to give the true ability and capacity for further studies of each student hence, given the opportunity for correct decision making such as certification and placement of students and for the prediction of their future performance. Alayafi (2017) and Anyor and Abah (2014) outlined the following tools in conducting continuous assessment:

1. Knowledge Surveys: These consists series of questions that cover the full content of a course. The survey evaluates the content master at all levels, from basic knowledge to higher levels of thinking. It serves as both formative and summative assessment tools.

2. Concept Tests: A concept test is constructed as a resource for science, technology and mathematics instructors to emphasize deeper levels of learning and to give valuable feedback during a learning course.

3. Mapping: A concept map is a diagram of nodes, joined by directional lines and organize in hierarchical levels that move from general to specific concepts. Concept maps are used to access how well students see the pictures.

4. Diagnostic Test: They access students understanding using multiple-choice test or short answer format that has been designed to address misconceptions.

5. Interviews: Interviews enable Instructors the extent of understanding students have developed with respect to series of well-focused conceptual related scientific ideals.

6.Mathematical Thinking: These are designed to promote and access thinking skills in Mathematics by checking results and correcting mistakes, making plausible estimates of quantities which are not known, modeling and defining new concepts, judging statements and creating proofs and organizing unsorted data as well as drawing conclusions.

7. Minute Paper: Minute paper provides real time feedback from a class to find out if students recognize the main points of a class session. It is a concise note taking one minute and written by student that focuses on a short question presented by the instructor to the class.

8. Multiple Choice Tests: This flexible assessment choice format can be used to measure knowledge skills, abilities, values and thinking.

9. Performance Assessment: it is designed to judge students using specific knowledge and research skills, which require manipulation of an equipment to solve a problem or to make an analysis. Others include portfolio, scoring rubrics, and weekly reports and so on. From these definitions, one could infer that Continuous Assessment is an assessment approach, which involves a use of variety of instruments, assessing various components of learning, not only the thinking process but also including behavior, personality traits and dexterity. Continuous assessment will also take place over a long period. Such approach would be more holistic, representing the learner in his/her entirety. Continuous assessment will however, not be successful without the dutiful commitment, diligence and sacrifice on the part of teachers (Airasian, 1991).

2.2.4.2 Purposes of continuous assessment (CA)

The assessment of students is always done with an aim in mind. The results so obtained are used for the purpose they are collected. Teachers use non-moderated teacher assessment for internal purposes and moderated teacher assessment for external purposes. According to, Letsoalo(2000 p.23), Sanok(1996 p.6) writes that there is a myth that the purpose of assessment is to determine which students "have it" and which "do not" and also to assign grades and placements accordingly. She further argues that if we all live in the era where we believe that all students can be successful and can and must learn mathematics, then the traditional assessment practices that sort, rank and stigmatize should be done away with.

Continuous assessment at the primary school can be used purely for formative purposes to enable teachers to focus on supporting all pupils particularly; those who record lower attainments in classrooms to improve. Wiliam (2000) suggests that to enhance pupils' learning, teachers need to find ways to integrate the diagnostic, formative, and summative functions of assessment and not be driven by the evaluative function. A number of studies from the USA have shown some strategies teachers use to foster participation of children with SEN, including lower attainment in mainstream classrooms. The materials reviewed focused on peer-assistance and collaborative problem-solving strategies.

1. Peer-assisted learning strategies

The first study by Fuchs, Fuchs, Mathes, and Simmons (1977) explored the effectiveness of Peer-Assisted Learning Strategies (PALS), a version of Class wide Peer Tutoring. The researchers compared the reading progress of three learner types (low attaining with and without learning difficulties and average-attaining pupils) to corresponding controls. The PALS were conducted during regularly scheduled reading instruction, 35 minutes per day, 3 times per week, for 15 weeks. The teachers paired all pupils by ranking them on reading performance. The top-ranked pupil in the stronger half was paired with the strongest reader in the weaker half. Teachers were advised to determine whether the pupils were socially incompatible. If so, a coupling was changed. Within a pair, the role of tutor and tutee was reciprocal. Pairs remained together for 4 weeks, after which the teacher announced new pairings.

According to Fuchs et al. (1977), the pupils engaged in three strategic reading activities: collaborate reading with retell, paragraph summary and prediction relay. In addition to assigning pupils to pairs, teachers assigned pairs to one of two teams, to give PALS a competitive and co-operative dimension. Pupils earned points by reading without errors, working hard, behaving co-operatively, identifying correct subjects, making reasonable predictions and checking predictions. Points were awarded by tutors and teachers then recorded on scorecards.

At the end of the week, the teacher summed up the teams' points and announced the winner. Members of the winning team stood and applauded by the second-place team. After 4 weeks, new team assignments were made. Teachers used whatever reading materials they believed were appropriate, the program did not require teachers to acquire, develop, or modify materials. The No-PALS teachers conducted reading instruction in their typical fashion. They were told that the purpose of the study was to examine how teachers accommodate pupil diversity; they were not informed that they were a control group. Fuchs et al. (1977) reported that pupils with disabilities, lower performing and average attainders in peer-assisted learning strategies (PALS) classrooms made significantly greater progress than their counterparts in No-PALS classrooms across the three reading measures. Teachers believed PALS positively affected lower performing (LP), learning disabled (LD) and average achiever (AA) pupils' reading attainment and social skills (although they seemed to view PALS as benefiting LD and LP children more than AA pupils). All peer-assisted learning strategies pupils expressed a belief that the treatment had helped them to become better readers. This study focused on mainly on reading activity and not written tasks. As argued in previous sections, in spite of cultural and contextual differences, Cameroon can adapt PALS to enable pupils who record lower attainments to receive assistance from their more capable peers during classroom activities. The strategy would not require any changes in policy or re-training of teachers.

2. Collaborative problem solving

Furthermore, in another study in the USA, Salisbury, Evans, and Palombaro (1997) found that collaborative problem solving promoted the physical, social and instructional inclusion of pupils with SEN in the mainstream. The perceived outcomes identified by the teachers and project staff from field notes, observations and interview sources of data: pupils develop concern for others, accept and value diversity, empowered to create change, work with others to solve problems, develop meaningful ways to include everyone, foster understanding and friendship. Pupils used perspective talking, advocacy, and creative thinking as well as communications skills to change classroom routines.

Moreover, Stevens and Slavin (1995b) investigated the academic and social outcomes of using co-operative integrated reading and composition (CIRC) program as an approach to mainstream academically handicapped pupils (at least 2 years behind their grade level, for example, learning disabled, educationally mentally handicapped) (op. cit). Experimental teachers used the CIRC program for two years. The CIRC program consists of three main elements: story-related activities, direct instruction incomprehension strategies, and integrated writing and language arts. According to Stevens and Slavin (1995b) the results showed that CIRC can provide a vehicle for effectively mainstreaming academically handicapped pupils into regular education classes (op. cit). After the first year, academically handicapped pupils in CIRC had significantly better attainment on reading vocabulary and reading comprehension than did their counterparts in traditional pullout special education programs. After the second year, the pupils had significantly better performance in reading vocabulary, reading comprehension, and language expression, results that essentially mirror those of all pupils in CIRC. Mainstreamed academically handicapped pupils improved academically and socially (op. cit). Although the CIRC program has the potential to help lower attaining pupils to improve, the lack of computers at basic schools may hamper the introduction of the program in Cameroon.

2.2.4.2.1 Purposes of Continuous assessment (CA) and formative assessment or assessment for learning (AFL)

Wiliam (2000) cited by Weeden et al. (2002) points out that 'very few teachers are able or willing to operate parallel assessment systems, one designed to serve *"summative"* function and one designed to serve a *" formative"* function (p. 20). Black (2003) states that for any assessment to be considered formative assessment the first priority in its design and practice should be to promote pupils' learning, provide information for teachers and their pupils to use as feedback to assess themselves and each other. Thus, in assessment for learning, teachers use assessment as an investigating tool to find out as much as they can about what their students know and can do, and what confusions, preconceptions, or gaps they might have. Therefore, investigation results provide the basis for determining what teachers need to do next to move student learning forward. In this regard, Okas (n.d.:4) contend that assessment for Learning shifts the emphasis from summative to formative assessment, from making judgments to creating descriptions that can be used in the service of the next stage of learning. [Teachers] construct assessment tasks that open a window on what students know and can do already and use the insights that come from the process to design the next steps in observation, worksheets, questioning in class, student-teacher conferences or whatever mechanism is likely to give them information that will be useful for their planning and teaching. Similarly, according to Stiggins (2002) assessment for learning must involve pupils in the process. When teachers assess for learning, they use the classroom assessment process and the continuous flow of information about pupil attainment that it provides in order to advance, not merely check on, student learning. Teachers do this by:

- Understanding and articulating in advance of teaching the attainment targets that their students are to hit;

- Informing their pupils about those learning goals, in terms that pupils understand, from the very beginning of the teaching and learning process;

- Becoming assessment literate and thus able to transform their expectations in to assessment exercises and scoring procedures that accurately reflect pupil attainment;

- Using classroom assessments to build pupils' confidence in them as learners and help them take responsibility for their own learning, so as to lay a foundation for lifelong learning; and

• Actively involving pupils to communicate with their teacher and their families about their attainment status and improvement (p. 4-5).

In the UK, the Assessment Reform Group, the ARG (2002) explains that 'formative assessment' itself is open to a variety of interpretations and often means no more than that assessment is carried out frequently and is planned at the same time as teaching. However, the ARG notes that generally teacher assessment involves only marking and feeding back grades or marks to pupils. Marking is not designed to make comparative judgments among the students but to highlight each students' strengths and weaknesses and provide them with feedback that will further their learning. In reality, it is through classroom assessment that attitudes, skills, knowledge and thinking are fostered, nurtured and accelerated or stifled (Hynes, 1991 cited in Okas, n.d.). According to the ARG (2002), there is abundant evidence from reports of school inspections that the use of assessment to help pupils learn is one of the weakest aspects of classrooms across the UK. Though carried out by teachers such assessment has increasingly been used to sum up learning; it has a summative rather than formative purpose.

With respect to formative assessment, now our days, emphasis of curriculum assessment shifts from summative (assessment of learning) to formative assessment (assessment for learning) to meet the dynamic needs of learners. Formative assessment comes in the form of continuous assessment (CA) and its result can be used to adjust teaching and learning. CA is more likely to be process-oriented, informal, internal, involved learner (McGonigal, 2006). There are many types of continuous assessment such as essays, presentation and class participation, projects/term papers and practical work (e.g. laboratory work, fieldwork, drawing practice). CA acts as a supplement to traditional exams and tests, offering a methodology for measuring students' performance. According to Alausa(2006 p.2), *"this could play a vital role in diagnosing and mediating areas of learners' weakness if properly anchored in what occurs in classrooms".*CA is an approach that captures the full range of learners' performance. Thus, educators and administrators are able to assess learners' progress and would have time to correct the problems encountered by the students and adjusting the teaching and learning process. Similarly, Alausa (200) regarded continuous assessment as guidance-oriented because it gathers data about the teaching/learning over a period and helps modify instruction.

Atondo.G et al (2019 p.25) cites Grounlund (1981) by presenting the following purposes of continuous assessment as applied to education.

1. Appraisal of individual student's achievements;
2. Diagnosis of individual student or an entire class learning difficulties in order to provide helpful information in subsequent teaching;
3. Appraisal of the educational effectiveness of a curriculum instructional materials and procedures as well as organization and administrative arrangement;
4. The assessment of the educational progress of large population will help the public to understand educational problems and needs and to develop sound policy regarding education.

The system of continuous assessment in Cameroon is supposed to serve as a mechanism by which pupils are given feedback on their performance by teachers, while teachers obtain some insights into areas of pupils' learning difficulty early enough for intervention. This formative function of continuous assessment is to be realized through the systematic assessment of pupils throughout the course of the academic year. In Cameroon, both nursery and primary school teachers use continuous assessment for many different purposes. These purposes however, can be categorized into two: formative and summative purposes. The formative purposes of continuous assessment encompass monitoring, diagnosis of difficulties, intervention, and improving teaching. Accordingly:

i- **Monitoring**

Monitoring of pupils' progress is considered as one of the basic activities teachers engage in the continuous assessment process in Cameroon. As shown in the teaching syllabuses, the curriculum teachers have to use oral and written activities to monitor pupils' progress in learning. During classroom tasks, and point out that teachers interact with pupils checking their work, questioning them to clarify points, and explaining points to them. The marking and recording of marks pupils' obtain in exercises, class tests and homework provide teachers with substantial information about pupils' progress in the National Curriculum. For their part, Pollard et al. (2005) explain that teachers use continuous assessment to gather evidence of pupils' responses and adjust the learning program to meet pupils' needs as a course of study or a lesson progresses. As a result, continuous assessment enables teachers to engage more accurately and directly with the development of the learners' thinking and understanding.

ii- Diagnosis of difficulties

With respect to diagnosis, teacher-pupil interactions during classroom activities and marking of exercises, class tests and homework help the Basic education schoolteachers in Cameroon to identify pupils' difficulties for intervention. In line with this Amedahe (2002) suggests that continuous assessment is as a mechanism by which teachers obtain some insights into areas of pupils' learning difficulties, and enables them to adopt strategies to re-dress those difficulties before they become entrenched. In the study among senior secondary school teachers in the Ashanti region of Ghana, Asamoah-Gyimah (2002, p.102) reported that 64% of the senior secondary school teachers (SSS) used continuous assessment to identify students who were experiencing difficulties in their studies in order to "organize remedial instruction for such students to enable them reach the pass level". Although, the study involved SSS teachers as stated earlier the continuous assessment guidelines and format are the same for basic and senior secondary schools.

iii- Intervention

Monitoring, diagnosis and intervention can be viewed as a continuum in teachers' assessment practices in basic schools in Cameroon. Teachers adopt different approaches to address pupils' difficulties. During classroom tasks, such as exercises teachers may use a direct approach, which involves either working with children individually or in small groups. If many children in the class make the same error, the teacher involves the whole class in the intervention process.

In Asamoah-Gyimah's (2002) study, 86% of the SSS teachers reported that they used their students' attainment in continuous assessment to guide individual students.

However, the researcher did not explain what the teachers meant by 'guide student'. In addition, 64% of the respondents reported that they involved their students who did not get the required pass marks in remedial teaching while 36% did not engage their students in any remedial lessons. In this case, a large number of teachers (36%) did not use continuous assessment as formative assessment because they did not use information from their assessment to help the students to improve. The study did not explain why more than a third of the teachers failed to use information from their assessments to help their students to improve.

iv- Evaluating teaching

Additionally, teachers use continuous assessment to evaluate the effectiveness of teaching. Pupils' general performance enabled teachers to know whether the lesson was successful. As

Avoke, Hayford and Ocloo (1999) point out there is a column in the teacher's notebook for them to write remarks about lessons taught. In this column, teachers are expected to provide their objective assessment of lessons, based on pupils' learning and attainments.

In line with this, Asamoah-Gyimah (2002) suggests that continuous assessment enables teachers to review their own performance and effectiveness in getting their messages across to their students in the most efficient manner. Further, 68% of the SSS teachers in the study reported that they used continuous assessment to evaluate the effectiveness of their own work, while 32% did not use continuous assessment to evaluate their work. Again, a third of the teachers did not use the information from their assessment, and the researcher did not explain why the teachers did not use information to evaluate the effectiveness of their lessons.

4. Grading

The main function of continuous assessment is grading. Indeed, class exercises, tests and homework are used for gathering marks to fill pupils' continuous assessment (MoE, 2004). As MoE (1988) cited by Amedahe (2002) states, continuous assessment is to enable teachers make judgements about pupils' learning in relation to National Curriculum targets. The grading function facilitates decision making in relation to progress to next class as well as transfer across schools when the need arises. This function highlights summative assessment, which can have negative impact on pupils, and in particular lower attainers at school.

5. Reporting progress

Other basic functions of continuous assessment at basic schools are: reporting and progress to next class. At the end of every term teachers calculate pupils' marks and convert that as 30% to add to examination marks for the purpose of reporting pupils' attainments (MoE, 1988; 2004) to parents and families. Further, at the end of every academic year pupils' aggregated continuous assessment is used to inform decisions about their progress to next class. As Amedahe (2002) reports: "information from continuous assessment is used for decisions such as promotion from one class to the next class" (p 5).

6. Transfer

Transfer is a common phenomenon in the world. In Cameroon, it is common at the urban centers where people working in the public sector go on transfer and move with their children. Further, in cases where pupils move to new locations the continuous assessment records provide teachers at the new school important information about the child and the level of his/her attainments

In the UK, Pollard et al. (2005) state that assessment information has a very important role in effective transfer (when pupils move from one school to another) and transition (moving from one class to another within the same school). However, Pollard et al. point out that in order that the next teacher and/or school can extend each pupil's present attainment, building on strengths and addressing weaknesses. It is vital that key pieces of information from present teacher's knowledge are passed on in a manageable way.

7. Contributing to external examination

Another fundamental role of continuous assessment is the contribution of 30% of the marks of external examination, the First School Leaving Certificate (FSLC). The weighting of continuous assessment to external examination was 40:60%, this was changed to 30:70% in 1994 because the Ministry felt teachers did not organize their assessment systematically (MoE, 1996). Wiliam (2006c) state that for assessments that are used outside the school, whether for progress to employment, further stages of education or for accountability purposes the stakes are even higher. These different forms of assessment can be considered to be what Madaus (1988) defines as 'high stakes assessment'. High stakes assessment consists of tests and procedures that provides information perceived by pupils, parents, teachers, policy makers, or the general public as being used to make important decisions that immediately and directly impact upon pupils' educational experiences and futures. A combination of externally designed and marked Standard Assessment Tasks (SATs) and Teacher Assessment (TA) carry out the national assessment. Wolf (1996) explains that the fact that teachers conduct continuous assessment does not mean that it is low stakes or less important, from the pupils' point of view, or low in the stress it creates for pupils particularly, those who record lower attainments.

Literature shows that, many systems of public examination consist of a mixture of continuous and terminal assessments. For example, in England, as Torrance and Pryor (2002) report in 1998 the Government introduced a National Curriculum coupled with a program of National Assessment designed to measure how much children were learning and how effective schools were implementing the National Assessment. Nonetheless, in England, Pollard et al. (2005) state that at the end of Key Stage 1, there are a variety of tests and tasks designed for children working at different levels. The teachers mark the Key Stage 1 tests and tasks, with Local Education Authorities undertaking audit to ensure consistency of administration and marking. In addition, the end of Key Stage National Curriculum assessment is carried out through tests or tasks and Teacher Assessment and applies to English, mathematics and science. According to Pollard et al., at Key Stage 2, the lowest attaining pupils are assessed through Teacher Assessment alone. For the end of Key Stage Teacher Assessment the teacher makes judgements for each child in the form of a level for each attainment target in English, mathematics and science; an overall subject level in mathematics and science is also calculated.

However, this will raise a number of challenges including; certification, further training opportunities as well as public opinion and acceptance of the new assessment program . Also, in the UK, there has ongoing debate among writers in education assessment and commentators for example, Weeden et al. (2002), as to whether a single assessment system, such as the one proposed by TGAT for the National Curriculum (DES/WO, 1988) can serve all these functions.

2.2.4.2.2 Purposes of Continuous assessment (CA) and summative assessment or Assessment of Learning (AoL)

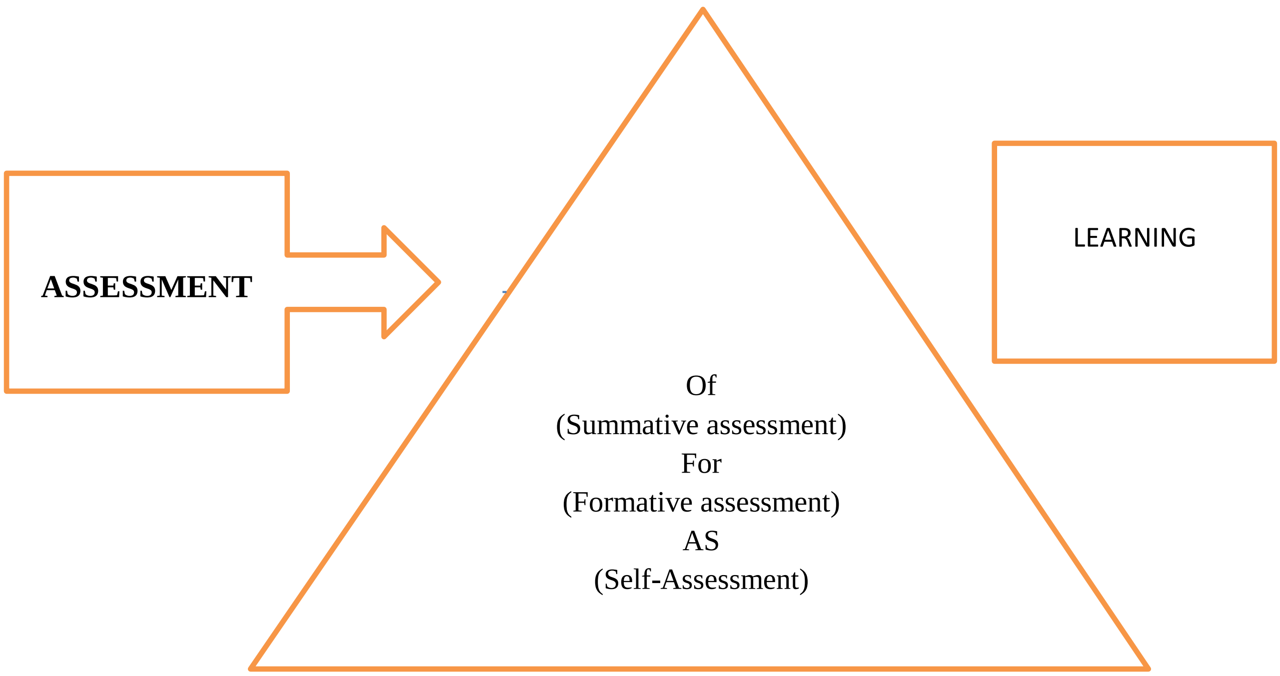
According to Okas (n.d.), the purpose of AoL is summative, it intends to certify learning and report to parents and students about students' progress in school, usually by signaling students' relative position compared to other students. AoL in classrooms is typically done at the end of for instance (a unit, course, a grade, a program) and takes the form of exercises, class tests and even homework or exams that include questions drawn from the material studied during that time are all used to sum up learning in the classroom. Okas also claimed that AoL is a kind of assessment that still dominates most classroom assessment activities with teachers firmly in charge of both creating and marking the test. Thus, a strong emphasis is placed on comparing students, and feedback to students comes in the form of marks or grades with little direction or advice for improvement. Further, Amedahe (2000) indicates that continuous assessment is the sum of knowledge and skills pupils have acquired over a period. It should be noted that, the use of teachers' assessments for important decisions concerning pupils makes such assessments summative (Black and Wiliam, 1998, 2006a; Harlen and Crick, 2003; Harlen, 2006a). Further, Harlen and Crick (2003) suggest that in practice, teacher assessment has more characteristics of summative than formative assessment and often emulates external tests in the assumption that this represents good practice. The summative purposes emphasize the use of continuous assessment for grading, reporting and progress, transfer across schools, and contributing to official national examination, FSLC.

2.2.4.2.3 Purposes of Continuous assessment and Assessment as Learning (AaL)

Assessment as learning' reinforces and extends the role of formative assessment for learning and is 'a process through which pupil involvement in assessment features as an essential part of learning' (Dann, 2002, p.153). The student is regarded as the connector between the assessment and learning process. Emphasizing assessment as a process of metacognition (Earl and Katz, 2006), assessment as learning encourages students to monitor and practice self-regulation over their thinking processes, and stresses the importance of fostering students' capacity over time to be their own assessors (Ontario report, 2010; Lee and Mak, 2014).Self and peer-assessment practices are often mentioned as examples of assessment as learning. The approaches help students take more responsibility for their learning and monitoring of future directions (Earl and Katz, 2006). Thanks to these functions, assessment as learning can be especially beneficial for developing and assessing transversal skills, such as initiative, decision-taking, critical thinking, etc. (Earl, 2013).

All emphasizes the role of the student, not only as a contributor to the assessment and learning process but as the critical connector between them. Students, as active, engaged, and critical assessors, can make sense of information, relate it to prior knowledge, and master the skills involved. It occurs when students personally monitor what they are learning and uses the feedback from this monitoring to make adjustments, adaptations, and even major changes in what they understand (Okas, n.d.).

Figure 8: Contemporary Pyramid of continuous assessment



Source: Arega(2014)

2.2.4.2.4 Distinction between formative assessment or assessment for learning and assessment of learning

Meyer et al (2009) distinguish two distinct purposes of assessment: assessment of learning, and assessment for learning.

Assessment for learning (AfL) or formative assessment is focused on using assessments to help students improve and move forward in their learning. This kind of assessment is equally important in giving students the information they need to guide and promote their own learning so that they can meet the intended outcomes. **Assessment for** learning requires that academic staff assess in a manner that will allow them to identify what kinds of improvements are needed and communicate this information to students. In other words, assessment should be for rather than of learning only, such that it provides an experience for learners to learn from, that is, promote deep learning.

Assessment of learning (AoL) or summative assessment involves measuring what and how much students have learned, tied to specific learning outcomes, which they derived from the graduate profile.

A distinction is made between assessments for learning, which describes the process, assessment as a support for learning, compared to assessment of learning that describes the nature of assessment or the product (Wiliam & Black 1998; Wiliam& Thompson, 2008). Similarly, other researchers agree that the core features that characterize formative assessment are that it affects the quality of teaching and learning, and it engages students in self-directed learning environment (Chappuis & Stiggins, 2004). Black, Harrison, Lee, Marshall, and Wiliam (2003) equally make a clear distinction between the two. They argue, "assessment for learning is any assessment for which the priority in its design is to serve the purpose of promoting pupil's learning, compared to an assessment design that serves... to provide information to be used as feedback, by the teachers and pupils, in assessing themselves... to modify the teaching" (Black et al. 2003, p. 8).

2.2.4.2.5 Distinction between formative assessment and assessment as learning

However, some researchers differentiate between assessment for learning and assessment as learning as two types of assessment conducted for formative purposes. In some recent formulations, the active participation of students in the process has given rise to the term assessment as learning, which focuses on students reflecting on and monitoring their own progress to inform future learning (Earl, 2003). According to Earl (2003) **Assessment as learning (AaL)** is the process of developing and supporting learner metacognition (knowledge of one's own thought processes). Learners are actively engaged in the assessment process; that is, they monitor their own learning. Through this process, learners are able to learn about themselves as learners and become aware of how they learn. They become metacognitive. WNCP (2006) equally states, Assessment as learning emerges from the idea that learning is not just a matter of transferring ideas from someone who is knowledgeable to someone who is not, but is an active process of cognitive restructuring that occurs when individuals interact with new ideas. Within this view of learning, learners are the critical connectors between assessment and learning. For learners to be actively engaged in creating their own understanding, they must learn to be critical assessors who make sense of information, relate it to prior knowledge, and use it for new learning. This is the regulatory process in metacognition; that is, learners become adept at personally monitoring what they are learning, and use what they discover from the monitoring to make adjustments, adaptations, and even major changes in their thinking (p.41).

2.2.4.3 The nature of continuous assessment

The nature of continuous assessment in the context of international perspectives as compared to other Africans' countries and Cameroon in particular as **prescribed in the curriculum.**

The discussion of the nature of continuous assessment in the context of international perspectives concerning teacher assessments is organized under the following subtopics:

- The continuous assessment format
- Continuous assessment activities
- Continuous assessment and curriculum-based assessments
- Continuous assessment and criterion referenced assessments
- Continuous assessment and teacher assessment
- Continuous assessment and external examinations

2.2.4.3.1 The continuous assessment format

Today the demands of assessment are the use of multiples methods of assessment integrally connecting assessment to instruction and that diagnoses, inform and empower both teachers and learners. Jones (1994 p.14) says, "Knowing the characteristics of a variety of assessment methods can help you choose the most effective way to evaluate your students' progress".

Teachers are no longer bound to use traditional paper and pencil tests that measure only the mastery skills, factual knowledge .There are new methods of assessment that evaluate learners' conceptual development, process skills and problem solving abilities (Jones, 1994 p.14). When looking in Ghana educational policy for instance, continuous assessment is observed by Amedahe (2002); The Ministry of Education has prescribed record-keeping practices in terms of students' attainments. The minimum number of assessment scores to be recorded for each student in each subject during a school term using designated assessment procedures, as delineated (p. 6). The following table 14 illustrates the continuous assessment format for both Basic and Senior Secondary Schools.

Table 14: Sample of Termly Assessment Format

Subject……………… Year…………………

Class………………… Term……………….

Teacher…………….. No. on roll………..

1	2	3	4	5	6	7	8	9	10	11	12
Exercise Assignment	Sub Total 40	Class Test	Sub Total 40	Home Work	Sub Total 20	Total Class score 100	30%	term Exam	70%	Over All Total	30% + 70% Position

Source: MoE, 2004.

Table 14's format above requests teachers to record summative marks only and does not make provision for descriptive statements of pupils' progress that could help teachers to address difficulties hampering learning.

As indicated in the previous section, as distinct from terminal examination continuous assessment encompasses exercises, class tests and homework. According to the MoE (2004) for the '**termly assessment plan'**: Your pupils will be doing many exercises in class. You will need to find the average (mean) of all the scores every two or three weeks and record of scores. (In the case of SSS, give 4 assignments). There should be four (4) of such scores in the term and the maximum score for all four will be 40 as indicated in column 2 (p. ii).

In terms of **class tests**, the MoE (2004) states three-class tests you administer and should be recorded for this purpose. The tests may be administered after every 3 or 4 weeks of the term.

The first two tests should carry 10 marks each and the third should carry 20 marks so that the maximum for all the three tests should be 40 marks as shown in column 4 (p. ii). Furthermore, the MoE (2004) states: Sometimes the teacher may give the pupils work to do in groups. For each such group work, each member of the group is awarded a maximum of 5 points or marks, the actual mark will depend on each member's contribution to the project. If homework is given and pupils are expected to do this individually, each task also attracts a maximum of 5 points, the actual mark depending on the quality of the work done. The maximum score for all four (homework/project) in the term is 20 as shown in column 6 (p. ii).

Owing to its role in grading and certification, teachers have been provided with guides to follow in order to ensure consistency in their continuous assessment practices. Continuous assessment plan should encourage teachers to use information to help each pupil to improve. The emphasis on marks raises three concerns: measurement, competition and time. The focus on marks causes teachers to focus on measuring pupils' attainments, which leads to giving pupils feedback mainly in the form of marks. It is imperative that teachers also record information that both teachers and pupils can use to improve learning. As Watkins (2007) points out, assessment is a key tool for teachers in determining not just, what pupils need to learn, but also how best they can learn it.

Second, by focusing on marks teachers are more likely to give feedback to pupils, including those who are lower attainders, mainly in the form of marks. However, literature has shown that feedback in the form of marks and grades are not beneficial to pupils, particularly lower attainders (see Black and Wiliam, 1998; 2006a; Butler 1988). Clarke (2005) states giving grades and marks for every piece of work lead to inevitable complacency or demoralization leading to regression in progress. Whilst, pupils who continually receive high grades such as 'A' and 'B' may become complacent, lower attainders who get low marks will become demoralized.

Third, the procedure for processing pupils' marks for recording is laborious and time consuming. The amount of time and energy teachers expend in paperwork can reduce efforts for supporting pupils who record lower attainments in class to improve. As Weeden, Winter, and Broadfoot (2002) have argued, when teachers spend so much time on paperwork they have less time to help pupils to improve. In line with this, Farrell (1997) states that in order to assess the progress pupils are making on the curriculum successfully it is necessary for schools to have a carefully planned curriculum and accompanying record sheets which enable pupils' progress to be recorded clearly and without taking up too much time. In addition, Stakes and Hornby (2000) suggest that records should be straightforward to keep and simple to access.

The ARG (2002) in UK advise teachers to be mindful of the impact of comments, marks and grades on learner's confidence and enthusiasm and should be as constructive as possible in giving feedback to learners. For teachers' feedback to be effective the focus should be on the learning or success criteria, aim at closing the gap, and give specific guidance about how to improve. Clarke (2005 p. 70-71) confirms that, the greatest motivational benefits will come from focusing feedback on the qualities of the pupil's work, and not on comparison with other pupils; specific ways in which the pupil's work could be improved; improvements that the pupil has made compared to his/her earlier work .

Still, in England, Stakes and Hornby (2000) note that the National Curriculum demands that a record of the work and progress of pupils be kept and varied formats for doing this have been developed in schools throughout the country. These formats include written records, tick boxes, the use of charts by pupils or pie charts or graphs. According to Stakes and Hornby, a wide variety of possible approaches for recording of pupils' progress has been identified, because of the need to meet a large range of individual circumstances. However, as this is a new framework, time will be needed for its incorporation into the existing continuous assessment program. As Watkins (2007) points out, in England, the 'P' scales were developed over a period. Despite the contrasting cultural contexts, Cameroon can adopt a similar framework for recording the progress of pupils in primary schools.

2.2.4.3.2 Planning of Continuous assessment activities

Clarke (2005 p. 25) cites the Assessment Reform Group (ARG, 2002) that teacher's planning should provide opportunities for both learner and teacher to obtain and use information about progress towards learning goals. It also has to be flexible to respond to initial and emerging ideas and skills. Planning should include strategies to ensure that learners understand the goals they are pursuing and the criteria that will be applied in assessing their work. That is teachers should have formative assessment information about their pupils so that specific objectives can be refined and differentiated. Pollard et al. (2005) argued that assessment is an integral component of planning, without assessment and the consequent re-evaluation of planning effective teaching cannot be maintained.

As far as Cameroon is concerned, the continuous assessment program has the characteristics of both curriculum-based and criterion-referenced assessments. The characteristics can have both positive and negative impact on lower attaining pupils in classrooms. The key points from the review so far indicate that: basic schoolteachers follow prescribed format for recording the progress pupils make in relation to the curriculum. The format does not make provision for recording the progress of pupils with needs, particularly lower attainments. Basic education schoolteachers use the national curriculum, the teaching syllabuses, to construct their schemes of work and their lesson plans. At the beginning of every term, teachers give their schemes of work to their head teachers for vetting. Teachers also show their lesson plans to their head teachers every week for vetting, and lesson plans are individual teacher's responsibility. The continuous assessment policy is not clearly stated in the Cameroon primary school curriculum as teacher assessment despite the fact, teachers are recommended to organize monthly evaluation after 3 weeks of teaching learning process and at the fourth week remedial works. The continuous assessment encompasses marks from exercises, tests, homework and end of term examinations. However, there is no quota of marks to be considered for the summative final examinations. For example, the Ministry has provided a format for gathering, processing and recording marks pupils obtain in all activities for their records but no indication of the percentage marks of continuous assessment as compare to some countries.

2.2.4.3. 3 Continuous assessment and curriculum-based assessment

According to Norwich (1993 p.66), curriculum-based assessment refers to the process of assessment involving task analysis, objectives setting and criterion referencing. This assessment requires that the curriculum be defined as a series of tasks, which are sequenced and expressed in a behavioral objective form. There is an initial assessment of learner's starting skills to enable placement on the sequence of objectives - placement assessment. For instance, suitable methods, materials and classroom arrangements are selected to enable the learner to achieve the next step on the sequence. Progress is monitored and the assessment can be used as feedback to make changes to objectives or methods - formative assessment. In line with this, Lewis (2001) states that curriculum-based assessment is part of a continuous cycle of teaching and assessment. According to Lewis, recent theoretical work in the field is helping to explain why classroom practices, such as helping pupils to articulate learning strategies used, are fundamental to increasing attainments.

In Cameroon, basic education schoolteachers use continuous assessment activities, for example, exercises, class tests and homework to assess pupils' progress in the curriculum and program of study. As Watkins (2007) explains, in countries that have clearly defined national curricula, ongoing, formative assessment is usually goal-related and linked directly to the objectives for the curriculum for all pupils. National guidelines for assessment may state what is to be assessed and how it is to be assessed. Within countries using this approach, a key aspect is that developing and implementing assessment is mainly the responsibility of mainstream schools and class teachers. This fits with the purpose of such assessment for informing decisions about next steps in an individual pupil's learning. Watkins (2007) points out that curriculum–based assessment is linked to programs of learning; curriculum-based assessment is used to inform teachers about the learning progress and difficulties of their pupils in relation to the program of study, "so they make decisions about what a pupil needs to learn next and how to teach that material" (p. 67). Curriculum-based assessments provide only teachers with relevant information in order to improve teaching; the assessments do not provide pupils information on how to make progress in learning. As Tucker (1985) cited by Frederickson (1992) explanation below shows:

Curriculum-based assessment properly includes ANY procedure that directly assesses student performance within the course content for determining those students' instructional needs. In curriculum-based assessment (CBA), the pupils' performance is compared in an ongoing way to each new set of curriculum demands as they presented in the classroom (p. 147). In curriculum-based assessment, assessment and intervention go hand in hand.

2.2.4.3. 4 Continuous assessment and criterion-referenced assessments

Apart from curriculum-based assessments, Amedahe (2000) also suggests that in Ghana, the continuous assessment program is organized within a criterion-referenced framework. Curriculum-based assessment however contrasts with Criterion-referenced assessment where the pupils' performance in each area assessed by the test is compared with a stated criterion or level of mastery (Frederickson, 1992). Thus, teachers not only use continuous assessment to identify pupils' learning needs in the content of the curriculum, they also use continuous assessment to compare pupils' performance against specific standards set for their classes. This is normal, according to Frederickson (1992) some curriculum-based assessments may be criterion referenced. For example, the ongoing teacher assessments currently being conducted in Britain are designed both to assess pupil performance in the National Curriculum, 'in order to clarify the next steps for individual and class planning' and to assess pupils, 'in relation to a criterion given by a Statement of Attainment'. Harlen (2006b) explains that the criterion-referenced approach involves using the same criteria for all pupils because the purpose is to report attainment in a way that is comparable across pupils. There is no feedback into teaching- at least not in the same immediate way as in the assessment for learning cycle.

In addition, Stobart (2006) argued that in a criterion-referenced system, in which the pupil must meet every statement at a level to gain that level, the threat is that the standard may become too detailed and mechanistic. This may encourage a surface learning approach in which discrete techniques are worked on in a way that may inhibit 'principled' understanding (p. 140). Stobart suggests that there is dilemma in making learning intentions explicit. Among the issues raised were - How do us strike a balance, which encourages deep learning, processes and mastery learning? If the intentions are general, the learner may not be able to appreciate what is required. If they are, too specific this may lend itself to surface learning of "knowledge in bits" (p. 139).

2.2.4.3 .5 Continuous assessment and teacher assessments

Black and Wiliam (1998) point out that assessment practices in which lower attaining pupils recorded gains in attainments showed enhanced formative assessment procedures.

The continuous assessment program is the only teacher (classroom) assessment among the various evaluating models evolved by the Cameroon basic education level. Continuous assessment is used as classroom assessment to inform teaching and learning as well as to report pupils' progress and to contribute to final official examination in some of the field subjects enacted in the curriculum especially physical education. Thus, continuous assessment is used for both formative and summative purposes in Cameroon. Black and Wiliam (1998) synthesized the literature on teacher assessment and reported that there is sufficient evidence to show that similar situation exists across many other countries. However, in England, Lewis (1997) has drawn attention to the differences between 't.a.' non-moderated teacher assessment, used for formative purposes, or just within the classroom, and 'T.A.' moderated teacher assessment used for reporting purposes outside the classroom, and external tests.

2.2.4.3.6 Pupils' role in continuous assessment

The basic school continuous assessment guide requires the teacher to plan, and sets learning objectives, designs activities, mark and records pupils' scores (MoE, 2004 p. 25). The only role pupils play in the continuous assessment process is performing tasks assigned to them by the teacher. The situation in Cameroon reflects the 2018 curriculum observation that although the process and purpose of assessment may vary from professional to professional, and indeed, there are different emphases on test, observation and other techniques, pupils themselves are conventionally ascribed a subservient role in the whole assessment process. They are often expected to carry out specified tasks, answer specific questions, undertake written activities or follow set of procedures. The child is generally seen as a relatively 'passive object', and assessment is viewed as something which is 'done to the child' than involving very actively

For their part, Tilstone, Lacey, Porter and Robertson (2000) suggest pupils themselves have little role to play in the traditional perspective on assessment. It is something done for them. However, in a dynamic view of assessment, pupils have a central part to play. They are involved in setting their own targets and monitoring their own progress. There are several frameworks that support pupils' involvement, such as records of attainment. Currently, in Cameroon, there is no provision in terms of pupil involvement in their assessment. It will be impossible for basic school pupils to play any meaningful role in their assessments. In Cameroon, the continuous assessment model seems to apply the principles from the behaviorist learning theory. For example, the teachers assess and reinforce pupils' responses and make records based on new assessments; the pupils' progress is measured against performance criteria, which are teacher-defined. If pupils' involvement is to be fostered then in addition to principles drawing on behaviorist theory, the continuous assessment program in Cameroon has to adopt some principles from the cognitive, constructivist theories of learning. This however, requires radical changes in teachers' beliefs, competencies and their conceptualization of continuous assessment; these shifts may not occur easily.

2.2.4.4 Advantages of continuous assessment

According to Onuka (2006 p.1), there is a need to use a variety of instruments to measure effectively the students" traits and their results are used to assist the students to improve themselves. One of the expected advantages of continuous assessment lies in its being guidance oriented. Since it will involve data gathering over a long period, it will yield more accurate data reaching the teachers early enough to modify instruction. This could play a vital role in diagnosing and remediating areas of learners" weakness if properly anchored in what occurs in classroom. Another advantage of continuous assessment is that it place learners at the Centre of all performance –assessment activities. It encourages more teacher participation in the overall assessment or grading of his/her learners. However, this approach, teachers would be able to integrate assessment and assessment results into instructional practice.

Teachers will be expected to incorporate assessment into the larger learning framework and possibly to provide evidence regarding how assessment information is used to inform and guide instruction for individual learners.

- Continuous assessment is a regular assessment of the learning performance related to a course module and that is separate from examinations, and accompanied by regular feedback.

-Continuous assessment can take various forms, depending on the final objectives and competencies. A few examples:

- Regular observation of practical skills or attitudes, e.g. nursing skills, your team's collaboration skills, collaboration during tutorials, etc
- Regular feedback on your portfolio, paper, etc
- Regular assessment of your verbal language skills
- Regular testing of your insight into theoretical concepts

-Continuous assessment can take place within various types of contact moments, e.g. practical, workshops, lectures, placements, projects, cases, etc.

-Continuous assessment is the result of the continuous assessment of the learning performance on a course module. The assessment task can verify which developmental process you are going through. The continuous assessment (partially) counts towards the final mark for the course module.

-Continuous assessment often goes hand in hand with information about: the assessment criteria, how you performed? What went smoothly? What went less smoothly, and the things you still have to work on. Source: https://www.arteveldehogeschool.be/spotlight/node/43e

2.2.4 .5 Characteristics of continuous assessment

Bethel T. Ababio1 & Hillary Dumba(2013 p.71) quote Etsey (1992) "the process of continuous assessment is formative, systematic and comprehensive". According to Broohart (2011), continuous assessment has the following characteristics: Continuous assessment should be **systematic**, **comprehensive**, and **cumulative** and **guidance** oriented.

- **Continuous assessment** is systematic in the sense that it is planned, graded to suit the age and experience of the students and is given at suitable intervals during the school year. Appropriate timing saves students from being tested to death or becoming bored with too frequent assessments.

- **Comprehensiveness of continuous assessment** means that it is not focused on academic skills alone. It embraces the cognitive, the psychomotor and the affective domains. A child is assessed as a total entity using all the psychometric devises such as test and non-test techniques.
- **Cumulative characteristics of continuous assessment** means that all information gathered on the individual has to be pooled together before a decision can be taken.
- **Continuous assessment is guidance oriented** means that the information so collected is to be used for educational, vocational and personal-social decision-making for the student. Conceptually as well as in practice, continuous assessment provides feedback to children and teachers. Such feedback provides information, which is used for purposes of improving on the child's performance or modifying the content, context and methods of teaching, as well as in making a variety of other decisions.

2.2.4 .6 Problems with the implementation of continuous assessments

Even though continuous assessment is very important in terms of improving student learning of instructional practices, it appears that teachers are over-burdened with workload and consequently, they fail to employ various continuous assessment strategies that can provide a comprehensive picture of students learning. According to Etsey (1992), since the process of continuous assessment is formative, systematic and comprehensive, it has increased the workload of teachers. Consequently, he posits that the "teacher resorts to unfair means in providing the requisite data for each pupil" (Etsey, 1992, p. 90).

Some of the objectives for the adoption of continuous assessment have not been achieved because of some factors. The problems of continuous assessment that could be associated with the teachers include their skills in construction and administration, and their attitudes toward the continuous assessment approach and record keeping. Large classes resulting from prerequisite skills by teachers, lack of materials and facilities necessary for acquisition of skills in the psychomotor domain and poor supervision or administration of continuous assessment practice in various schools (Ezeudu, 2005; Greaney, 2001). For successful implementation of the continuous assessment approach, teachers need to give most tests, which mean more marking. One of the important aspects of continuous assessment is the availability of valid and reliable tests, which could be used in all schools. There is a need to construct these tests following established procedures and practices. Comparability of standards results from the variation in the quality of test and other assessment techniques in scoring and grading patterns as the inability of teachers to make reports of records to concerned persons. Continuous assessment places much power in the hands of teachers. This power is often abused by the teachers who award scores even when tests are not administered (Ezeudu, 2005).

The entire practice of continuous assessment is surrounded by Laxity. Thus, there is laxity in timing. There is also laxity in terms of the mode that the continuous assessment exercise takes. For instance, a school calendar may specify two continuous assessment tests, but because there is no enforcement, some teachers and their pupils agree on one test and one assignment, one test and two assignments, one test only.

Griffiths (2005) captures another area of disparity, which relates to teacher involvement. He opines that the input of teachers/lecturers in continuous assessment may not be fair because different lecturers may understand their involvement differently. Other areas of disparities noticed across the board is that there are lecturers, who grant students the opportunity of a makeup test when they miss one, while others do not, some lecturers remark continuous assessment scripts and make corrections on them while others do not, some disclose continuous assessment marks to students while others do not.

Apart from the skills of test construction measuring cognitive aspects of learning, teacher should also be able to measure the learners‟ affective attributes such as attitudes, motives, interests, values and other personality characteristics. Such characteristics could be as important as others associated with intelligence. They need to observe the learners more keenly to assess their affective outcomes, and there will be more records to be kept on the learners. However, there is a total neglect of the affective and psychomotor domains of behavior. They should be made aware of the requirements of the system, its importance and how to implement it. All these could mean more work to the teacher, more demand on his or her time and more responsibility on him or her. This means they must have a sound professional and attitudinal knowledge and skills of the system. Thus, teachers should be encouraged to form favorable attitudes toward the practice.

Another problem with continuous assessment is the issue of record keeping. Learners‟ records have to be adequately and meticulously kept over a long period. They should be properly stored and easily retrievable. A related issue is that of collation. Scores may have to be combined from different sources using various weights. Teachers will need basic arithmetical operations of addition and multiplication; calculators may be handy here. So that scores are not misplaced, marks books or registers for learners could be used.

2.2.5 Summative evaluation/ assessment

2.2.5.1 Definitions of summative/ assessment

Summative assessments are usually defined as cumulative assessments that intend to capture what a student has learned, or the quality of learning, and judge performance against some standards (Dixson and Worrell, 2016). Summative assessments are generally ‘high stakes ‘assessments and used to get a final judgment of how much learning has taken place—that is, of how much a student knows and has learned (Gardner, 2010). Summative assessment or “assessment of learning” involves judging student performance for a decision or record (Ewell, 2005). It usually occurs at the end of a learning unit, term, school year or educational level (Eurydice, 2009b). The results of summative assessment can be reported in different forms including marks, transcripts, certificates and qualifications.

Summative assessment methods rely on an extrinsic motivation for students, represented by marks, transcripts and diplomas. They are built on strategies to motivate students, provide information about student performance, serve to select or group students, and certify learning and award qualifications (Bennett, 2011; OECD, 2013, Dixson and Worrell, 2016).

The researcher on his turn differentiates summative assessment in two folds: School based Assessment and Centralized assessment. School based Assessments (summative assessment) are carried out through weekly, monthly tests, termly or final year exams) .These assessments are fully carried out by the classroom teacher and the school starting from the planning, construction items and assessment instruments, administration, checked or scoring, recording and reporting. The aims are to evaluate students’ academic achievement in terms of knowledge, skills and values. Summative assessment aims is to provide a summary statement about past learning; formative assessment is intended to inform future teaching and learning. Meanwhile, Centralized assessment (summative evaluation) organized by the Examination Board of different ministries in charge of education in a particular period according to certain subjects based on performance standards and guarantee quality through monitoring and coordination for the official standardized examinations through standardized official exams such as: FSLC,CEP,BEPC, GCE O and A/ L exams etc.

2.2.5.2 The purpose of summative assessment

Summative assessment is similar to the achievement tests above, in other words, the purpose is to determine, at suitable points in the course, and especially at the end, to what extent the aims of the course have been achieved; it is concerned with "the accountability of the product" (Davies et al. 1999 p. 65). Summative assessment methods, in particular standardized testing, are also often considered more reliable than the alternatives, as they tend to be easier to interpret and are not influenced by the particular assessor or assessment (Pepper, 2013). Achievement decisions are about students' success or failure on a specific course: "about the amount of learning the students have done." (Brown 1996 p. 14) As a result, the content will be related very precisely to the course syllabus and the item types will be familiar to the students. The intentions for designing and implementing summative assessment strategies include:

•To motivate students to increase effort and achievement. The marks, transcripts or diplomas connected to summative assessment are often conceived as rewards for having performed successfully on an assessment.

•To provide information about student performance to a range of different stakeholders, such as the students themselves, their parents, others within the school, or school-external players such as employers.

•To select or group students according to their achievement levels. In many countries, assessment results are used to stream students according to their ability levels within schools, or to select them into certain types of schools.

•To certify learning and award qualifications that grant students access to higher education institutions or certain professions OECD (2013 p.153).

2.2.5.3 Relevance of summative evaluation

The summative evaluation has as a function the attestation or the social recognition of the apprenticeships. It occurs at the end of a teaching and learning process and serves to sanction or certify the degree of mastery of the learning outcomes of the curriculum. It is important not to include the results of formative evaluations for summative purposes, as the result is often unfair. Therefore, we assert that when the pedagogue makes an evaluation, which permits by continuous control, by examination, or by a mixed system, to attribute diplomas, to certify a competence, when it puts a note, which counts on average, it does summative evaluation. The evaluation is therefore part of the summative evaluation.

2.2.5.4 Some implications

Assessment of learning, identified as summative assessment in the current literature, is deeply rooted in education and what has emerged along with it is the new paradigm, assessment for learning (formative assessment). Another change that emerged is regarding assessment of achievement (summative assessment) and its negative effect on teaching and classroom climate and assessment (Firestone & Mayrowetz, 2000).

Effectiveness for quality learning

The strong impact of summative assessment on teaching and learning has been widely reported. In many contexts, summative assessment dominates what students are oriented towards in their learning –this is typically described as the "backwash effect" of summative assessment (see e.g., Baartman et al., 2006). The marks, transcripts and diplomas that summarize student performance can be seen as rewards for student effort and achievement, which provide an extrinsic motivation for learning (Sjögren, 2009). However, recent research findings suggest that the exclusive use of extrinsic motivation may be problematic as it is often too closely related to the reward. If used in isolation, summative assessments with high stakes for students may in fact encourage surface learning approaches, reduce enjoyment of learning and decrease student focus on long-term goals (European Commission, 2012b; Pepper, 2013; Lau, 2015).

Measurement

Some research findings suggest that summative assessment methods, including standardized tests, can produce a bias in the results of students' performance, depending on the background of learners (Klapp, 2015). A test-takers' performance may not only be affected by the content and difficulty of the test, but also by their behavior and emotional and motivational concerns related to test-taking (Stenlund et al., 2017). Furthermore, in the summative assessments used for selection and qualification purposes, it is important to introduce carefully controlled conditions to ensure fairness of the assessments. However, these conditions can be an obstacle to assessing students in real life contexts, which is often more appropriate due to the mobile and multi-dimensional nature of key competences (Pepper, 2013).

Teacher

The criterion-based student summative assessment often requires a better moderation it is a key area to guarantee fairness of student marking across schools in a given country. The process ensures the consistency of student marking by teachers.

Preparedness

The effective implementation of summative assessment also requires comprehensive teacher training (Crossouard, 2011; Pepper, 2013). The assessment and instruction should therefore, focus on how to better support successful learning processes rather than achieving or receiving a grade. It is important that summative assessments be carefully controlled to ensure that their consequences are fair (European Commission, 2012b; OECD, 2013). Table 16 presents an overview of some assessment practices that serve summative and/or formative purposes that are suitable for measuring different types of competences and skills.

2.2.5.5 Characteristics of summative assessments

The following characteristics of summative assessments were presented by Dixson and Worrell (2016) :

In terms of purpose: Learning outcomes are evaluated in support of learning, placement, promotion decisions and to certify students' competences.

Time: Cumulative, after instruction**.**

Main actor: Usually done by teachers; students are not directly involved in assessment processes**.**

Question asked: Does the student understand the material? Is the student prepared for the next level of activity?

Example: Projects, performance assessments, portfolios, papers, in class examinations, school and national tests, etc.

2.2.5.6 Challenges associated with implementing summative assessment in the classroom definition/focus

Summative assessment was limited only to assess knowledge, Pepper, (2013) and Lau, (2015) perceive that the potential of the summative assessment practices to support learning was not taken into consideration , especially when using innovative tools, can lead to the fragmented view of learning and curricula, teaching competence that can be easily quantified.

Bennett (2011) further emphasizes that summative assessment can fulfil its primary purpose of documenting what students know and can do, but, if carefully crafted, can also successfully meet the secondary purpose of support for learning. In sum, reporting learners' development of key competences can be a challenge to existing summative assessment practices, which often focus on documenting knowledge and skills limited to specific subject contexts, while non-traditional competences are often transversal and multi-dimensional in nature. Therefore, it is important that innovative summative methods be used to bring assessments into real-life contexts of students (Pepper, 2013).

Table 15: The potential of different assessment practices to support key competences and transversal

	Standardised tests	Multiple-choice assessments	Surveys of competences,attitudinal questionnaires	Performance-based assessments	Teacher, peer and self-assessments	Computer-based assessment	Computer adaptive tests	Portfolios	Game-based assessment	Simulations	Intelligent Tutors	Learning Analytics
Key competences												
Communication in the mother tongue	S	S	S	SF		S	S	SF	F		SF	SF
Communication in foreign languages	S	S	S	SF		S	S	SF			SF	SF
Mathematical competence and basic competences in science and technology	S	S	S	SF		S	S		SF	SF	SF	SF
Digital competence	S	S	S	SF		S	S	F	SF	SF		SF
Learning to learn			SF	F	F		F	F				SF
Social and civic competence	S			SF	F	S	F		SF			
Cultural awareness and expression				F			SF	SF				
Sense of initiative and entrepreneurship				F	F			SF				
Transversal skills	S	S		F	F	S	S	F	F	F	SF	SF
Problem solving					F							
Risk assessment			S	F	F			F				
Initiative				F	F			F		F	F	
Decision-taking												
Constructive management of feeling	S	S	S	F	F	S	S		F			
Critical thinking												
Creativity												

Source: compiled by the authors based on the literature review.

Note: F –Formative assessment; S –Summative Assessment

2.2.6 Mathematical competence

Obtaining information on the development of mathematical competency is a central concern of mathematics education (e.g., Leuders, 2014) and empirical educational research (e.g., Hartig, 2007). Aleksands Vorobjovs (2020 p.1) Laursen, 2010; Niss, Hojgaard 2019, Turner 2010 presented many contradictory interpretations of mathematical competence in a study published in Europe. The most common explanation is interpreting mathematical competence as a list of specific skills, abilities and behaviours which makes it easier to measure mathematical competence against some valid evaluation criteria (Laursen , 2010, Lee 2016). The council of the European Union (2018) defined mathematical competence as the ability to use knowledge and skills in work and learning situations, as well professional and personal development . Jayanti Dasgupta (2019) defined mathematical competences as expected learning outcome of schooling. In school system, mathematical competence encompasses basic arithmetic skills, intermediate concepts like algebra, fractions, decimals, percentage and understanding and computing geometrical shapes. To Niss (2002), mathematical competency refers to the ability to understand, judge, do, and use mathematics in a variety of contexts and situations in which Mathematics plays or could play a role. According to him, there are 8 mathematical competencies (Niss, 2002) that follows:

1. **Thinking mathematically**

   Such as:

- Posing questions that are characteristic of mathematics and knowing the kinds of answers (not necessarily the answers themselves or how to obtain them) that mathematics may offer;
- understanding and handling the scope and limitations of a given concept;
- extending the scope of a concept by abstracting some of its properties; generalising results to larger classes of objects;
- distinguishing between different kinds of mathematical statements (including conditioned assertions ('if-then') quantifier laden statements, assumptions, definitions, theorem, conjectures, cases).

2. Posing and solving mathematical problems

Such as:

- identifying, posing and specifying different kinds of mathematical problems – pure or applied, open-ended or closed;

- solving different kinds of mathematical problems (pure or applied, open-ended or closed), whether posed by others or by oneself, and, if appropriate, in different ways.

3. Modelling mathematically

Such as:

- analysing foundations and properties of existing models, including assessing their range and validity;
- decoding existing models, i.e. translating and interpreting model elements in terms of the 'reality' modelled.
- performing active modelling in a given context.
  - structuring the field;
  - mathematising;
  - working with (in) the model, including solving the problems it gives rise to;
  - validating the model, internally and externally;
  - analysing and criticising the model, in itself and vis-à-vis possible alternatives;
  - communicating about the model and its results;
  - monitoring and controlling the entire modelling process.

4. Reasoning mathematically

Such as:

- following and assessing chains of arguments, put forward by other;
- knowing what a mathematical proof is (not), and how it differs from other kinds of mathematical reasoning, for example, heuristics;
- uncovering the basic ideas in a given line of argument (especially a proof), including distinguishing main lines from details, ideas from technicalities;
- devising formal and informal mathematical arguments, and transforming heuristics arguments to valid proofs, i.e. proving statements.

5. Representing mathematics entities

Such as:

- understanding and utilising (decoding, interpreting, distinguishing between) different sorts of representations of mathematical object, phenomena and situations;
- understanding and utilising the relations between different representations of the same entity, including knowing about their relative strengths and limitations;
- Choosing and switching between representations.

6. **Handling mathematical symbols and formalisms**

   Such as:

- decoding and interpreting symbolic and formal mathematical language, and understanding its relations to natural language;
- understanding the nature and rules of formal mathematical systems (both syntax and semantics);
- translating from natural language to formal/symbolic language;
- handling and manipulating statements and expressions containing symbols and formulae.

7. **Communicating in, with, and about mathematics**

   Such as:

- understanding others' written, visual or oral 'texts' in a variety of linguistics
- registers, about matters having a mathematical content;
- expressing oneself, at different levels of theoretical and technical precision, in oral, visual or written form, about such matters.

8. Making use of aids and tools (include IT)

- knowing the existence and properties of various tools and aids for mathematical
- activity, and their range and limitations;
- to use such aids and tools reflectively.

2.2.6.1 The competency level model O-M-A

Competency level models that are empirically based indicate to what extent tasks differ in their level of difficulty in terms of processing. Evidence of existing difficulties can be obtained by carefully analyzing potential and actual solutions. Normative stipulations of difficulty levels imply that it is not possible to process successfully the task on a lower level. The levels of the competency model postulate what skills are needed to solve them. This does not exclude that there are multiple solution strategies, particularly for complex task definitions. Competency level models contribute to the diagnosis of the learners' levels of competency by the assessment of their achievements. The competency level model is aimed at fulfilling all essential requirements with regard to the conception of mathematical learning outcomes in Austrian mathematics education of the Secondary School Level II (cf. BIFIE, 2013a). For designing the domains of mathematical competencies, Table 16 below indicates winter's basic experiences (cf. Winter, 1996, p. 37) orientation as :

Table 16 : O-M-A Grid

	Domains of mathematical competency		
Level	**Operating**	**Modelling**	**Reasoning**
1	Identify the applicability of a given or familiar method; Implementing/executing a given or familiar rule	Implementation of a representation change between context and mathematical representation Using familiar and directly recognizable standard models for describing a given situation with appropriate decision	Perform basic technical language reasoning Examine the application of a relationship or method and the fit of a term for a given (intra-mathematical) situation
2	Implementing/executing multi-step methods/rules, possibly with the use of computers and use of control options	Description of the given situation by mathematical standard models and mathematical relationships Recognizing and setting general conditions for the use of mathematical standard models	Understand, comprehend, explain mathematical concepts, principles, methods, representations, reasoning chains and contexts
3	Determine whether a particular method/specific rule is appropriate for a given situation, make and perform the appropriate method/rule	Apply standard models to novel situations, find a suitable fit between suitable mathematical model and real situation	Examine and complete mathematical reasoning, perform and describe multi-step mathematical standard reasoning
4	Develop/form macros[1] and join together macros already available	Complex modelling of a given situation; reflection of the solution variants or model choice and assessment of the accuracy or adequacy of underlying solution methods	Form independent chains of reasoning, technically correct explanation of mathematical facts, results and decisions

[1] aggregated mathematical rules

Complex problem solving situations can be described by the interaction of the three domains of mathematical competencies.

1) To perceive and understand phenomena of the world around us that concern or should concern all of us, from nature, society and culture in a specific way. The basic experience corresponds to mathematical modelling which is a fundamental action area in learning mathematics. “Modelling” served as the basis of the fundamental work of Niss (2003) and other ideas, e.g. of Boehm (2013) or Goetz and Siller (2012).

2) To learn and comprehend mathematical objects and facts represented in language, symbols, images and formulas as intellectual creations as a deductive-ordered world of its own kind. There are the other two basic experiences “operating” and “reasoning”, which serve the second fundamental experience .The domain “Reasoning” is related to the suggestions of Bruder and Pinkernell (2011), which also notice considerations of Walsch (1972). There are

relatively few preparations for a levelled conception of competencies in the mathematical domain “Operating”.

3) To acquire task problem-solving skills that goes beyond mathematics (heuristic skills). The third basic experience is “problem solving”. “Problem solving” is defined as a more complex aspect of action and therefore includes the domains of the mathematical competencies.
In various competency models, “communicating“ is included to emphasize the linguistic aspects, as well as other domains of mathematical competencies. “Communicating” is seen as an important domain of mathematical competencies for teaching mathematics, but cannot be specifically differentiated from Operating, Modelling and Reasoning and is therefore included in the other aspects. In primary school, Pupils are expected to have mathematical (basic) knowledge and (basic) ability, as well as general mathematical skills such as reasoning skills, problem solving skills, and the ability to use mathematics in different situations, i.e. modelling skills.
However, in PISA 2000, a lack of modelling competency was observed, when students failed to solve (real-life) problems with the help of models in a satisfying way (cf. Klieme et al., 2001). To develop mathematical competence, students must be involved in a dynamic process of thinking mathematically, creating and exploring methods of solution, solving problems, communicating their understanding not simply remembering things.

Understanding of mathematics thus demands that learners should develop mathematics confidence, become problem solvers, communicate mathematically, reason mathematically, and be creative and critical thinkers instead of objectives; expected learning outcomes are defined in the curriculum. Expected learning outcomes are mathematics competences to be developed by the learners at end of primary school cycle with precise evaluation criteria. Assessment, therefore, must reflect and reinforce this view during the learning process.

In this thesis, the researcher defined mathematics competence as expected learning outcomes specified in terms of knowledge, skills and attitudes, which make it easier to measure mathematical competence against some valid evaluation criteria. Attainment of mathematics competence is the ability pupils use knowledge, skills and attitudes acquired in mathematics competence to solve mathematics problems through operations, real-life situations and use the acquired mathematics competences for their personal development in careers aspirations.

2.2.6.2 Example of Cameroon's Competency-Based Mathematics Curriculum

Mathematics in the real sense is a science of space, quantity and change that helps in solving the problems of life needing numeration and calculation. Mathematics is also one of the core subjects in science that has the function of developing students' skills, knowledge, attitudes and values towards solving problems and satisfaction of real needs in life. One of the purposes amongst others in teaching mathematics is based on the notion that an educated person has the right to be initiated into all the various forms of human knowledge and to appreciate their distinctive ways of reasoning and arguing. Mathematics provides opportunities for developing important intellectual skills in problem solving, deductive and inductive reasoning, creative thinking, communication and the ability to deduce and visualize in space and time. It is a tool for scientific and technological development. Through mathematics therefore, the learner improves his/her knowledge of science, technology, agriculture and engineering. Merely everyday transactions and real-life problems, and most forms of employment, require confidence and competence in a range of basic mathematical skills and knowledge such as measurement, manipulating shapes, organizing space, handling money, recording and interpreting numerical and graphical data, and using information and communications technology (ICT). Mathematics is thus regarded as an extremely powerful tool for the development of other human disciplines and represents the most of the phenomenon under natural sciences more accurately and exactly (Goodwin, et al., 2014) .

Mathematics itself is taught in the classroom through a series of activities. All activities are described in step by-step detail, follow the same format and prescribe the same teaching strategy. The activities are designed in a sequence according to the 5E learning cycle of engagement, explanation, exploration, elaboration and evaluation. Instruction focuses on solving real life problems, developing the skills of individuals, and assessing them through tasks, not exercises. The learners are prepared directly to be responsible citizens, being placed at the Centre of problem solving situation and not only for academic performance. In changing environment, mathematics is being taught to match the changing demands or requirements of modern society. Awodeyi(2004) opined that Mathematics has always been seen as a factor in the prosperity, development and undertaking of any nation. Thus learning mathematics is very important for an individual's full development in today complex society. It is very necessary for individual to acquire mathematics ability in order to have proper mental development.

Introducing notions of Mathematics, Science, and Technology involves the acquisition of Knowledge, skills and attitudes in these subject areas and the ability to use them to address challenges in real life situations. The mathematical problem solving has been the focus of concern in the area of mathematics problem solving which involves the application of previously acquired knowledge to and new unfamiliar situations. The learners are taught not about the mathematics but the mathematics from real life situation, for proficient mathematics problem solving. Sometimes to solve a mathematical problem we have to reason logically and systematically, using what is called deductive reasoning. Also in learning mathematics, children have many opportunities to 'look for patterns'. This involves inductive reasoning leading to the articulation of generalizations, statements of what is always the case. Involving learners in experimenting, questioning, reflecting, discovering, inventing and discussing could effectively help them to learn mathematics. Mathematics is thus, a kind of a discipline, which requires minimum factual knowledge and a great deal of experience in dealing with real situations using problem solving and thinking skills. These are opportunities for the intellectual gymnastic of the man's inherent powers (Ravanan, 2004). People without this mathematical competency will be at a great disadvantage in dealing with this information to make reasonable decisions affecting their work, their life and their society (Spannberg, 2011) cited in Tadesse W(2014 p. 2).

Mastering Mathematics thus entails the acquisition of knowledge, skills and attitudes as well as problem solving skills related to the different integrated learning themes as incorporated for instance in Cameroon 2018 new curriculum. According to the 2018, primary school curriculum, five components of mathematics had been identified: Sets and Logic, Numbers and Operations, Measurement and Size, Geometry and Space, Statistics and Graphs. This subject has been developed from domains that were derived from the following national core skills.

• Use of basic notions in Mathematics, Science and Technology

• Practice of lifelong learning and the four broad-based competences.

Primary School learners need these in computation, logical thinking and problem solving to construct knowledge and understand the world around them. (Cameroon Primary School Curriculum English Subsystem - Level III: Class 5 & Class 6 p.26). The mathematics curriculum represents the total experiences to which the learners must be exposed to components of the subject, units/contents, suggested methodology (Teaching/Learning

Strategies) and didactic materials, expected terminal learning outcomes and evaluation criteria guide as indicated below in Table 17 and Table18 respectively.

Table 17: Mathematics contents, expected learning outcomes, suggested methodology and didactic materials

Class 5		Class 6		Suggested Methodology And Didactic Materials	
Units/Contents Expected	**Expected Learning Outcomes**	**Units/Contents**	**Learning Outcomes**	**Teaching/Learning Strategies**	**Didactic Materials**
Types of sets - Finite/infinite - Universal - Subsets -Equal/equivalent -Disjoint sets -Intersection of sets - Venn diagrams	-Discriminate sets -Describe sets -Solve problems involving sets -Represent sets in Venn diagrams - Arrange belongings in an orderly and neat manner	**Types of sets** -Universal set -Subsets - Intersection of sets -Finite/Infinite sets -Equal/equivalent sets -Disjoint sets -Venn diagrams	- Solve problems involving sets - Describe various types of sets - Represent sets in venn diagrams - Arrange belongings in an orderly and neat manner	-Discovery method -Problem Solving method -Laboratory method -Cooperative learning - Individualized instruction - Task approach	Real objects -Audio video tapes -Pictures -Charts -Recycled materials -Abacus
		Numbers and operations			
Operations -Six digit numbers (0 - 100,000) - Mathematical operations -Simple interest, rate, time and principal -Direct and Inverse proportion -Number bases -Modulo arithmetic -Cumulative properties and law of addition and subtraction	- Read numbers - Write numbers in words - Make bonds - Solve problems using all mathematical operations - Build multiplication tables - Calculate simple interest, rates, time and principal - Solve problems based on proportions - Convert from one number base to another - Solve	**Operations** -Seven-digit numbers (0 - 1,000,000) -Decimal numbers -Fractions -Mathematical operations -Simple interest, rate, time and principal -Direct, inverse and compound proportion -Number bases -Cumulative law of addition -Place value -Highest	-Read numbers -Write numbers in words -Set up bonds -Solve problems involving vulgar and decimal fractions -Use mathematical operations to solve real life problems -Cherish equitable distribution	Discovery method - Guided inquiry - Problem solving method - Laboratory method - Cooperative learning - Individualized instruction	Real objects - Audio video tapes - Pictures - Abacus - Recycled materials - Clock face - Maths set - Calculator -Real objects -Audio video tapes -Abacus -Charts -Recycled materials -Calculator

- H C F of numbers up to 100,000 - Odd, even and prime numbers **Fractions and decimals** - Proper fractions - Mixed fractions - Improper fraction - BODMAS - Decimals and whole numbers	problems involving modulo arithmetic - Show interest in Mathematics - Solve problems involving fractions - Convert mixed fractions to improper fractions - Convert improper fractions to mixed fractions - Solve problems involving decimals and whole numbers	common factors (HCF) Lowest Common Multiples of numbers up to 1,000 -Fractions -BODMAS -Decimals and whole numbers	- Place numbers under M, H/Th, TTh, Th, H T & U - Solve problems involving factors and multiples - Describe LC M and H C F of numbers - Solve problems involving fractions - Show interest in solving real life problems		
		Measurement and size			
Metric System -mm, cm, dm, m, km ml, cl, dl, litres g, Kg -Shapes (rectangle, square, triangle, trapezium, parallelogram etc) **Calendar** Ordinary and leap year 13 Lunar months 12 Calendar months **Time** -seconds, minutes, hours, Days, week -Distance, Speed and Time -World time zones	-Convert from one unit to another -Calculate areas and perimeters -Associate specific activities to different periods of the day/ year - Solve problems involving Distance, speed and time -Calculate the various time zones - Use money	**Metric System** -Length, width, Height, weight and capacity -Shapes **Calendar** -Ordinary and leap year - 13 Lunar months **Time** -Distance, speed and time -World time zones **Money** -Cost price, selling price, profit and loss, discount.	Convert from one unit to another -Calculate areas and perimeters -Associate specific activities to different periods of the day/year - Solve problems involving Distance, speed and time -Calculate the various time zones - Use money appropriately	Discovery Method -Problem Solving Method -Laboratory Method -Cooperative Learning Strategy -Individualized Instruction -Team Teaching -Target Task Approach -Multiple Intelligences Teaching Approach -Discovery method	Convert from one unit to another -Calculate areas and perimeters -Associate specific activities to different periods of the day/year - Solve problems involving Distance, speed and time -Calculate the various time zones - Use money appropriately - Show interest in being punctual - Show awareness of changes in time in different parts of the world

Money -Shopping bills -Foreign currency -Cost Selling price -Profit and loss -Curves and lines positive & negative numbers from 0 to 30 -Parallel and intersecting lines -Patterns with 2, 3 D shapes. -Triangles, rectangles, squares and circles. -Types of angles (right, obtuse, acute, isosceles) -Mathematical set and content -Quadrilateral, pentagon, hexagon, trapezium, prism	appropriately - Show interest in being Punctual -Draw curves and lines -Differentiate between parallel and intersecting lines -Complete patterns using 2 and 3 dimensional shapes -Measure angles using a protractor -Calculate the area and circumferenc e of circles -Manipulate objects, shapes, letters, and figures in puzzles - Construct diff erent models using plane and other shapes - Show interest in engineering and construction	-Curves and lines Number line: positive & negative numbers from 0 - 50 -Parallel and intersecting lines -4 D shapes -Mathematical set and content -Quadrilatérals, pentagon, hexagon -Trapezium, prism, cylinders, cone, sphere, cube -Cylinders, cone, sphere, cube	- Show interest in being punctual - Show awareness of changes in time in different parts of the world -Draw curves and lines -Differentiate between parallel and intersecting lines -Complete patterns using multiple dimensional shapes -Measure angles using protractor -Calculate the area and circumferenc e of circles -Manipulate objects, shapes, letters, and figures in puzzles -Construct different models using plane and other shapes - Show interest in engineering and construction	-Guided inquiry method -Problem solving method -Laboratory method -Cooperative learning -Individualized instruction	-Real objects -Pictures - Bacus -Charts -Recycled materials -Maths set -Calculator -Cardboard -Cartons
			Graphs and statistics		
Data management - Picture	-Represent data using pictures	**Data management** -Picture	Represent data using pictures - Solve	-Discovery Method -Problem Solving Method	- Pictures - Charts - Models

representation -Number line -Ranking - Mapping - Referencing -Coordinates -Frequency distribution -Mean - Tallying - Graphs (Bar charts, pie charts, histogram,)	-Locate assigned points on a number line - Arrange in ascending and descending order - Locate points on a map -Interpret relationships on maps -Locate places given the Y and X-axis -Represent data on charts - Show interest in keeping accurate records	representation -Number line -Ranking - Mapping - Referencing -Coordinates -Frequency distribution -Mean - Graphs (Bar charts, pie charts, histogram, tallying)	problems involving the number line - Arrange in accending and descending order - Interpret relationships on maps -Locate places given the Y- and X- axis -Represent data on charts - Show interest in keeping accurate records - Show willingness in planning activities	-Laboratory Method -Cooperative Learning -Individualized Instruction	- Maths set

SOURCE: Cameroon Primary School Curriculum *English Subsystem - Level III: Class 5 & Class 6(2018 pp. 51-53)*

Evaluation Criteria

The terminal learning outcomes and the evaluation criteria are illustrated in table 18.

Table 18: Terminal learning outcomes and evaluation criteria

Terminal Learning Outcomes	Evaluation Criteria
- Solve problems involving sets and logic - Solve problems involving number operations - Solve problems involving measurement units - Construct different geometric shapes - Categorize statistics on graphs - Use mathematical skills in daily life - Show interest in mathematics	- Group, match and classify objects and numbers in sets using different attributes - Correct representation of sets, symbols and figures - Correct use of symbols, signs and diagrams - Ordering and consistency - Identifying and building geometric shapes - Manipulating statistical information on groups - Appropriate use of operations and formulae - Associating quantities to figures and symbols - Proper use of mathematics tools - Solve meaningful daily life problems

Source: Cameroon Primary School Curriculum *English Subsystem - Level III: Class 5 & Class 6(2018 p. 27)*

2.3 Theoretical Framework

The intent of this section is to provide an overview of instructional, learning and measurement theories suggested by Psychologists and Measurements Experts in relation to learning in general and assessment of mathematics in particular. Theories help teachers to conceptualize learner communication, promote interpersonal relationships between teachers and learners, help teachers to implement professional ethics and have an impact on how teachers regard themselves. Instructional theories entail active learner participation in responding to instructional stimuli with immediate feedback as a positive reinforcement. Instructional theories have been seen as the conglomeration of small, incremental steps sequenced to link information in a logical order (Tennyson, 2010). The importance of learning theories is summarized by Ertmer and Newby (in Steyn, 2003 p.79) when they remark that: "Learning theories provide instructional designers with verified instructional strategies and techniques for facilitating learning as well as a foundation for intelligent strategy selection." In this regard Owens (1995 p.158) states, *"No discipline can claim uniform agreement on the theoretical framework for teaching and learning"*. Romberg (1988) alludes to the fact that there are many theories because the way humans learn is extremely complex. Romberg (1998 p.23) states the following reasons in support of his remarks:

- Lack of general agreement on the definition of learning;
- Different kinds of learning;
- Different philosophical assumptions about the nature of the learning process

Philips, Kennedy and McNaught (2012) related that the characteristics of a theory are that, it is derived from empirical evidence or from other theories; that it can provide a generalized explanation of a phenomenon to the accuracy of the evidence, sometimes based on a model, framework or analogy and it can predict the behaviour of another instance of the phenomenon. In relationship to the research topic, the researcher identified about seven theories while reviewing literature. However, the researcher anchored on five of the theories in regards to this study, behaviourist, cognitivist, constructivist in relations to Piaget"s theory of cognitive Development, Brunner's cognitive theory of learning and Kolb's Experiential Learning theory); the social constructivist theory of Lev Vygotsky and Tara's measurement theory**.** Reasons being that, the researcher has chosen to concentrate on theories that are seemingly significant in influencing the way mathematics is currently taught and evaluated in primary schools. Each of the theory represents a particular view of knowledge. To explain why we need to bring learning theories into the discussion of assessment, consider the three main theories and their simple formulation (Watkins, 2003):

- Behaviorism: “Learning is being taught”
- Cognitive constructivism: “Learning is individual sense-making”
- Socio-cultural constructivism: “Learning is building knowledge as part of doing things with others.” The researcher agrees with the opinion expressed by Maree (1997) that each theory is valid to a certain extent. These different theories have identified different principles of learning, instruction in relation to mathematics’ competency based assessment practices.

2.3.1-The Behaviourist Orientation of Learning

Behaviorism describes a view of learning in which behaviors are formed by a system of rewards and punishments, so learning can be controlled externally and motivation is almost entirely extrinsic. A feature particularly relevant to assessment is that complex behaviors are deconstructed into parts, which can be taught, practiced and assessed separately. This view, then, is consistent with tests of disconnected facts and skills, where speed is of the essence and answers are either correct or incorrect.

In Cameroon, the behaviorist learning theory has a long tradition in education policies. Many aspects of general and special education such as curriculum, pedagogy and assessment have been shaped by the principles of behaviorist learning theory. According to Leonard (2002 p.38), in behaviourism learners are placed in a controlled environment in order to be directed to a specific set of behavioural changes based on a set of predetermined, instructor-based objectives. Behaviorists promote the theory that the acquisition of knowledge is aided by rewarding a correct response (positive reinforcement) rather than punishing an incorrect response (negative reinforcement). The behaviorists, according to Smith (1999) view learning as a change in behavior and the purpose of learning is to produce a behavioral change in a desired direction. Similarly, James (2006) explains that behaviorist theorists are interested in observable behavior and claim that this is sufficient. From this perspective, achievement in learning is often equated with the accumulation of skills and the memorization of information (facts) in a given domain, demonstrated in the formation of habits that allow speedy performance. Performance is usually interpreted as either correct or incorrect, poor performance is remedied by more practice in the incorrect items, sometimes by deconstructing them further, and going back to even the basic skills. The teacher’s role is to arrange the environment to elicit the desired responses and assessment is used to ascertain whether all pupils, including lower attainders, have achieved the desired responses. The implication is that the teacher's role is to train pupils to respond to instruction correctly and rapidly. With respect to assessment, the implications are that progress is measured through unseen timed tests with items taken from progressive levels in a skill hierarchy. According to Katie L. McClarty and Matthew N. Gaertner (2015 p.17), Harris et al. (1995, pp. 16-17), B.F Skinner (1953) is the major proponent of this theory. He suggests that there can only be speculation as to what occurs during the learning process, and therefore the only way to assess this process is to evaluate a person's behavior or performance as they learn. Learning is viewed as change in behaviour (or performance) and the changes in scores on some measure of performance are often used as evidence of learning.

B.F. Skinner's contribution to learning theories is based upon the idea that learning is a function of change in overt behaviour. According to Skinner, changes in behaviour are a result of individuals' responses to events, or stimuli that occur in their environment. When a stimulus-response (S-R) pattern is rewarded, the individual is conditioned to respond similarly in the future. The central tenet of Skinner's work is that positively reinforced behaviour will reoccur. This is why information is presented in small amounts. Responses can be reinforced, and reinforcement will be applied to similar stimuli. The key to Skinner's theory is reinforcement, or anything that strengthens the desired response. This could include praise, good grades, a reward or even a feeling of accomplishment. Of course, negative reinforcement occurs when a stimulus results in increased response when it is withdrawn. Skinner's work in operant conditioning has been integrated into both classroom management and instructional development. When applied to programme instruction, the following should occur:

- Practice should occur in a question-answer format that exposes students to information gradually through a series of steps.
- The learner should respond each time and receive immediate feedback.
- Good performance should be paired with secondary reinforces like praise, prizes and good grades.
- Instructors should try to arrange questions by difficulty so the response is always correct, creating positive enforcement.

Harlen (2006a) also suggests that since behaviorism is based upon the principle of reinforcing required behavior with rewards and deterring unwanted behavior with punishments, pupil assessment is generally used as the vehicle for applying these rewards and punishments endorses this view. For their part, Torrance and Pryor (2002) state that in this model, teachers decide on the subject matter, provide instruction, pace the lesson, correct, assess and reinforce pupils' responses. In this context, pupils play a passive role in their assessment. However, Sebba, Byers and Rose (1993) explain that adherents to behavioral approach to teaching identify three suppositions, which lie behind the methodology. One of the suppositions is that, in order to be effective, teachers need to prescribe clear objectives for learners. A neat cyclical process is proposed whereby teachers establish and maintain control over the learning process. Teachers assess learners; set objectives that describe, in terms of observable behaviors, the learners' next steps on the learning ladder; and make records, on the basis of new assessments, of progress measured against performance criteria which are teacher-defined in the first place.

2.3.2 -The Cognitive Orientation to Learning (Cognitive learning theories)

Behaviourism focuses mainly on the outcome of learning whereas the cognitive learning theories focus on the process of learning. Cognitive theories of learning emphasize that learners are ultimately responsible for their own understanding through active construction of meaning (Bigge&Shermis, 1999). It is clear that instructional theory among the most important aspects of teacher education. **There are four cognitive approaches to learning.**

2.3.2.1 Social Cognitive

Albert Bandura borned in 1925 and presently alive is considered the proponent of this theory. He is a renowned psychologist. Albert Bandura posits that people learn from one another, via observation, imitation and modelling. The four steps in social learning theory of bandura are attention, retention, reproduction and motivation. The social cognitive views the learning process as an interaction and observation in the social contexts. Here the focus of learning is on the relationship between people and the environment. The purpose of education involves full participation in communities of practice and uses of resources.

2.3.2.2- Cognitive Information Processing

Gagne (in Maree, 1997 p32) defines learning as follows: "Learning in human disposition or capability, which persists over a period of time, and which is not simply ascribable to processes of growth”. In developing his information-processing model of teaching, Gagne first lists five major categories of learning capabilities, namely intellectual skills, cognitive strategies, verbal information, motor skills and attitudes (Bigge&Shermis, 1999). Gagne regards these categories as educational outcomes and as descriptive of possible different kinds of human performance. Gagne’s theory implies that skills in mathematics are analysed according to learning hierarchies. This approach focuses on low learners’ process information through attention, memory, thinking and other cognitive processes. The focus of learning is in internal cognitive structuring. The purpose in education is to develop capacity and skills for better learning.

2.3.2.3- Cognitive Constructivism

Constructivism is a theory of knowledge with roots in philosophy, psychology, and cybernetics (Jaworski, 1994). In the same light, according to, Somekh and Lewin (2005, p. 344), “Constructivism is the term used to describe a theory of knowledge which stresses the active process involved in building knowledge rather than assuming that knowledge is a set of unchanging propositions which merely need to be understood and memorised.” Knowledge is assumed to exist in the heads of people and the thinking subject constructs it based on their experiences in their social and cultural contexts (von Glasersfeld, 1996). The cognitive constructivist worldview dictates that the search for knowledge is the search for how the world really works and the value of knowledge is determined by its correspondence with the real world (Prawat & Floden, 1994). Learning, according to the cognitive constructivist theorist, requires the active engagement of learners and is determined by what goes on in people’s heads. Harlen (2006a) states that the constructivists’ view of learning focuses attention on the processes of learning and the role of learners. Teachers engage pupils in self-assessment and use their own assessment to try to identify their current understanding and levels of skills.

Cognitive constructivism views learning as constructed by learners themselves and influenced by their existing knowledge. The aim is understanding, which is seen as occurring when new experience is incorporated into an existing or new model. The active participation of students is seen as paramount because, as widely quoted, ‘they do the learning’. Constructivist views of learning underpin formative assessment, but there are few examples of summative assessment being based on a constructivist view of learning, although there are some attempts through computer adaptive testing and screen-based concept-mapping (Osmundson *et al.*, 1999). Debate and research on this theory have brought about its two offshoots, namely radical and social constructivism. In the following section radical and social constructivism are defined.

2.3.2.3.1 Radical Constructivism

According to Glasersfeld (in Jaworski, 1994 p.15) radical constructivism asserts two main principles, which state that:

(a) "Knowledge is not passively received but built up by the cognizing subject;

(b) The function of cognition is adaptive and serves the organisation of the experiential world, not the discovery of ontological reality." (von Glasersfeld, 1996, p. 18).

Jean Piaget (1896 -1980) is the proponent of the theory. He was a Biologist who originally studied mollusks but moved into the study of the development of children understanding, through observing them and talking and listening to them while they worked on exercises he set (Joubish & Khurram, 2011). To understand it better, Atondo.G et al (2019 pp.20-22) present Piaget's Theory of Cognitive Development, Brunner's theory of instruction and Kolb's Experiential Learning. Generally, Piaget's work consist of two principal parts; first his **theory of adaptation and the process of using cognitive schemes;** second, his **theory of cognitive developmental stages.** The first aspect deals with the concept of schema**, assimilation, accommodation and equilibrium.**

2.3.2.3.1 .1. Piaget's theory of adaptation and the process of using cognitive schemes

To Piaget, intelligence is represented by how an organism interacts with its environment through mental organization or structures (Schema) that an individual uses to represent the world, driven by a biological impulse to obtain balance (equilibrium) between those mental structures and the environment (Lutz & Huitt, 2004). According to Piaget (in Bigge & Shermis, 1999 p.18) the key processes in the stages of child development are assimilation and accommodation. Assimilation consists of the modification of the input from the environment. In this process, new knowledge meshes with the child's existing insight. Accommodation consists of the change in the child's internal patterns of understanding to fit reality. In this process, existing internal insights are reconstructed to "accommodate' new information. This theory proposes that knowledge is acquired by the continuous refinement of schemata, in which, understanding formed by past experiences and new experiences are evaluated. Utilization of continuous assessment is an indication to make students construct true cognitive structures.

The second aspect posited four major stages of cognitive development that occurs over a lifetime, namely: **Sensorimotor, pre-operational, concrete operational and formal operational.**

2.3.2.3.1.2. Piaget's Theory of Cognitive Development

Piaget‟s theory states that children must continually reconstruct their own understanding through active reflection on objects and events until they eventually achieve an adult perspective (Gillani, 2013). Piaget's theory of cognitive development as a philosophical and theoretical foundation provides answers to the questions of "why" and "how" specific pedagogy, including the administration of continuous assessment should be employed. Piaget believed that students construct knowledge by transforming, organizing and reorganizing previous knowledge and information. Consequences for the study of cognitive development and learning, namely knowledge is not passively received by learners but actively built up by the teachers and learners in the acquisition of knowledge is an adaptation process during which learners reorganize their experiential world. Piaget (in Maree: 1997) do not accept that learning is subordinate to development. Piaget's theory is important in assessing readiness for learning in school. According to Piaget, children cannot learn certain concepts until they are at a particular stage of development. He argues that teachers should understand that each individual child's cognitive development does not occur quickly and little, if any progress may be assessed on weekly or even monthly basis. To assess the progress, the teachers should be guided by such questions as: How little or how much of the curriculum does a learner know at the beginning of school year? What changes occur in the behaviour of the learner during and at the end of the school year? What are the individual learner's interest, aptitudes and achievement –at the beginning, during and at the end of the instructional programme?

He argues that the mental development of any child consists of a succession of four mental stages of learning which include the following :

-Sensorimotor: According to Piaget, the sensorimotor stage (birth to 2 years old) begins with the reflex actions of infants and proceeds through the development of basic concepts such as time, space and casualty. The sensorimotor stage ends with the beginning of symbolic thought in the child.

- The **pre-operational** stage (from 2 to 7 years) is characterized by the development of symbolic thinking and language.

- The **concrete operational** stage (from7 years to twelve years or adolescence) is marked by a significant increase in the child's ability to analyse and classify patterns according to the attributes of events and objects (Gillani, 2013). At this stage, children attain the cognitive ability of reversal and generalization. In the concrete operational period children learn to do what they had learnt previously through physical action**.**

-The **formal operational stage** (adolescence to adult) is marked by the ability to handle abstraction. Individuals at this stage can control variables systematically, test hypotheses and make inferences. One focal fact that emerges from an in-depth study of Piaget's work is the provision of frame of reference by which educators and educational technologists can analyse the behaviour of a learner and design instructional environments within which students can control their own knowledge (Gillani, 2013). Learners in the formal operational stage function on an abstract level that is an adult level of thinking and not bound by concrete experience. In addition, how effective are instructional methods for each individual learner? Piaget emphasizes social interaction. Children must be involved in the learning process and assessed individually based on each learner's ability. The use of continuous assessment involves using criteria to judge the adequacy of a problem solution. For example, the learner can follow a predetermined rubric to judge the correctness of his solution to a problem. Assessment leads to formulating hypotheses about future events, assuming one's problem solving is correct thus far. Piaget's cognitive constructivism provides that criteria for judgment (Gardner, 2005). Piaget's theory also provides a profound coherence and understanding in changing teaching practices and standards that are imperative to the choice and employment of assessment and instructional scaffolding techniques. Piaget (cited in Maree, 1997) is of the opinion that the learners master insight into the basic structure of mathematics and an execution of mathematical operations when they construct their interactions within their physical, social and cultural environment. Piaget's model implies that, teachers should provide support for students to explore their world and develop understanding.

2.3.2.3.1.3 Bruner's Cognitive Theory of Learning

Jerome Bruner (October 1st, 1915 –June 5, 2016) was an American Psychologist who made significant contributions to human cognitive psychology and cognitive learning theory in educational psychology. Bruner was born blind (due to Cataracts) in New York City. An operation at the age of two restored his vision (Bourgoin, 1997). As an adjunct Professor at NYU School of law, Bruner studied how psychology affects legal practice. A Review of General Psychology Survey published in 2002, ranked Bruner as the 28th most cited psychologist of the 20th Century. Bruner is one of the pioneers of cognitive psychology in the United States, which began through his own early research on sensation and perception, has been active, rather than passive processes (Bruner, 1947).

According to Bruner, the outcome of cognitive development is thinking. The intelligent mind creates from experience "generic coding systems that permit one to go beyond the data to new and possibly fruitful predictions" (Bruner, 1947). Thus, children as they grow must acquire a way of representing the "recurrent regularities" in their environment. To Bruner, important outcomes of learning include not just the concepts, categories and problem-solving procedures invented previously by the culture, but also the ability to „invent" these things for oneself. Cognitive growth involves an interaction between basic human capabilities and culturally invented technologies that serve as amplifiers of these capabilities. As a result, the aim of education should be to create autonomous learners. In his research on cognitive development of children (1996), Jerome Bruner proposed three modes of representation namely; **Enactive (action-based), Iconic (image-based) and Symbolic (language-based)** representations. Modes of representation are the ways in which information or knowledge are stored and encoded in memory.

In the Enactive (0-1 year) involves encoding action based information and storing it in the memory. The child represent past events through motor responses. This is not just limited to children, adults too can perform a variety of motor tasks (such as typing, sewing, operating a lawn mower)that they would find difficult to describe in picture or word form.

The iconic representation (1-6 years) is where information is stored visually in the form of images (a mental picture in the mind's eye). For some, this is conscious; others say they do not experience it. This is why it is important to have diagrams or illustrations to accompany verbal information when learning a new concept.

In the symbolic (7 years onward), this develops last. It is where information is stored in the form of a code or symbol such as language. Symbolic is the most adaptable form of representation for actions and images have a fixed relation to that which they represent.

Symbols are flexible because they can be manipulated, ordered, classified and so on. Bruner’s theory suggests it is effective when faced with new materials to follow a progression from enactive to iconic representation (Bruner, 1961).

2.3.2.3.1.4 Brunner’s theory of Instruction

Jerome Brunner’s does not describe what happens when you learn but he prescribes what should be done if the learners are to learn successfully. His theory of instruction tells the teachers what to do in order to ensure successful teaching. He brought forward four principles of instructions.

A- Principle of motivation

Brunner insisted that it is good to provide extrinsic motivation.

B- Principle of structure

He insisted that, any subject can be taught to any individual provided the structure (organization of the material is well laid out.

C- Principle of sequence

The order to which information is presented can facilitate learning comprehension. If information is presented in a disorderly manner, it will be difficult to be understood by the learners.

D- Principle of reinforcement

The, reinforcement means feedback. It is very important to provide feedback to learners. The feedback should be given in time. Learners construct knowledge and understandings within a social context. Bruner’s notion of “scaffolding” elaborated on the kinds of social support that would assist a child in performing a task that would otherwise be out of reach; these supports include engaging interest, simplifying the problem, maintaining direction, marking critical features, reducing frustration, and demonstrating (Wood, Bruner, & Ross, 1976).

Another focal point of Bruner’s work is the concept of discovery learning (Bruner, 1961), Bruner proposes that, learners construct their own knowledge and do this by organizing and categorizing information using a coding system. He believed that, the most effective way to develop a coding system is to discover it rather than being told by the teacher. The concept of discovery learning implies that students construct their own knowledge for themselves; this is known as constructivist approach to learning. To Bruner, the role of the teacher should be to facilitate the process by designing lessons that help students discover the relationship between bits of information rather than rote learning. While Bruner has influenced education greatly, it has been most noticeable in Mathematical education. The theory is useful in teaching Mathematics which is primarily conceptual, as it begins with a concrete representation and progresses to a more abstract one. Initially, the use of manipulative in the inactive stage is a great way to hook students who may not be particularly interested in the topic. Furthermore, Bruner's theory allows teachers to be able to engage all students in learning process regardless of their cognitive level of the concept at the moment (Brahier, 2008). In the same vein, Continuous Assessment will be diversified since there are various stages in representation of information. This can help the students to do better as one will not be entirely weak in all aspect of learning and assessment. According to Bruner, important outcomes of learning include not just the concepts, categories, and problem-solving procedures invented previously by the culture, but also the ability to "invent" these things for oneself. Thus, the basic aim of education and assessment should be to create autonomous learners. Again, in assessing the learners, teachers should adopt numerous approaches in order to let the students have variety of tasks to perform.

2.3.2.3.1.5 Kolb's Experiential Learning

Theory David A. Kolb (born 1939)is an American educational theorist whose interests and publications focuses on experiential learning, the individual and social change, career development, executive and professional education. He is the founder and chairman of Experience Based Learning Systems, Inc (EBLS) and an Emeritus Professor of Organizational Behaviour in the Weather Head School of Management, Case Western Reserve University, Ohio.Kolb‟s Experiential Learning Theory (ELT) was propounded by David A. Kolb in 1984 (Kolb, 1984). He was inspired by the work of Kurt Lewin who was a gestalt psychologist in Berlin. Experiential learning theory is a method where person's skills and job requirement can be measured. Kolb‟s experiential learning theory is based on the following principles:

1. Emphasis is on how learning can be applied.
2. Relate to participant's goals.
3. Relate to participants‟ past experience.

4. Encourages debate and challenges ideals.
5. Respect for the opinions of participants.
6.Encourages all participants to be a resource for the instructor and the group.
7. Treat participants like adults.
8. Gives the participants elements of control

Kolb’s experiential learning theory works on two levels; a four-stage cycle of learning and four separate learning styles (Mcleod, 2013). Kolb’s theory has a holistic perspective that includes experience, perception, cognitive and behaviour.

Experiential Learning Cycle

The learning cycle involves four stages namely; concrete learning, reflective observation, abstract conceptualization and active experimentation. Effective learning can be seen when the learner progresses through the cycle. The learner can also enter the cycle at any stage of the cycle with logical sequence (Antherton, 2013).The first stage is concrete learning, where there is encounter of new experience or interpretation of existing experience. Then it is followed by the next stage of reflective observation, where one reflects on the experience on personal basis. After this, the abstract conceptualization, where new ideas are formed based on the reflection or could be modifications of the existing abstract ideas. Lastly, active experimentation stage is where a learner will apply the ideas to his surroundings to see if there are any modifications in the next appearance of the experience. All these lead to concrete experience. This can happen over a short duration or over a long duration of time.

The learning characteristics are concrete experience and active experimentation. According to Kolb (1984), *“learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it”.* Kolb also developed the following six main characteristics of experiential learning:

1.Learning is best conceived as a process, not in terms of outcome.
2. Learning is continuous process grounded in experience.
3. Learning requires the resolution of conflicts between opposing models of adaptation to the world (learning is by its very nature full of tension).
4. Learning is a holistic process of adaptation to the world.
5. Learning involves transaction between the person and the environment.

6. Learning is the process of creating knowledge that is the result of the transaction between social knowledge and personal knowledge.

Kolb's learning cycle and styles can be represented diagrammatically as shown below:

Figure 9: Kolb's Learning Cycle

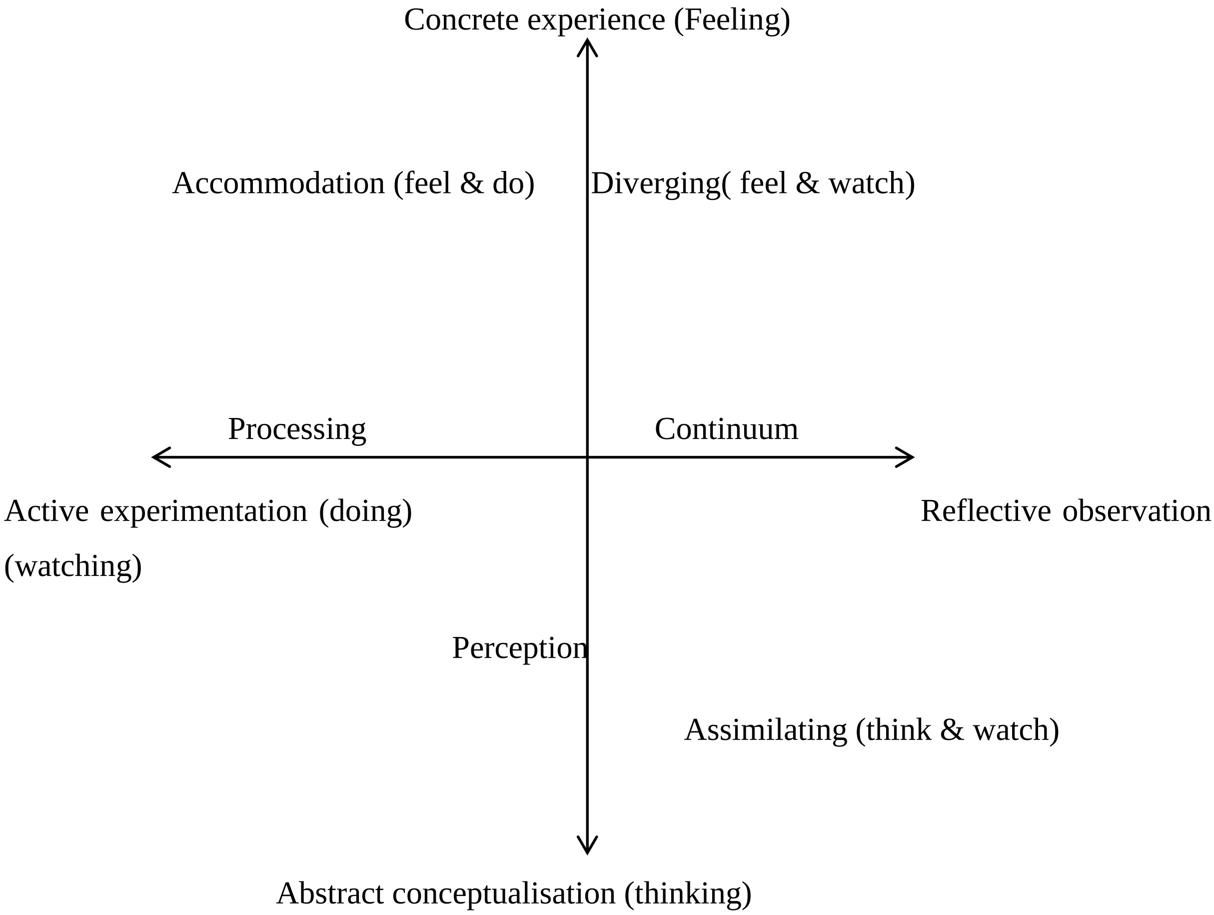
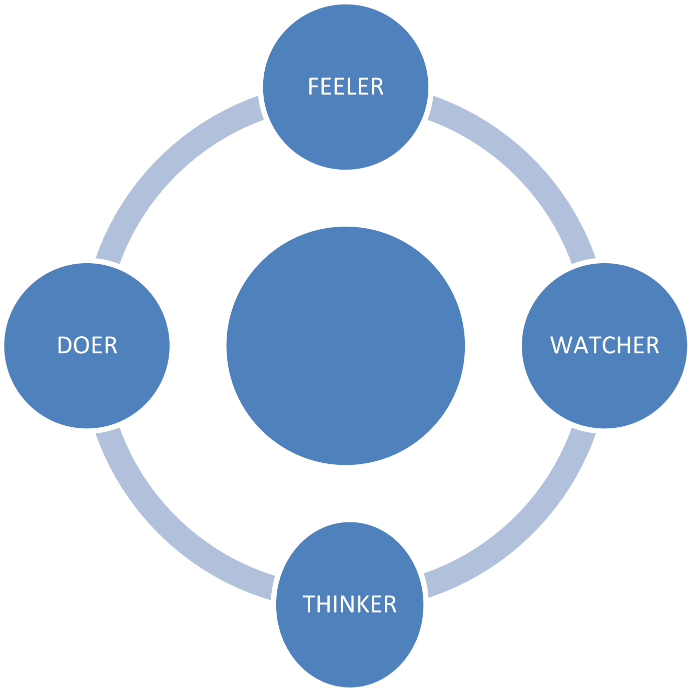


Figure 10: Kolb's Learning Styles



In assessing students, Kolb's theory is of great impact because it helps teachers to develop more appropriate learning opportunities for the learners (Atherton, 2013). Teachers should also design activities that will give opportunities to all the learners to learn in the best way which suites them. This enhances their performance. In the same vein, the activities carried out should make the learner to go through the whole process of experiential learning cycle. As students are given numerous learning opportunities, there is positive relationship between the continuous assessment and their performance.

2.3.2.3. 2 The Social Constructivist Approach of Theory

Although earlier, Piagetian versions of constructivism focused on individual developmental stages or processes (Eisenhart et al., 1996), over time, cognitive psychologists have come increasingly to take seriously the influence of social processes. In socio-cultural constructivist perspectives on learning, there is also a focus on understanding but through 'making sense of new experience with others' rather than by working individually. In the situations the individual takes from (internalises) a shared experience what is needed to help his or her understanding, then externalises the result as an input into the group discussion. There is a constant to-ing and fro-ing from individual to group as knowledge is constructed communally through social interaction and dialogue. Within a social and cultural context (Greenfield, 2009; Rogoff, 1998, 2003; Vygotsky, 1978); as building new knowledge on what they already know (i.e. prior knowledge) Bransford, Brown, & Cocking,(2000); and as developing the metacognitive skills necessary to regulate their own learning (Bransford et al. 2000; Bruner, 1985; Vygotsky, 1978). Modern views of science education reflect this approach, emphasising inquiry, thinking scientifically, building models, engaging in argumentation and critical reflection, through working in groups, sharing ideas communicating in a variety of modes. Clearly, there is little in common between this view of learning and what is represented in traditional modes of assessment where students sit in isolation from one another in an examination room.

Social constructivism as a learning theory can be applied to any school subject including mathematics. This research was anchored on the theory of social constructivism as a possible philosophy of mathematics education. Mathematics is viewed as the theory of form and structure that arises within language. From a sociocultural constructivist perspective, learners are seen as actively constructing knowledge and understanding through cognitive processes (Piaget, 1954). There is no doubt that the origins of mathematics are social or cultural, hence mathematics can be viewed as a social construction and a cultural product. Its justification can be tested through quasi-experiments whose results can be right or wrong. Social constructivism as a philosophy of mathematics explains the obvious usefulness and objectivity of the subject. The concepts of mathematics can be derived by abstraction from direct experience of the physical world, from reflecting upon those experiences and then generalizing or negotiating meaning with others during discourse (Ernest, n.d.). Mathematics is also a language of communication and children acquire mathematical concepts first through their mother tongue and later through other languages. Social constructivism therefore offers the possibility of a philosophy of mathematics that accounts for the objectivity and utility of the subject as well as its fallibility and culture-boundedness. Teachers and pupils should not view mathematics as too rigid, alien or 'already discovered.' Mtetwa (1999) said there should be a *'shift in orientation'* in which teachers need familiarization and understanding of the main characteristics of constructivist thinking. He believes that if teachers' teaching plans are based on a theoretical framework, they stand a better chance of being improved upon through scrutiny and debate. He viewed mathematics as a social construction, a cultural product and one that is fallible as opposed to the radical constructivist views. However, social constructivists also believe that personal theories resulting from our experience of the world must fit social and physical reality. It is believed that, it can be achieved by a cycle of theory – prediction – test – failure – accommodation – new theory. This cycle gives rise to the socially agreed theories of the world and social patterns and rules of language use.

Balacheff (1990) characterized the learning and teaching of the mathematics process as a relationship between two hypotheses, namely Constructivism and Epistemology and two constraints namely the nature of mathematics knowledge and the nature of the classroom. According to Balacheff (1990), the **constructivist hypothesis** states that the learner, not passively received, constructs knowledge and that one comes to know by an adaptive process of organizing one's experiences rather than by perceiving some external reality. In relation to **epistemological hypothesis,** Balacheff (1990) said mathematical knowledge is developed through solving problems. Problems set the stage for construction of knowledge by establishing the need for mathematical knowledge and the context in which mathematics is learned. Under this, hypothesis problems only generate mathematical knowledge to the extent that learners perceive the problem as their own. Taken together, **constructivist** and **epistemological** hypotheses imply the centrality of the process of developing responsibility for learning from the teacher, where it has traditionally resided to the learner. He also suggested a view of learning and knowledge as a private domain intrinsic to the individual. According to Owen (1995), this view of learning and knowledge conflicts with two constraints inherent in the teaching process and in mathematics outside the classroom.

- Mathematical knowledge is social knowledge.
- The mathematics class exists as a community.

Since mathematics education (unlike pure disciplines) is heavily influenced by cultural, social and political forces, this study will be guided by the social constructivist learning theory as propounded by Lev Vygotsky, Paul Ernest, among others Drew (2012)(Salema 2014).

2.3.2.2.1 Social constructivist theory of Lev Vygotsky (1896-1934)

According to Salema (2014), social constructivist theory is informed by the work of Lev Vygotsky (1896-1934). Vygotsky believed that learning could not be separated from social context. Vygotsky believed students construct through social interactions with others. The content of his knowledge is influenced by the culture in which includes language, beliefs and skills. Vygotsky (1978) maintains that culture, social instructions and customs are the dominant factors in a child's cognitive development, especially in the area of thought and language. The process of complexity and adaptation among children according to Vygotsky is influenced by such factors as the home environment, peer relationships, the food they eat, the clothes they wear and the mastery of language (Henson & Eller, 1999). This suggests that the changing social characteristics of disadvantaged learners can affect their cognitive development. It is essentially a theory about how people socially construct knowledge. Works of Vygotsky (1962, 1978) was based on current conceptualizations of the sociocultural aspects of constructivist learning theory and had been widely applied to models of formative assessment. Some profound implications for assessment also follow from the view proposed by Vygotsky (1978) that for any learner there is an area just beyond current understanding where more advanced ideas can be used with help. Vygotsky called this area the ‘zone of proximal (or potential) development'. It is, in essence, what we have called the ‘next step' that the student can be expected to take identified through formative assessment. ‘Scaffolding’ is an apt term used to describe helping students to take this next step in understanding through introducing new ideas or better scientific practices and providing vocabulary that enables students to express their ideas more precisely. Recognising that, in the company of other learners, students can exceed what they can understand and do alone, throws into doubt what is their ‘true’ level of performance. Is it the level of ‘independent performance’ or the level of ‘assisted performance’ in the social context? It has been argued that the level of performance when responding to assistance and the new ways of thinking provided by others gives a better assessment than administering tests of unassisted performance (Grigorenko, 1998).

The four principles of social constructivism as propounded by Vygotsky in Social Constructivist Theories (2013) are that,

1. Learning and development is a social collaborative activity,
2. According to Vygotsky, the zone of proximal development “is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (1978, p. 86). The ‘Zone of Proximal Development’ in simple terms is Vygotsky’s idea that students can master concepts which they cannot understand on their own if they get help from adults or students who are more advanced. Vygotsky argues that, all cognitive functions begin as a product of social interactions and that learning is not simply assimilated but by a collaborative process (Drew, 2012). Emphasis on collaboration with others to produce knowledge and understanding it stresses on social context of learning and that knowledge is mutually built and constructed. The Zone of Proximal Development can serve as a guide for curricula and lesson planning,

3. School learning should occur in a meaningful context and not be separated from learning and knowledge children develop in the real world, and

4. Out-of-school experiences should be related to the child's school experiences (Silvanos Chirume 2016 p.33).

In teaching, the teacher serves as a mediator between the student and the learning goal, providing scaffolding (i.e., learning support) to aid attainment of the goal (Black & Wiliam, 2009; Walqui & van Lier, 2010). Formative assessment is not necessarily associated with any particular theory of learning (Wiliam, 2010). However, current conceptualizations of formative assessment are typically rooted in a sociocultural constructivist view of learning (Heritage, 2010a; Pellegrino et al., 2001; Shepard, 2000). This theory of learning is supported by research (Pellegrino et al., 2001), is most compatible with current goals of education, and best explains the processes of effective formative assessment (Heritage, 2010b; Pellegrino et al., 2001; Shepard, 2000). Students are seen to develop knowledge and understanding in a domain over time, not only as individuals but in an interactive social context, guided by others with greater expertise (e.g., teacher, parent, peer) (Tharp & Gallimore, 1991; Vygotsky, 1978; Wenger, 1998). One assumption of sociocultural theory is that learning is enhanced by what Vygotsky referred to as "joint productive activity" within a social setting, such as in a classroom where students and teachers collaborate as a community of learners (Ash & Levitt, 2003; Koschmann, 1999). He viewed school as a perfect place to begin cultivating social interaction and learning through modelling appropriate social and academic skills (Salema, 2014). Vygotsky (1978) emphasises the importance of the conceptual scaffolding for the gradual internalization of knowledge, obtained by social interaction between a novice and a more competent peer or adult who provides a model. He equally notes the significant role of dialogue in learning, the place of peers in instructional practices of various learning tasks and the interactive structure of all learning tasks. Thus, learning is the result of internalization of social interaction. The instructional processes which Vygotsky emphasizes teacher co-operation, teachers supporting their learners and language development of the learner. Vygotsky's model implies that teachers should create more opportunities for students to learn with the teacher, peers in co- constructing knowledge in both Piaget and Vygotsky's models; teachers serve as facilitators, and guides rather directors and moulder of children's training.

2.3.2.2.2 Social constructivist theory of Paul Ernest (1999)

Paul Ernest (1999) on it turn, provides an account of social constructivism, identifying two key features:

- First, there is the active construction of knowledge, typically concepts and hypotheses, based on experiences and previous knowledge. These provide the basis for understanding and serve the purpose of guiding future actions.
- Secondly, there is an essential role played by experience and interaction with the physical and social worlds, in both physical action and speech modes.

Paul Ernest believes that mathematics education should foster the construction of knowledge through active participation and interaction among students under the guidance and supervision of teachers. The mathematics education gained should contribute to the development of democratic citizens who are able to evaluate critically political, economic and social claims that are based on mathematical arguments.

2.3.2.2.3 Social constructivist theory of Drew (2012)

Drew (2012), according to him, identified three major characteristics assumptions of social constructivism namely: social interaction, More Knowledgeable Other (MKO) and zone of proximal development (ZPD).

First assumption is social interaction. **Social interaction** plays a fundamental role in the development of cognition. Vygotsky viewed the interaction of peers as an effective way of developing skills and knowledge (Drew, 2012). In learner centered teaching and learning approaches, peer assessments and performance tasks are highly encouraged as students learn through others. Another assumption of the social constructivist theory is that, there should be a facilitator in the process of learning. The assumption is normally referred to as More Knowledgeable Other (MKO). According to Drew (2012), MKO refers to anyone who has a better understanding or with the higher ability than the learners with respect to a particular task, process or concept. As students construct their own knowledge based on their experiences, there should be a facilitator to focus their effort towards specific tasks at a given time. The facilitator can be a teacher or a peer who is more knowledgeable than the students are. Therefore, in assessing whether students have acquired mathematics competencies for instance, mathematics teachers who are viewed as more knowledgeable should design and select appropriate CBA strategies through which students can be involved actively. Some proposed CBA strategies include portfolio, checklists, rating scales, oral presentations, projects, practical, and written essays/reports. Among these types of assessment, learners could be active, working collaboratively, and participate fully in assessment process.

The third assumption in social constructivist theory is that, learning takes place through two levels. The first level is the actual level of development that the learner has already reached. It is the level at which the learner is capable of solving problems independently (Drew, 2012). The second level is that of a potential development referred to as Zone of Proximal Development (ZPD). This is the level of learning which students are capable of reaching under the guidance of the teacher or collaboration from peers. The "zone of proximal development" (ZPD), a concept taken from Vygotsky (1978), has been invoked by formative assessment theorists as useful for understanding the gap between a student's actual understanding and the student's targeted or potential learning. The ZPD is the developmental space between the level at which a student can handle a problem or complete a task independently and the level at which the student can handle or complete the same task with assistance from a more competent other, such as a teacher. Work within the ZPD is a particular example of joint productive activity, that is, teacher and student are working jointly to ensure that the student reaches a learning goal (Ash & Levitt, 2003). At this point, there are number of tasks, which the learner alone cannot accomplish unless being assisted. This brings the importance of social interaction and active involvement during learning. The social-constructivist model states that students must actively engage with every stage of the assessment process so that they fully understand the requirements of the process, the criteria and standards being applied (Cox, 2009). Therefore Competency based assessment in social constructivist class among other things should involve aspects of active engagement between teachers and learners. According to Cox (2009), in order to adopt effectively the social constructivist assessment, teachers should be knowledgeable in assessment theory, engaging students in assessment criteria and engaging students with the feedback. He illustrated an example of a conceptual framework of the evaluation study as shown below.

Evaluation and feedback

Primary School Teacher

-Knowledge of assessment and subject matter

-Attitude towards CBA

Teacher/Pupils interaction in implementing CBA in mathematics competence

-Design and planning CBA (portfolio, checklists, oral presentations, practical, projects, etc)

-Administration, marking, and provision of feedback

Pupils' characteristics

-Prior Knowledge -Attitude towards CBA – Pupils readiness

Student Competencies in mathematics competence

- Numeracy
- Communication
- Critical and creative thinking
- Independent learning
- Personal and social values
- Technological skills

Source: Evaluator (2015)

2.3.2.4 Strengths of the Social Constructivist Theory

The theory of social constructivist encourages learner-centered approach of teaching and learning. While learners through interaction are expected to create their own understanding, teacher plays an active role as a facilitator. Liu (as cited in Salema, 2014) point out that, the active participation of students promotes acquisition of skills because students are active in the mental and motor activities, which also encourage retention of knowledge. In addition, students benefit from the knowledge and skills of others while working in collaboration. For example, through peer assessment, feedback and in-group discussions, learners can learn through others' experiences.

2.3.2.5 Weaknesses of the Social Constructivist Theory

The efforts of the group are guided by pre-existing social roles and group dynamics. One learner can be more dominant in the group, while another may not want to share his ideas. In this case, not every learner can contribute or gain from the group. Another weakness is that, although many number of learners in the class may imply that there can be more contribution from the learners, managing, organizing and involve actively each learner in the class may be very difficult. It can consume much time since every learner must participate actively in the process of learning.

2.3.2.6 Usefulness of Social Constructivist Theory to the Study

Since CBA is participatory in nature, social constructivist theory provides a framework on how active participation should be established. The theory describe the role of teachers and learners in a constructivist learning and hence in constructivist assessment. One of the assumptions of social constructivist theory is the presence of a teacher or instructor who is more knowledgeable than the learners . The teacher act as a mentor and facilitator as learners construct their understanding. Thus, the teacher should be well acquainted with knowledge and skills of designing mathematics assessment tasks, which are authentic such that, it measures the intended learning outcomes by actively engaging pupils. Thus, the theory guide the Evaluator in studying important aspects such as teachers level of knowledge in implementing CBA and the application of authentic assessment tasks which reflect the demands of the CBC.

2.2.3.7 Proposing a theory of assessment: summative, formative and self-assessment

Taras 2005 uses definitions from Scriven 1967 and Sadler 1989 to explain and interlink the elements of the process of assessment. From Scriven (1967) there is the definition of assessment, and the original distinction between summative and formative assessment. Taras (2005) argues that all assessment, including formative assessment, requires an implicit or explicit judgement or summative in order to provide feedback which may subsequently be used as formative feedback and become formative assessment. She provides a formula to represent this:

SA + feedback = FA

This framework provides definitions of the terms of assessment how they inter-relate and the process, which links them. It is clear that, in this framework assessment is defined as a process, and does not add the confusion of functionality. The process of formative assessment can only be said to have taken place when feedback has been used to improve the work; whether this work is used for accreditation or within a less formal arena does not affect the definition. This is the theory that can explain and justify assessment for learning because it firstly, supports the principles, secondly, clarifies the process and thus permits it to be monitored and improved. The above argument and rationale seems appropriate for discussions about product or process assessment of specific academic work. Sadler's theory of formative assessment and feedback (1989) provide an augmentation of Scriven's argument. From these, extrapolations from their both work and Taras' own work on assessment and self-assessment provide the links and the relationships between the elements and the rationale, which sustains them. A brief summary of this argument follows and the rationale which makes this a feasible and working theory to support the principles of assessment for learning. Assessment is a judgment; judgments may be of process, product or interactions. Therefore, everything can be assessed and this ubiquitous process is often taken for granted and rarely analyzed or broken down. Parameters i.e. standards, criteria, context etc. are required to make this judgment. These parameters may be implicit i.e. in the assessor's head, or they may be explicit and shared with others. However, Taras (2005) argued that making this explicit enables us to understand, clarify and hence improve it. 'This chair is comfortable because …' is a judgment that shares some of the parameters with the listener. How the parameters of assessment are weighted and used can vary: Scriven's (1967) definition requires the weighted criteria to be justified according to defined standards so the assessor communicates to others how, why and what priorities are attached to the assessment and the final judgement or grade. Sadler (1989), within the context of formative assessment in a multi-criterion academic piece of work, focuses on the importance of sharing and understanding the principal criteria in addition to being aware of implicit, basic criteria that only come into play when they are not respected at the level within which learners are working. Sadler's definition of formative feedback requires all feedback to be used in order for it to be called 'feedback': otherwise, it is merely information produced by the assessor. Sadler requires the understanding of the parameters and information from the assessor as a condition for formative feedback.

Both Scriven and Sadler require the sharing and understanding of the assessment parameters between the assessors and the assessed. The result of a judgement or assessment may be represented in words as feedback, or in a summary judgement in the form of a grade or mark in accordance with an agreed scale. Feedback, according to Scriven's definition of assessment, will justify the judgement: if it stops there and is a summation of work to date it is called summative assessment, if the feedback is used to update, change and improve the work, it becomes formative assessment. When discussing the central concept of feedback (ibid, p13-15) as expressed by Sadler 1989, his comment on feedback states that ,it requires information on some attribute, which it compares to the desired level in order to identify a gap; finally the information is used in order to alter the gap. Similarly, Ramaprasad, (1983, p.4) states that formative feedback is information about the gap between the actual level and reference level which is used to alter that gap. For the context of classroom interaction and learning, which is the focus of AfL, Black et al 2003, proffer four interventions which formed the basis for AfL dissemination and support in schools, so it is appropriate to examine these in relation to the assessment framework presented above. However of these four interventions, three of them i.e. feedback through marking, the formative use of summative tests, and peer and self-assessment would be product assessment and therefore appropriate for the above rationale.

Questioning within classroom interaction should pose fewer problems for a formal assessment theory than Black and Wiliam would have us believe because this is in fact the ideal medium for negotiation of meaning within a social-constructivist theory of learning. In conclusion, the aims and ethos of AfL is valuable to the education community, and as such is deserving of a robust theory of assessment to support it. This can be found in the definitions of Sadler (1989), the work of Scriven (1967) and the theory of Taras (2005) which bring together all of the disparate ideas of formative and summative assessment into one cogent theoretical framework. It has been shown that this theory supports the work of Black and Wiliam and the AfL framework providing it with the substance it needs.

2.4 Empirical Review

All efforts invested in teaching are futile without ascertaining that learning has taken place. The only proof that learning has taken place is an assessment result or outcome. Current approaches to classroom assessment have shifted from a view of assessment as a series of events that objectively measure the acquisition of knowledge toward a view of assessment as a social practice that provides continual insights and information to support student learning and influence teacher practice.

2.4.1 Diagnostic Assessment (DA)

The outcome of a well-designed diagnostic assessment with a proper remediation will go a long way in reducing failure rate especially in the standardized examinations and improves performance in the area of skills acquisition. Studies on diagnostic assessment have indicated positive results. Gani (2015) carried out an empirical study on diagnostic assessment of students ‘achievement in quantitative aspect of Economics in Akwanga. The finding revealed students’ weaknesses in areas like basic tool for economics analysis, consumer theory and theory of demand supply and price determination. According to him, diagnostic assessment improves teaching and learning in education as it identifies the strength and weaknesses of students and as an indicator of the effectiveness or ineffectiveness of the education system.

Imo(2002), conducted a diagnostic assessment on students' understanding of simple harmonic motion concept in physics. The findings revealed lower mastery level of students' knowledge in all aspects of simple harmonic motion. Sewell (2004) developed and validated a diagnostic test for providing feedback on skills and abilities of adult learners in United Kingdom. A variety of test tasks was employed including both multiple choices and open writing tasks. The research results demonstrated that the diagnostic test could provide a comprehensive diagnostic feedback on learners' strength and weaknesses. Jang (2005) investigated the validation process of the effects of the diagnostic cognitive reading skills assessment on teaching and learning. The empirical evidence showed that the diagnostic test was quite valid and could provide informative feedback to teachers and students. Obadare-Akpata (2015) constructed and validated diagnostics instrument that measures the achievement motivation of students in Mathematics and the findings did not only reveal that students that are highly achievement motivated are higher scorers in Mathematics but also ascertain the tendency of the less achievement motivated students being involved in examination malpractices during either internal or external Mathematics examination.

2.4.2 Formative Assessment (FA)

Bennett (2011) interpreted formative assessment to mean different things. For example, it may be used to describe commercial assessments that are not truly capable of serving a formative purpose because they are not tied closely enough to the teaching and learning context (Perie, Marion, Gong, & Wurtzel, 2007; Popham, 2006; Shepard, 2010). Another issue is that the body of research on which claims of the positive impact of formative assessment are based is relatively small, and many of the relevant studies do not have the methodological rigor to support conclusions about the effectiveness of formative assessment. In the same light, Bennett, (2011); Baird et al.(2014) emphasize that, some research also warns that claims on the effectiveness of formative assessment should be considered with caution, due to limitations of the research methodology used by earlier studies. Nevertheless, and while limited in scope, recent empirical evidence has shown the positive impact of formative assessment methods(such as peer-and self-assessment)on teaching and on students' learning outcomes, in particular on the development of non-traditional competences and transversal skills(e.g. Baird et. al, 2014; Cornu et al., 2014; OECD, 2015b).

A large amount of research has been conducted around the world regarding the impact of formative assessment on learning outcomes. Effects and procedures to conduct formative assessment at primary schools and high schools are well addressed in research (Bennett, 2011; Bonner, 2012; Briggs et al., 2012; I. Clark, 2013b; K. Clark, 2013; McMillan et al., 2013; Ruland, 2011; Stewart, 2011; Yin et al., 2008). Black and William (1998) conducted a review of 250 international journal articles, books, and research to determine whether formative assessment raises academic standards in the classroom. The 250 sources reviewed for this purpose cover learners ranging pre-school to university. The evidence gathered through formative assessment should be used to determine whether instruction needs to be modified and, if so, how. However, this part of the formative assessment cycle often falters: Teachers may succeed in gathering evidence about student learning and may accurately interpret the evidence to identify what knowledge a student lacks, yet may not be able to identify, target, and carry out specific instructional steps to close the learning gaps (Heritage, et al., 2009; Herman et al., 2006). In this case, formative assessment is almost indistinguishable from instruction, as the teacher introduces content; assesses how the student is responding; offers supports for understanding and modifies instruction as needed; re-assesses how the student's learning is progressing; continues with new content or returns in a new way to the same content, and so forth. Black and Wiliam (1998 p. 9), equally review some 681 publications on studies related to formative assessment, they concluded that, attention to formative assessment can lead to significant learning gains and asserted that there is no evidence to suggest that it may have negative effects. However, caution should be exercised in making an uncritical endorsement of formative assessment (Bennett, 2011; Dunn & Mulvenon, 2009; Kingston & Nash, 2012a; Shepard, 2005). Black and William (1998) are among the first researchers to argue that good formative assessment increased achievement on tests; hence, why it needs to focus on good teaching and active use of gathered information during learning progress, not just at the end of unit study. In others words, formative assessment is the process whereby, the teacher uses information either implicitly or explicitly about how a student responds to instruction in order to give feedback to the student and/or adjust instruction to prompt learning or performance. Most claims about the benefits of formative assessment begin with the Black and Wiliam (1998a) review of research on formative assessment. Their review is often referred to as a "meta-analysis," but, as the authors themselves observe, a true meta-analysis was not feasible for them because the studies they used represented such a wide range of practices and research methods. What the studies they reviewed had in common was teachers' use of some of the features of formative assessment (e.g., feedback, teacher questioning, student self-assessment); these features were associated with moderate-to-large effect sizes. Black and Wiliam concluded that the achievement gains associated with formative assessment were among the largest ever reported for educational interventions. The review also found that formative assessment methods were, in some cases, particularly effective for lower achieving students, thus reducing inequity of student outcomes and raising overall achievement. The 1998 Black and Wiliam review confirmed earlier reviews by Natriello (1987) and Crooks (1988), which had reached substantially the same conclusions (Looney, 2011a).They encourage self-assessment that provides clear learning targets. This must be combined with an understanding of the goal, evidence about the present position, artifacts of achievement, and strategies for closing the gap. One of their recommended strategies is the use of meaningful, focused dialogue and thoughtful, reflective questioning. They included studies on effective feedback; questioning; comprehensive approaches to teaching and learning featuring formative assessment, and student self- and peer-assessment. They concluded that "firm evidence shows that formative assessment is an essential component of classroom work and that its development can raise standards of achievement" (p. 139). This was particularly true for low achieving students and those with special needs. Using multiple research studies, they summarized primary research findings that are similar to conclusions drawn by other research on classroom assessment. They found an emphasis on rote and superficial learning, a focus on quantity rather than quality, overemphasis on grading rather than learning outcomes, and approaches that result in comparison and competition. Based on this research, they offer suggestions for improving formative assessment at all grade levels. “Feedback to any pupil should be about the particular qualities of his or her work, with advice on what he or she can do to improve, and should avoid comparisons with other pupils" (Black & William, 1998, p. 145). The reason for attention to formative assessment lies in the evidence of its effectiveness in improving learning. Empirical studies of classroom assessment have been the subject of several research reviews. Evidence of impact was drawn from more than 40 studies conducted under ecologically valid circumstances (that is, controlled experiments conducted in the student’s usual classroom setting and with their usual teacher). The review by Black and Wiliam (1998) attracted attention worldwide partly because of the attempt to quantify the impact of using formative assessment. A key finding was that ‘improved formative assessment helps the (so-called) low attainers more than the rest, and so reduces the spread of attainment whilst raising it overall’. Since then there have been a number of other reviews and investigations, which have justified the considerable claim, made for improved student learning. Evidence shows that, assessment for learning can lead to significant achievement gains.

2.4.3 Continuous Assessment(CA)

Various studies have pointed out that continuous assessment strategies being used by the teacher are likely to contribute to student learning in schools. According to Onuka (2006), teachers need to use a variety of instruments to measure effectively their students' traits and that the outcome of the assessment is used to assist the student to improve upon their learning skills. In addition, Carnoy (1999) indicated that teachers have had to rely on continuous assessment in order to monitor their students' academic progress and performance. However, Etsey (1992) stated that large class sizes do not permit teachers to use class tests, assignment, projects as well as observations to assess student learning. Onuka and Onabamiro (2010) found that regular individual assignments engender higher student learning and achievement because they form sources of feedback on the performance of the students and assist students to develop critical mind and good study habit. Thus, through assessment strategies like individual and group assignments, students are propelled to learn more to improve on their academic performance and compete favorably with their learning peers.

Nwachukwu (2005) embarked on the study in the University of Nigeria, Nsukka (UNN) to observe the relationship between Continuous Assessment in Basic Science and the Junior Secondary School result in Enugu state, Nigeria. The study applied a quasi-experimental design on 100 students who were selected from Enugu zone. Their Continuous Assessment Scores and the Basic Certificate Examination Results were considered. It was observed that 92 students had final results that were proportional to their Continuous Assessment Scores. This study by Nwachukwu (2005) relates to the present work in its direct usage of continuous assessment as a predictor of students achievement in mathematics. Students used were from the same level of education but in a different subject. The work intends to poll the Continuous Assessment of students and Basic Education Certificate Examination Results in mathematics and in Benue State, Nigeria. Adekeye (2011) equally conducted a study focused on the relationship between Continuous Assessment Scores and Junior School Certificate Examination Results of students in Kwara state, Nigeria. The study further sought to find out the contributions of each Junior School year to performance at Basic Education Certificate Examination. The sample for the study was made up of 540 participants selected from 18 secondary schools in Kwara state, Nigeria. The data generated were analyzed using Pearson's product moment Correlation, independents test and multiple regression analysis. It found that the continuous assessment actually predicted student's achievement at the end of the three years in Junior Secondary School especially the male students.

Letsoalo(2000) from (Rank Afrikaans) university conducted a research at the Gauteng Department of Education in South Africa with 50 grade one teachers of grade 1 primary schools of the locality. She guides her study on the implementation of continuous assessment with the aim of assisting educators in developing assessment and evaluation tools and practices in an effort to develop assessment procedures that accurately measure the learner's success in achieving the learning outcomes. These guidelines as being structured as follows:

- A brief explanation of self-assessing and guidelines on how to develop self-assessment as a skill for learners;
- Peer and group assessments.
- Portfolio assessment and guidelines in how to develop a portfolio assessment;
- Guidelines for creating rubrics and using them effectively;
- Guidelines on record keeping techniques of assessment.

The findings points' evidence that teachers find CA very useful in assessing learners' performances. The researcher recommended that the Gauteng Department of Education pursue the implementation of continuous assessment in other grades as well.

Lewin (2001) recorded that, over the years, various attempts have been made in many countries to improve the quality of examinations through the continuous assessment provisions. For example, in Tanzania, the National Examination Council for Tanzania (NECTA) in the late 1970"s established continuous assessment programs to monitor students" academic progress in the whole education cycle from lower classes to higher classes.

Type of Assessment Followed In the Center

There are three types of assessment followed in the English Language Center: 20 marks for the continuous assessment (CA), 30 marks for the Midterm (MT) and 50 marks for the final exam.

The weight of marks distribution is equally distributed for each level for the three different assessments. There are different skills taught at these levels (grammar, listening, reading, scanning, speaking, and writing).

Continuous Assessment:

Class Quizzes

Class participation

Speaking test

Project & Presentation
Reading/writing assignments
Note Taking
Portfolio
Vocab log
Source: Azzah Al-Maskari (2015).

Plessis et al (2003) have asserted that continuous assessment promotes dialogue among teachers and students to generate knowledge in order to improve the teaching and learning process. According to them, “Continuous assessment tells teachers if they need to re-teach something, which students need to be re-taught, and what the students need in order to improve their learning” (Plessis, et al., 2003, p. 6). With continuous assessment, teachers are given the responsibility to find out what students in their classes know and are able to do. They further maintain that such strategies are used to determine the kind of remediation and enrichment activities to provide as well as to identify which students need assistance. Mwebaza (2010) confirms this by indicating that continuous assessment helped students to revise more effectively and to gain confidence. He also stated that continuous assessment tends to make students ready for the final examination.

Onuka and Onabamiro (2010) found that regular individual assignments engender higher student learning and achievement because they form sources of feedback on the performance of the students and assist students to develop critical mind and good study habit. Thus, through assessment strategies like individual and group assignments, students are propelled to learn more to improve on their academic performance and compete favorably with their learning peers. Although Plessis et al. (2003) indicate that, the most commonly used continuous assessment strategies include: oral presentation, practical test and interviewing learners. Other studies have revealed that continuous assessment is not being implemented in terms of a wide range of alternate assessment strategies as it was intended to be, with pen-and-paper testing still being the more dominant practice (Deonarain; 2004; De Gaume & Naidoo, 2004). Thus, schools should design a range of assessment modes, such as oral questioning, observation of students, project work and assignments, according to their curriculum plans, to collect continuous information on students’ progress and to give feedback on what students have learned and achieved. The information collected will help motivate students’ learning and help teachers find ways of bringing out more effective teaching and learning.

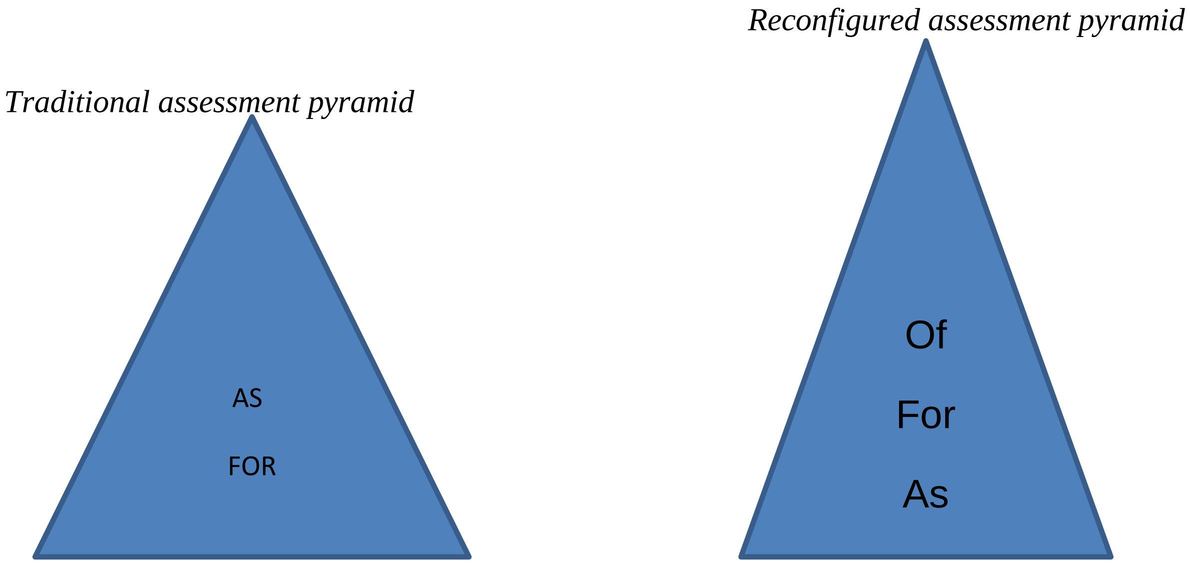
Mwebaza (2010) found that written tests, take-home assignments and recap exercises dominated teachers' continuous assessment strategies. He also found that checklist was the less used strategy while oral test and questionnaire were not used at all. The researchers found out that teachers had gained very little training in the use of checklists. On how frequent these were being used, the study reported that recap exercises were given more frequently while written tests and take home assignment were less frequent. Checklist and observation were rarely used. According to the respondents oral tests and questionnaires were never used all.

This review points out that although there are numerous assessment strategies, teachers do not make maximum use of these strategies. This might be because such teachers do not even know the value of those continuous assessment strategies in the teaching and learning process. In a study in Trinidad and Tobago, Rampaul and Freeze (1992) reported that teachers perceived a variety of continuous assessment methods as effective. These assessment methods represented a forward-looking approach in which the purpose of assessment was as much to guide future instruction as well as to evaluate past attainments. In another study, Edwin (2014) investigated the influence of continuous assessment on academic performance of senior secondary school students in Edo State, Nigeria. The researcher designed a well-structured questionnaire for 100 respondents in some selected secondary schools in Oredo Local Government Area. The data generated were interpreted using simple percentage analysis. The data finding revealed that students who were assessed continuously performed better than those who were not assessed continuously. It was also discovered that continuous assessment could lead to eradication of examination misconduct among students. Again, it was recommended that effective records should be kept in schools on student's performance.

2.4.4 Summative Assessment (SA)

In the past, educators concentrated mostly on assessment of learning while that context has been shifted into assessment as/for learning (Arieli-Attali, 2010; Hayward & Spencer, 2010; Leirhaug & MacPhail, 2015; MacCann & Stanley, 2009). As assessment purposes improving student learning as an ongoing process generating from interactions between teacher and students during learning. Through assessment, teachers may gain information about what knowledge, understanding, or skills students need. Most assessment was summative (of learning), with assessment for and as learning being a minor element: the two figures below show that assessment as learning now forms the major role in contemporary educational practice (Figure 11).

Figure 11 : Traditional and reconfigured assessment pyramid



Traditional testing methods are very narrow in scope and do not allow students to demonstrate a wide range of skills nor do they allow for differing learning styles, development of innovative thought, or unexpected but appropriate responses. Multiple sources of assessment will therefore involve different ways of presenting tasks to students as well as different ways of probing assessment information so that valid inferences about students' progress can be made. Tasks can include a variety of formats: written, oral, and practical; can be closed or open-ended; real life or abstract; completed individually or as a group (Swan, 1993b). Teachers and students alike will make inferences about learning based on information gained through broad approaches like observing, questioning and testing. More fine-grained 'strategies can also be employed. Observational strategies include such techniques as anecdotal record keeping, annotated class lists and checklists. Questioning approaches may involve structured or open-ended interviews, self-questioning, using higher-order questions or fact recall. Reporting may take the form of oral reports given to the class, written reports on a project or investigation, portfolios, journals and diaries. Testing procedures may be formative in nature such as diagnostic tests or have a more summative purpose as in examinations (Clarke, 1988; Mitchell & Koshy, 1993; NCSM, 1996; Sten mark, 1991). The strong impact of summative assessment on teaching and learning has been widely reported. On the one hand, according to Thorsen,(2014), Thorsen and Cliffordson,(2012) summative assessments are often believed to have positive effects on student learning and achievement, irrespective of students' prerequisites and backgrounds such as cognitive ability, socioeconomic status (SES) and gender. In many contexts, summative assessment dominates what students are oriented towards in their learning – this is typically described as the “backwash effect” of summative assessment (Alderson and Wall, 1993; Somerset, 1996; Biggs, 1998; Baartman et al., 2006). The use of summative assessment often rests on the assumption that if the assessment matters to students they will seek to influence the result by increasing effort and improving performance (Becker and Rosen, 1992) quoted in OECD(2013 p.145). However, the way summative assessments are used in the classroom can present both opportunities and challenges for assessing key competences and transversal skills. Combrinck & Hatch (2012) have criticized summative assessment for being Context-independent and inflexible.

2.5 Summary of the chapter

Assessment in the context of education has been used primarily “in deciding, collecting and making judgments about evidence relating to the goals of the learning being assessed”, which does not refer to how the information being collected and could be used (Harlen, 2006, p. 103). The review has revealed that the nature of diagnostic, formative, continuous and summative of assessment practices in relation to international perspectives of learners' assessment influence positively pupils' performances. A well-designed diagnostic assessment with a proper remediation will go a long way in reducing failure rate especially in the standardized examinations and improves performance in the area of skills acquisition. The formative assessment or assessment for learning, aims to identify aspects of learning, as it is developing in order to deepen and shape subsequent learning. However, literature from the UK and USA reveals that classroom assessments that focus more on informing teaching and learning (formative assessment), support lower attaining pupils to improve. These countries have relevant policies, support and resources to enhance teachers' practices. The continuous assessment comprises three distinctive activities: classroom exercises, tests and homework. These activities are designed specifically to measure attainments in order to get marks to fill pupils' records. Pupils' aggregated continuous assessment is added to external examination (FSLC) for grading and certification. The summative assessment or assessment of learning, aims to summarize learning that has taken place, in order to record, mark or certify achievements (EPPI, 2002).

The main differences between the three types of assessments are captured in Table 19 below. It is a helpful visual to review when designing a course to help you create a balanced assessment plan to incorporate both formative and summative assessments.

Table 19: Summary of Assessment Types

	Diagnostic	Formative	Summative
Feedback	Informal	Dialogue-based/comments	Grades
Timing	Prior to instruction	During learning experience (small check-ins)	End of unit or course
Rationale	Assess prior knowledge, skills, preconceptions, etc.	Monitor learning and provide feedback	Evaluate student against some standard benchmark
Examples	Background knowledge survey; ungraded quiz	Practice quizzes, minute papers, in-class writing exercises, clearest/muddiest point exercises, various kinds of group work in the class	Multiple choice midterm and final exams; final project; term paper

This will enable the researcher to draw conclusion as to whether teachers' diagnostics, formative, continuous and summative assessment practices support and enhance lower attaining pupils' learning in classroom.

CHAPTER THREE

RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

This study adopted a quantitative research methodology approach since it relies on the measurement and testing of numerical data unlike qualitative research that is more exploratory. The researcher adopted a survey (by questionnaires) and a quasi-experiment (by competency mathematics tests) research designs. The researcher presented the Area of study, Population of the study, Sample and Sampling procedures, Instrumentation, Validity of the instrument, Reliability of the instrument , Data collection procedure, Administration of the instrument, Data coding schedule, Data analysis procedure and Chapter Summary. This chapter permits whether research hypotheses are accepted or rejected.. The researcher then explained the sampling process that was used to select the people included in the study. A discussion of the construction of research instruments (guided by the research questions stated in Section 1.5.2) follows. The researcher used both self-constructed and standardized instruments but there was need to pilot test the self-constructed ones in order to check on their validity and reliability, and this is discussed in Section 3.7. The actual data collection procedure took place in 64 selected primary schools of the Anglophone sub system education from the Centre region of Cameroon. The data presentation and analysis procedures are then explained followed by, last but not least, the ethical and legal considerations to ensure voluntary and parental consent, confidentiality, and anonymity.

3.2 Research methodology and research designs used in this study

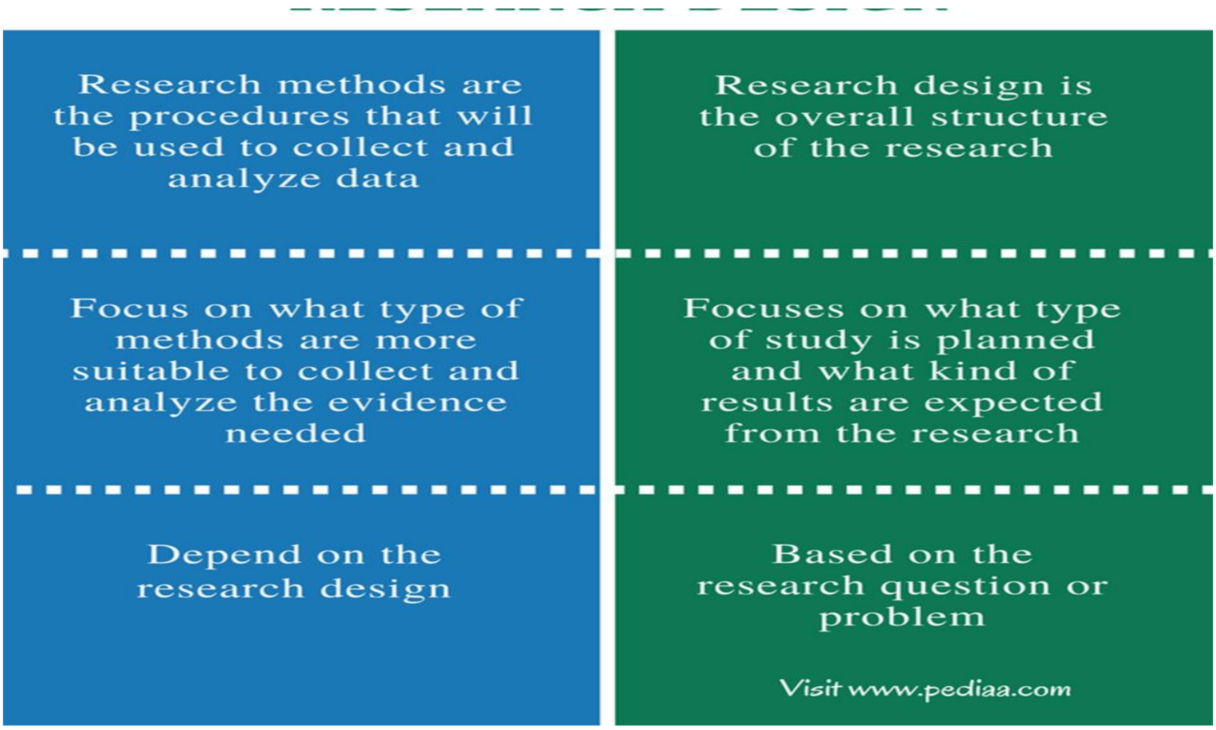
Research problems can be categorized into two basic sections: **qualitative research** and **quantitative research**. Researchers may use one or both of these methods (**mixed method)** in their research studies. Others include descriptive, analytical and applied research methodologies. This study adopted a quantitative research methodology approach since it relies on the measurement and testing of numerical data unlike qualitative research that is more exploratory. The researcher adopted two research designs namely: The survey (by questionnaires) and quasi-experimental (by mathematics tests) designs .It is important to distinguish the terminologies. Research methods/Methodology and research design are terms that many new researchers assume to be the same. Firstly, Kothari,C.R & Gaury;G(2014 p.6) distinguished the difference between research methodology and research methods. According to them, research methodology is a way to solve systematically the research problem. It may be understood as a science of studying how research is done scientifically. In other words, a Research methodology refers to the different procedures, techniques and processes employed to carry out research on a specific topic. Whereas, research methods are the various processes, procedures, and tools used to collect and analyse data. Quantitative methods of data collection include experiments, surveys and existing literature. Quantitative data has an advantage because hypotheses could be statistically tested and results could be generalized to a wider population (Johnson & Onwuegbuzie, 2004). Meanwhile, Research design is an overall plan or blueprint that explains how the research is done and how it will be accomplished (Lee, 2013). According to Hasan(2017) a research design can be:

- Descriptive (case study, survey, naturalistic observation, etc.)
- Correlational (case-control study, observational study, etc.)
- Experimental (experiments)
- Semi-experimental or non-experimental (field experiment, quasi-experiment, single variable research etc.)
- Meta-analytic (meta-analysis)
- Review (literature review, systematic review)

The design of a study involves determining how the chosen method(s) will be applied to answer the research question(s).

Figure 12 below illustrates the differences Research methods versus Research design

Figure 12: Research methods versus Research design



Source: De Vaus, D. A. 2001 p.23 Research design in social research. London: SAGE. *Image Courtesy:*

Since, this study adopted a survey and a quasi-experimental research designs, it is equally to clarify them.

In a quasi-experimental research, the prefix quasi means, “resembling”. Thus, quasi-experiment research is research that resembles experimental research but is not true experiment research. Quasi-experimental research involves the manipulation of an independent variable without the random assignment of participants to conditions or orders of conditions. It does not eliminate the problem confounding variables, however, because it does not involve random assignment of participants to conditions. For these reasons, quasi-experimental research is generally higher in internal validity than correlational studies but lower than true experiments. Among the important types are the non-equivalent groups designs, pre-test; post-test and interrupted time series designs.

This study focused on pre- test, post-test designs. The researcher first administered a mathematics quiz to the participants of class six pupils under the study from their selected schools based on the new vision of evaluation and the competency based assessment approach at the time the researcher launched his research in October 2018. After the participation of teachers to various pedagogic seminars and animations for the implementation of competence-based assessment practices with the hope that it was to be implemented by 2021 sessions First School Leaving Certificate examinations in Cameroon, teachers started evaluated their pupils based competency based assessment approaches. The researcher relied on results’ marks sheets kept by the head teachers of each school and those from 2019, 2020 and 2021 sessions First School Leaving Certificate examinations organised by the ministry of basic education to obtain the performances class six pupils’ mathematic competences marks were concerned. From January 2020, the researcher administered progressively a post-test mathematics competency test to respondents of class six pupils under study and after wards responded well-structured questionnaires. It was to cater for the issue of triangulation in order to overcome threats to validity and reliability of the instruments (Bless &Higson Smith, 1995; Mhlanga &Ncube, 2003). It was hoped that such a design would produce authentic, valid, generalizable and reliable information relating to the mathematics curriculum.

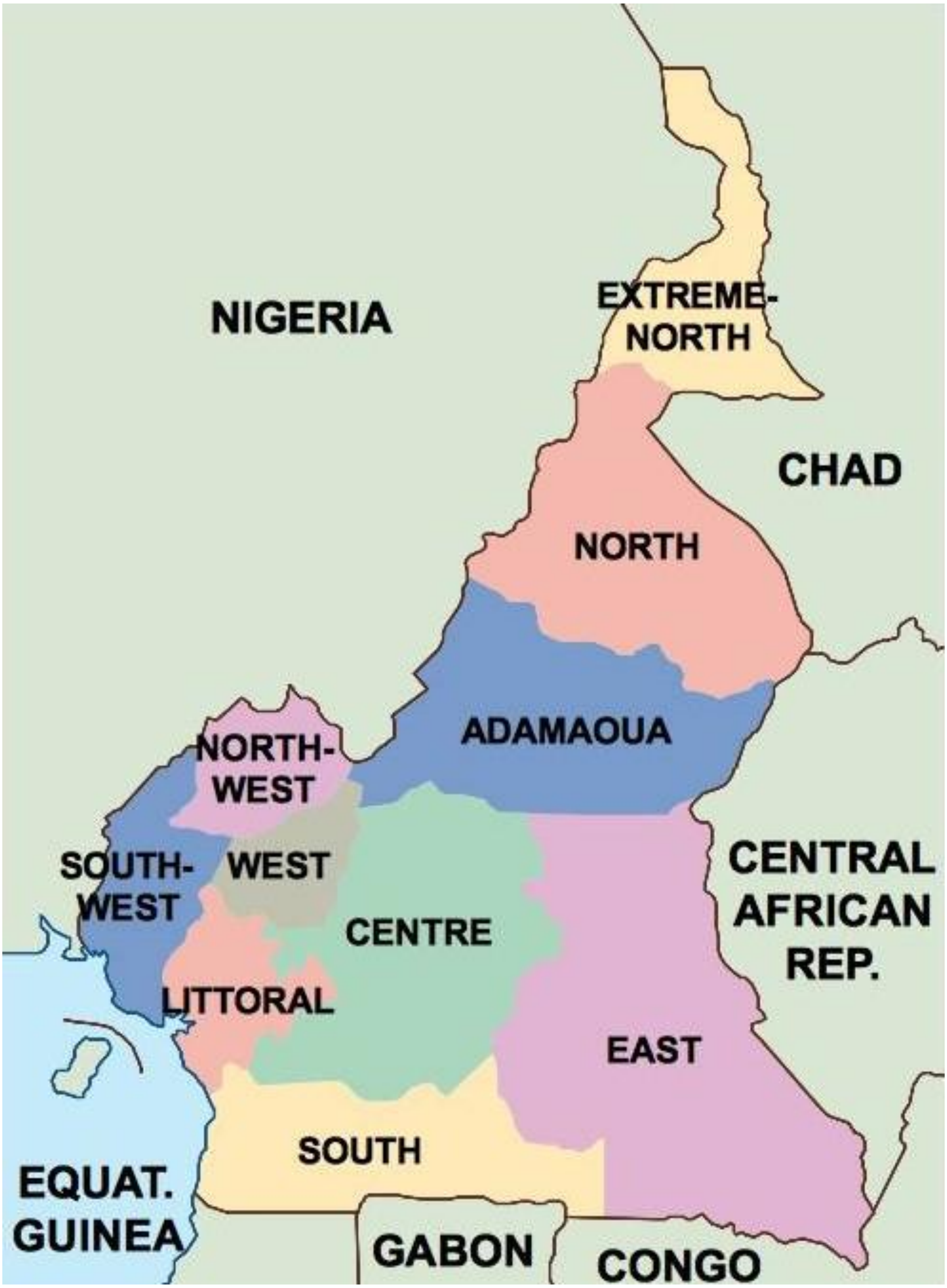
3.3 Area of Study

This study is carried out in Cameroon in the Centre region in both Mfoundi and Lekie divisions precisely among the seven and nine subdivisions respectively of each of the divisions. It seems judiciously necessary to present the study site on the historic political trends, physical and institutional plans.

3.3.1 Historic political trends presentation of Cameroon

Historically, Portuguese explorers reached the coast in the 15th century and named the area Rio dos Camarões (Shrimp River), German colony in 1884 called Kamerun. After World War I, the territory was divided between France and the United Kingdom as League of Nations mandates. In 1960, the French-administered part of Cameroon became independent as the Republic of Cameroun under President Ahmadou Ahidjo. The southern part of British Cameroons federated with it in 1961 to form the Federal Republic of Cameroon. The federation was abandoned in 1972. The country was renamed the United Republic of Cameroon in 1972 by Ahmadou Ahidjo. Paul Biya has been ruling the country (as President since 1982), governing with his Cameroon People's Democratic Movement (CPDM) party. He renamed the country as Republic of Cameroon in 1984. In 2008, the President of the Republic of Cameroon, President Paul Biya signed 'Décret N° 2008/376 du 12 November 2008' abolishing "Provinces" and replacing them with "Regions" headed by presidentially appointed governors. Hence, all of the country's ten provinces are now known as Regions. Cameroon 10 regions are illustrated on map No 1 below.

Map 1 : Map of Cameroon



The regions are subdivided into 58 divisions (French departments). Presidentially appointed divisional officers (préfets), they perform governors' duties on a smaller scale. The divisions are further sub-divided into 360 subdivisions (arrondissements), headed by assistant divisional officers (sous-préfets). The country, and the largest cities in population-terms are Douala on the Wouri River, its economic capital and main seaport, Yaoundé, capital of Cameroon, is at the heart of the Centre region, drawing people from the rest of the country to live and work there. The Centre's towns are also important industrial centers, especially for timber. Agriculture is another important economic factor, especially with regard to the region's most important cash crop, cocoa. Outside of the capital and the plantation zones, most inhabitants are sustenance farmers. Although Cameroon is not an ECOWAS member state, however, Cameroon is a member state of the African Union, CEMAC, the United Nations, Non-Aligned Movement and the Organization of Islamic Cooperation. Cameroon is a member of both the Commonwealth of Nations and La Francophonie. Party to Biodiversity, Climate Change, Desertification, Endangered Species, and Hazardous Wastes, Law of the Sea, Ozone Layer Protection, Tropical Timber 83, Tropical Timber 94, Wetlands, and Whaling signed, but not ratified Nuclear Test Ban. It is governed as a unitary presidential republic and has good relations with the major powers of France, the United Kingdom and China. Cameroon is home to over 250 native languages spoken by over 20 million people .(Kouega, J P (2017 pp. 3-94); "Cameroon". Ethnologue. Retrieved 1 July 2019). Both English and French are official languages, although French is by far the most understood language (more than 80%) Nathan, Fernand (ed.) (2010). French and English have long since displaced German, the language of the original colonisers. Cameroonian Pidgin English is the lingua franca in the formerly British-administered territories. The government encourages bilingualism in English and French, and as such, official government documents, new legislation, ballots, among others, are written and provided in both languages. As part of the initiative to encourage bilingualism in Cameroon, six of the eight universities in the country are entirely bilingual and its religious population consists of 70% Christians and 20% Muslims. The country is well known for its native styles of music, particularly Makossa and Bikutsi, and for its successful national football team.

The country has experienced tensions coming from the English-speaking territories since 2017 and has escalated into open warfare. The crisis escalated into open warfare. Politicians in the English-speaking regions have advocated for greater decentralization and even complete separation or independence (as in the Southern Cameroons National Council) from

Cameroon. In an attempt to resolve the Anglophone crisis the head of state, President Paul Biya addressed the nation on 10 September 2019. He appealed the head of government to hoist the major national dialogue as from the first to fourth, October 2019.Resolutions taken were immediately implemented by the head of state to appease not only the two regions under the crisis, but also the entire country. 33O ex detainees were released with immediate effect. The Islamist jihadist group Ansar al-Islam also known as Boko Haram has been reported as operating in North Cameroon.(BBC. 15 May 2013. retrieved 19 June 2013.)

3.3.2 Geographic presentation of Cameroon

The country is often referred to as "Africa in miniature" for its geological and cultural diversity. It exhibits all the major climates and vegetation of the continent: Natural features include beaches, deserts, mountains, rainforests, and savannas and ocean coastland. Cameroon can be divided into five geographic zones. The country is sometimes identified as West African and other times as Central African due to its strategic position at the crossroads between West and Central Africa. Cameroon is bordered by Nigeria to the west and north; Chad to the northeast; the Central African Republic to the east; and Equatorial Guinea, Gabon and the Republic of the Congo to the south. Cameroon's coastline lies on the Bight of Biafra, part of the Gulf of Guinea and the Atlantic Ocean. Cameroon has **a** diverse terrain, with coastal plain in southwest, dissected plateau in center, mountains in west, and plains in north. Its Area total is 475,440 km2 (183,570 sq. mi) lands: 472,710 km2 (182,510 sq. mi) water: 2,730 km2 (1,050 sq. mi).

Land boundaries: total: 5,018 km border countries: Central African Republic 901 km, Chad 1,116 km, Republic of the Congo 494 km, Equatorial Guinea 183 km, Gabon 349 km, Nigeria 1,975 km .**Coastline**: 402 km **Natural resources**: petroleum, bauxite, iron ore, timber, hydropower

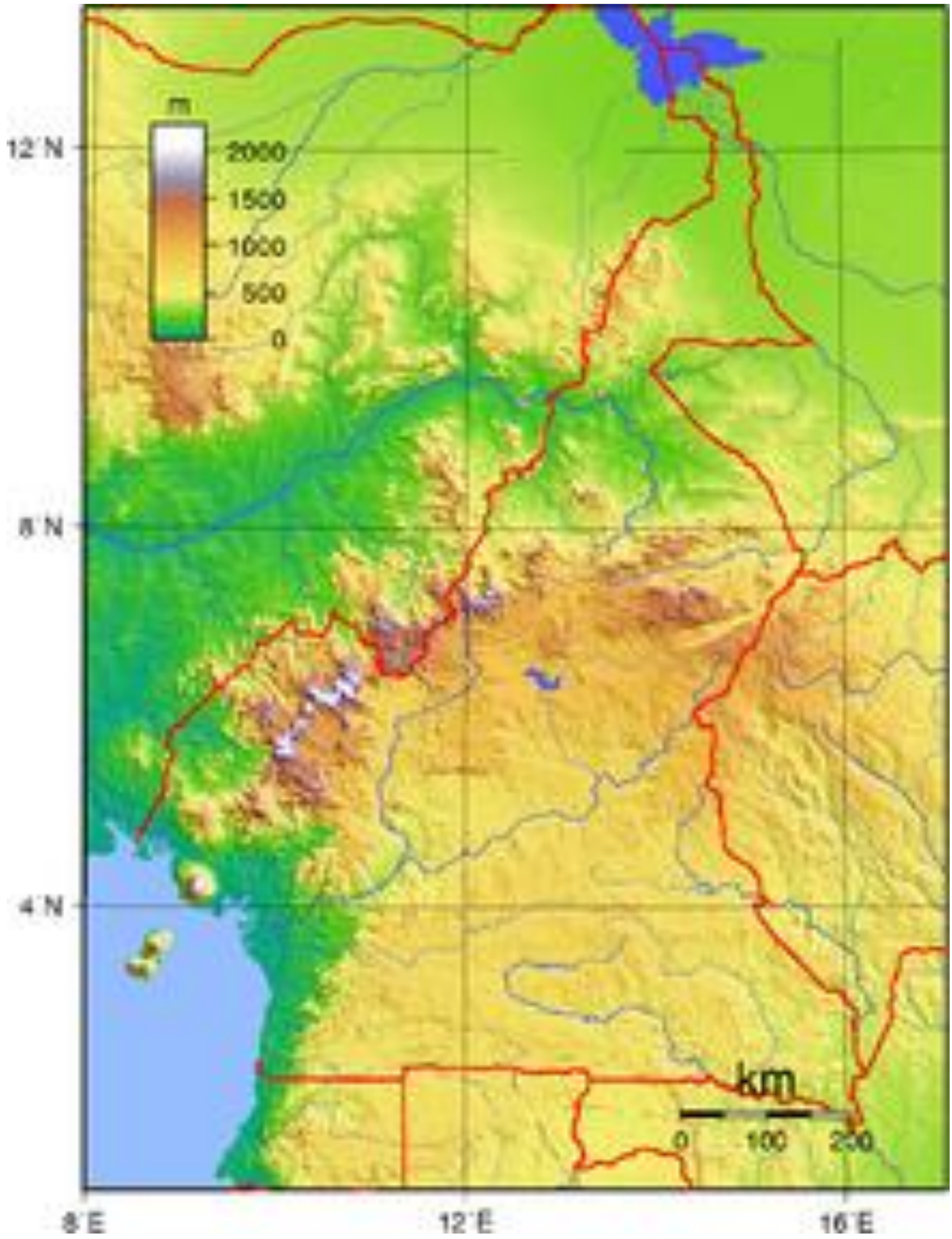
Land use: arable land: 13.12% permanent crops: 3.28% other: 83.61% (2012)

Irrigated land: 256.5 km² (2003)

Natural hazards: Recent limnic eruptions with release of carbon dioxide:

- From Lake Monoun, 15 August 1984, killing 37
- From Lake Nyos, 21 August 1986, killing as many as 1,800

Map 2: Geographic coordinates of Cameroon



Geographic coordinates of Cameroon are 6°N 12°E / 6°N 12°E

3.3.2.1 Geographic presentation of Centre region

The Centre region of Cameroon is at the hearth of the Republic of Cameroon (French: République du Cameroun). It is bordered to the north by the Adamawa Region, to the south by the South Region, to the east by the East Region, and to the West by the Littoral and West Regions. It is the second largest of Cameroon's regions in land area. Only the Centre region has been the researcher interest. The Centre Region (French: Région du Centre) occupies a total land area of 68,953 km2 (26,623 sq mi) that is 69,000 km² approximately of the central plains .

Map 3: Location of Centre Region

Location of Centre Region within Cameroon

Coordinates: 4°45′N 12°00′ECoordinates: 4°45′N 12°00′E

The Centre region has the following ten divisions:

1. Lekié, with its capital at Monatélé, is northwest of Yaoundé
2. Haute-Sanaga (Upper Sanaga), with its capital Nanga Eboko, in the west and centre of the region.
3. Mbam-et-Inoubou (Mbam and Inoubou), with its capital at Bafia,
4. Mbam-et-Kim (Mbam and Kim), with its capital at Ntui, is the largest, occupying almost the entire northern half of the region.
5. Méfou-et-Afamba (Méfou and Afamba), with its capital at Mfou, is the area east and south of Yaoundé.
6. Méfou-et-Akono (Méfou and Akono), with its capital at Ngoumou.
7. Mfoundi consists entirely of the Yaoundé capital and greater area.
8. Nyong-et-Kéllé (Nyong and Kéllé), with its capital at Eséka, occupies the southwest corner of the region.
9. Nyong-et-Mfoumou (Nyong and Mfoumou) is opposite this at the southeast, governed from Akonolinga.
10. Nyong-et-So'o (Nyong and So'o), with Mbalmayo as its capital, is on the central border with the South region.

Map 4: **The Centre region indicating the ten divisions**

Among these, the researcher has retrieved two out of them. These two divisions are from the Centre region that is Lekié and Mfoundi divisions. These two divisions have 16 subdivisions in common and share common boundaries. The researcher has chosen the locality for its easy accessibility and it is the researcher area of residence. In respect to the study, the researcher deemed necessary to locate Centre region in general and Lekié and Mfoundi in particular in the mind set of any reader who is not a Cameroonian.

3.3.2.1.1 Geographic presentation of Mfoundi division

The researcher carried out his research firstly in Mfoundi division, which has seven local subdivisions the head quarter is Yaoundé the political capital of Cameroon. It has an estimated cosmopolite inhabitants of 3.5 million (2018 census) occupying a surface area of 18300 Hectares or 183 Km², elevated of about 750 M (2500 ft) above sea level. It has a population density of 19126 inhabitant/Km².

3.3.2.1.2 Geographic presentation of Lekie division

Secondly in Lekié division there are ten subdivisions and it is headquarter is Monatele. Lekié division has an estimated population of 354,864 occupying a surface area of 2,989 km² it is second in terms of population in the Centre region of Cameroon.

- Lekié Name Comes from the River Lekié Which is an affluent of the Sanaga River
- Middle of the center region
- North border: Sanaga River
- Capital: Monatele
- Area: superficie : 2 989 km2).

3.4 Population

The population total in Cameroon was 23,439,189 in 2016. The life expectancy is 56 years (55.9 years for males and 58.6 years for females). Source: OECD/World Bank. The researcher's area of study is focused on the Centre region in general but in Mfoundi and Lekié divisions in particular. The study limited on English primary schools in these subdivisions. The population considered for this study is generated amongst the class six pupils populations enrolled in the English primary schools subsystem education for the 2019/2020 school year. There are 673 English and French sub systems schools of complete cycle that is having class 6 or CM2 classes as statistics gotten from both divisional delegation of basic education of Mfoundi and Lekié for the 2019/2020 school year depending on public or private owners. In Lekié division an enrollment of class pupils as shown in Table 20 below indicates boys= 315, girls= 292 total= 607. In Mfoundi division an enrollment of class pupils as shown in Table 21 below indicates boys= 1530, girls= 1776 total= 3306. The entire target English primary schools class six pupils' population for the two divisions is 3913 as indicated in Table 22 below. To carry out the study an accessible sample population was purposely drawn from the two divisions' target population as follows: in Lekié division, boys=31, girls= 39 total=60 as shown in Table 23 meanwhile, in Mfoundi, boys=130, girls=130 total=260 as shown in Table

24. The entire accessible class six population for the divisions stands as follows: boys=161, girls=159 making a total of 320 class six pupils' population as indicates in Table 20 below.

Table 20: Target class six populations of Lekié division

DIVISION	GENDER' POPULATION		
LEKIE	BOYS	GIRLS	TOTAL
	315	292	607
TOTAL	**315**	**292**	**607**

Source: Divisional delegation of basic education for Lekie 2019/2020 school year

Table 21: Target class six populations of Mfoundi division

DIVISION	GENDER' POPULATION		
MFOUNDI	BOYS	GIRLS	TOTAL
	1530	1776	3306
TOTAL	**1530**	**1776**	**3306**

Source: Divisional delegation of basic education for Mfoundi 2019/2020 school year

Table 22: Total target class six populations for Lekié and Mfoundi Divisions

DIVISION	GENDER' POPULATION		
MFOUNDI AND	BOYS	GIRLS	TOTAL
LEKIE	**1845**	**2068**	3913
TOTAL	**1845**	**2068**	**3913**

Source: Researcher's analysis

Table 23: Accessible class six populations of Lekié Division

DIVISION	GENDER' POPULATION		
MFOUNDI	BOYS	GIRLS	TOTAL
	31	29	60
TOTAL	**31**	**29**	**60**

Source: Researcher's analysis

Table 24: Accessible class six populations of Mfoundi Division

DIVISION	GENDER' POPULATION		
MFOUNDI	BOYS	GIRLS	TOTAL
	130	130	260
TOTAL	130	130	260

Source: Researcher's analysis

Table 25: Total Accessible class six populations for Lekié and Mfoundi Divisions

DIVISION	GENDER' POPULATION		
MFOUNDI AND	BOYS	GIRLS	TOTAL
LEKIE	161	159	320
TOTAL	161	159	320

Source: researcher's analysis

3.5 Sample and Sampling Procedure

3.5.1 Sampling techniques

To select schools and class six pupils, the researcher used a combination of a random selection from a wide range of schools from each subdivision depending upon schools who accepted to welcome the researcher and a stratified sampling to select both schools and class six pupils. The stratified sampling technique has been used in this study to ensure that each unit of a population has an equal chance of being selected for inclusion in the study sample. In stratified sampling, the population is first divided into groups or layers called strata. The items to be selected are such that they are as heterogeneous as possible between strata and as homogeneous as possible within strata. Stratified random sampling was used to select the schools and the class 6 pupils because schools are naturally stratified into private/government, rural/urban, while students are naturally grouped in terms of high, medium and low ability. Each head teacher has used judgmental sampling since the head teacher is the supervisor of teachers in his/her school and mastered how pupils perform within their different classes. This technique was used to select class six pupils to answer the questionnaires and sit for the mathematics competency test.

3.5.2 Sampling procedures and sample sizes

The original plan was to use stratified random sampling with proportional allocation to select 64 English primary schools with at least class 6 from government, private and mission schools. Stratified random sampling with proportional allocation ensures that every subject in the different categories (strata) has an equal chance of being selected (Dhliwayo& Keogh, 2002) quoted by Silvanos Chirume(2016 p.63). The researcher, with the help of each school's heads identifies five pupils for each of the 64 primary schools randomly selected by the researcher. 320 pupils constituted respondents and informants in the actual study sample. Pupils of varying backgrounds and abilities have been preferred to pupils of a particular background or ability class to avoid getting the same or 'class-biased' information in the following manner: 2 high achieving, 2 low achieving and 1 average pupils. The pupils were asked to give their perceptions about the mathematics assessment practices as affect their mathematics competence and equally sit for a competency mathematics test.

School sample: Sampling for schools in this study was two-fold.

The researcher took in consideration the different types of schools and pupils from different ethnic, political, socioeconomic backgrounds and abilities with the help of the various head teachers of the selected 64 English primary schools. The advantage is that data was collected from quite a heterogeneous population that fairly represents the entire population of the country, making it possible to generalize the results. Moreover, the education system in Cameroon is centralized again making it possible to generalize results from the Centre region or to any other region in the country. First, a convenience sampling method was used to select schools that are accessible to the researcher in terms of distance. In this case, all primary schools situated in Elig mfomo and Lobo for Lekié division were excluded from the sample due to their distance from the researcher's base. The sample was drawn from Obala, Monatele and Okola Ebebda , Saa and Batschenga and the 7subdivisions of Mfoundi , making it a representative sample of 81.125 % of the total number of Subdivisions found in the two divisions under study. Secondly, a simple random sampling method was used to select schools from the remaining subdivisions, to ensure that each school in the remaining subdivisions had an equal and independent chance of being selected (Dillman, Smtyth, & Christian, 2009; Mertens, 2010; Gay, Mills, & Airasian, 2009). Due to time and financial constraints, random sample of inspectoral areas was selected from each division (see Table 26 and 27). Based on this sampling frame, 5 inspectoral areas were sampled from Lekié division, 7 from the Mfoundi division .From each inspectoral area, the researcher selected schools randomly. The reason for selecting this sample size allowed the researcher to draw a small and manageable number of schools from each subdivision based on the time and financial constraints. No percentage of a sample size was respected because, some head teacher did not accept to welcome the researcher in their schools despite the fact their children received inform consent letters before. Further negotiations were made with schools who accepted the researcher to administer his questionnaires and the competency mathematics test.

Table 26: Sub divisional Inspectorate area's sampling frame of the English speaking schools for of Mfoundi Division

Sub divisional Inspectorate areas	No of schools	Sampled schools
Yaounde 1	127	9
Yaounde 2	43	2
Yaounde 3	78	10
Yaounde 4	136	6
Yaounde 5	111	8
Yaounde 6	114	15
Yaounde 7	64	2
TOTAL	**673**	**52**

Source: Divisional delegation of Basic Education for Mfoundi 2019/2020 school year

Table 27: Sub divisional Inspectorate area's sampling frame of the English speaking schools for Lekié division

Inspectoral area	No of schools	Sampled schools
Batchenga	2	2
Evodoula	1	1
Monatele	1	1
Obala	15	7
Okola	5	1
TOTAL	**24**	**12**

Source: Divisional delegation of basic education for Lekié 2019/2020 school year

3.6 Research Instruments

The first task a researcher does is to decide of which information he desires to treat (Pourtois & Desmet, 1988). He then chooses instruments that permit to gather the information. In the same light, Grawitz (2001, p.1254) emphasizes that ,it is essential for a researcher not to be contented of obtained results but to render a personal account of steps he took to obtain the data. Two data collection instruments are used in this study to collect data from the pupils. Class six pupils' questionnaires and a mathematics competency test elaborated by the researcher. They will be discussed in the following subdivisions:

3.6.1 Class six pupils' questionnaire

First, the researcher elaborated class six pupils' questionnaires. According to Lamoureux (1995), specific objectives of a research determine the content of the questionnaire and its most appropriated structure presentation. Concerning this study, the organisation of the questionnaire consists of a preamble that clarifies the objective of the questionnaire and recalls respondents that, their responses are anonymous and their participation in the study is voluntary since they are free to discontinue at any time. The questionnaire equally comprises the following sections:

Section A comprises pupils' Preliminary information such as the sector of the school it belongs, division and the subdivision the school is found; their sex and date of administration of the questionnaire. At last, sections B to E are constituted by the four research variables under study namely;

- ❖ Diagnostics assessment practices.
- ❖ Formative assessment practices.
- ❖ Continuous assessment practices.
- ❖ Summative assessment practices.

The questionnaire has 20 items statements. The different items' statements constitute competency based assessment practices which are either assessment activities or assessment tools /instruments carried out by teachers in a classroom situation for purposes of diagnostic, formative, continuous and summative evaluations that influence pupils' improvement in their mathematical competence. For each item is rated by a 4 -point Likert scales type through the opinions of respondents which roles were to read and place a cross (X) to the corresponding item that abides the degree of their opinions as indicated below:

- Strongly Agree =4
- Agree = 3
- Disagree = 2
- Strongly disagree= 1.

The students' questionnaire is found in Appendix C.

The researcher used questionnaires because, they have the advantage that they are relatively quick, responses are gathered in a standardized way and information is collected from a large group (Milne, 1999). Lamoureux (1995) mentioned another advantage of a questionnaire as it permits a comparison of obtained data and due to a high number of pupils' respondents implicated in the study, it is going to highlight their perceptions, which are latter compare. For those reasons, the researcher thus seems a questionnaire to be the most appropriate for this study; furthermore, the researcher's intention was to generate data from class pupil's points of views in respect of competency-based assessment practices, which teachers and pupils practise in classrooms, considered to influence the improvement of primary school pupils' mathematical competence attainment. All the learners may not always be at the same level of attaining the expected learner outcome at the same time because each learner has its learning style despite the fact that, learners must be assessed fairly at the same time. The questionnaire of this research thus, verifies the clarity and the pertinence of identified indicators for each of the study variables.

3.6.2 Mathematics competency test

Secondly, same respondents sat for a mathematics competency test. The researcher constructed a mathematics test competency in order to measure the present level of attainment of the class six pupils' mathematics competences. For a reliable and content validity of the instrument, the researcher first, inferred from PISA Mathematics past question. Students aged 15 are chosen as the target group in PISA as compulsory schooling ends in many countries at this age. In addition to assessing facts and knowledge, PISA assesses students' ability to use mathematical knowledge to solve real-world problems. Therefore, the term 'literacy' is used; it implies not only knowledge of a domain, but also the ability to apply that knowledge: A Teacher's Guide Shiel, Gerry et al (2007 p.7). Secondly, the researcher referred from the five components of Mathematics curriculum namely: Sets and Logic, Numbers and Operations, Measurement and Size, Geometry and Space, and Statistics and Graphs Cameroon Primary School Curriculum English Subsystem - Level III: Class 5 & Class 6(2018 p.26). According to the curriculum, Assessment in primary schools in Cameroon can take three forms (oral, written, practical) otherwise, assessment should take into consideration knowledge, skills and attitudes as indicated on the "Expected Learning Outcomes" and "Evaluation Criteria" column of each subject Cameroon Primary School Curriculum English Subsystem - Level III: Class 5 & Class 6(2018 p.3).

Based to the above considerations and principles, the researcher constructed and adapted in Cameroon context a Mathematics competency test that had 7 main short questions items in part one. Each question item had two or more sub items that made 36 tasks/ exercises, which cover the whole class six-mathematics syllabus that equated 55marks in total. The second part was constituted of a contextualized real life situation comprised of 4 tasks/exercises and which marks were distributed in the following manner: oral part 15marks, written parts 15 marks, practical part 10 marks and 5 marks for attitudinal part making a sum of 45 marks.

Each correct answer carries either 1 mark or 2 marks depending the level of item difficulty. Meanwhile, a real life situation comprised 4 tasks items with appropriate evaluation criteria on oral, written and practical parts that were to complete in 1 hour in respect to Table 28 **Competence 2:** Use basic notions in Mathematics, Science and Technology (100 marks) level 3 marking guide as stipulated in the curriculum.

Table 28: Use Basic Notions In Mathematics, Science And Technology (100 Marks)

N°	COMPETENCES	TOTAL MARKS	PARTS	CRITERIA	MARKS
2a	**Use basic notions in mathematics**	**50 marks**	**Oral 15 marks**	C1- relevance in the vocabulary	7
				C2- pertinence of logical thinking	8
				Total for oral	**15**
			Written 20 marks	C1- correctness of figures and formula	5
				C2- correct choice of operations	5
				C3-coherence of ideas in relation to instruction	5
				C4- correctness of answers	5
				Total for written	**20**
			Practical 10 marks	C1- respect of the norms	5
				C2- respect of instructions	2
				C3- correctness of the procedure	3
				Total for practical	**10**
			Attitude 5 marks	C1- collaboration	2
				C2-creativity	3
				Total for attitudes	**5**

N°	COMPETENCES	TOTAL MARKS	PARTS	CRITERIA	MARKS
2b	**Use basic notions in science and technology**	**50 marks**	**Oral 15 marks**	**C1- correctness in steps**	**5**
				C2- correctness in answers	5
				C3- relevance of scientific vocabulary	5
				Total for oral	**15**
			Written 20 marks	C1- correctness in steps	10
				C2- correctness in answers	5
				C3- relevance of scientific vocabulary	5
				Total for written	**20**
			Practical 10 marks	C1- appropriate manipulation of different objects	3
				C2- correctness of procedure in relation to instructions	3
				C3- respect of safety rules	4
				Total for practical	**10**
			Attitude 7 marks	C1- collaboration	2
				C2-creativity	5
				Total for attitude	**7**

Problems set in the test cover a wide variety of mathematical situations encompassing Arithmetic, Geometry, Algebra and Trigonometry, all of which are in the English primary school curriculum level three. Students were also tested on their ability to recall and apply formulae, comprehend, measure, construct, interpret graphs, solve equations and evaluate expressions, among other skills and real life situation .The researcher and the class six teachers of selected schools invigilated the mathematics test. Candidates were not told in advance the nature or structure of the questions in the paper that they were asked to write, so having seen or practiced the paper beforehand would have little or no impact on the results. It would be similar to having revised any other past exam paper, which is the practice most final year pupils normally do in preparation of first school leaving certificate for certificate purpose. The mathematics achievement scores were used for investigating relationships (or correlations) with pupils ‘perception on diagnostic, formative, continuous and summative assessments practices. The full mathematics competency test paper and the marking guides as raw scores of the mathematics test can be found in Appendix C.

3.7 validity and reliability of instruments

3.7. 1 Validity of the Instrument

In, Tavakol and Dennick (2011, p. 53), (Confrey&Stohl, 2004, p. 132) notes “Validity is concerned with the extent to which an instrument measures what it is intended to measure.” Valid data can be collected if one uses a standardized instrument or if an expert or a team of peers and then pilot tested is done with a few respondents firstly checks the instrument for validity. This ensures internal validity of the instrument. In this study, valid instruments used are Mathematics competency test that was retrieved from the net as a combination of PISA past questions. PISA was discussed in 3.6 above and a conceived 4 Likert Scale questionnaires strongly scrutinized and validated by the researcher’s supervisor since he is an expert in measurement and evaluation. The items responses range from strongly Agree, Agree, Disagree to Strongly Disagree.The questionnaires were firstly peer-checked and then pilot-tested with a few respondents.

3.7.2 Reliability of the Instrument

An instrument is reliable if it produces consistent results when administered to the same people at different times or when used at the same time to different people. Reliability implies validity but validity does not necessarily imply reliability (Tavakol&Dennick, 2011). Reliability can be objectively measured using any of the different methods (formulae) in the literature. The most commonly used internal consistency is the Cronbach’s alpha coefficient. It is viewed as the most appropriate measure of reliability when making use of Likert scales Whitley(2002), Robinson(2009) cited Hammed Taherdoost(2016 P.33). ***Cronbach’s alpha*** is another measure of internal consistency reliability. Split-half reliability is an estimate of reliability known as internal consistency; it measures the extent to which the questions in the survey all measure the same underlying construct. No absolute rules exist for internal consistencies, however, most agree on a minimum internal consistency coefficient of .70 Whitley (2002), Robinson(2009). Meanwhile, HAMMED Taherdoost(2016 P.33), Hinton and al(2004) suggested four cut-off points for reliability which includes excellent reliability (0.90 and above),high reliability(.70 -.90), moderate reliability(.50-.70) and low reliability(.50and below). Table 29 below indicates the interpretation of Cronbach's alpha to Measure Internal Consistency/Reliability using SPSS.

Table 29: Cronbach's alpha to Measure Internal Consistency/Reliability using SPSS

Cronbach's apha	Internal consistency
A ≥ 0.9	Excellent
0.9 > a ≥ 0.8	Good
0.8 > a ≥ 0.7	Acceptable
0.6 > a ≥ 0.6	Questionable
0.6 > a ≥ 0.5	Poor
0.5 > a	Unacceptable

Source: Deepa-Enlighten

For surveys or assessments with an even number of questions, ***Cronbach's alpha*** is the equivalent of the average reliability across all possible combinations of split-halves. Most analysis software will also routinely calculate, for each question or questionnaire item in the scale, the value of Cronbach's alpha if that questionnaire item was deleted. These values can be examined to judge whether the reliability of the scale can be improved by removing any of the questionnaire items Jo Morrison (n.d). When testing for reliability of questionnaire items in a survey, any coefficient α such that $0.7 \leq \alpha \leq 1$ is accepted as a good reliability indicator (Tavakol & Dennick, 2011).

3.8 How validity and reliability of instruments were tested

This study uses Cronbach's alpha to calculate the research instruments' reliability coefficients primarily because, it is the most appropriate measure of reliability when making use of Likert scales questionnaire with an even number of questions or items. The questionnaire of this study is made up of 20 items, which is an even number. A pilot study to check on the validity and reliability of the research instruments was conducted in a few randomly selected schools in Yaoundé municipality in schools not involved in this researcher's study. It was carried out in the third week of November 2019 and not in June 2019 as had been proposed because the researcher as a full time employee and student did not find time due to other work demands.

Four English primary schools of all denominations in Mfoundi division were visited and from each of these schools 5 of each of the pupils (2 high achieving, 2 average and 2 low achieving in mathematics) were selected and the researcher asked head teachers to assist their pupils in order to complete the given questionnaires and the competency mathematics test. For each questionnaire the coding was as follows: male 1, female 2, age (integer as indicated), and 1 to 4 for the responses strongly disagree to strongly agree. SPSS provides facilities for analyzing and displaying information using a variety of techniques. This study used version 16 of SPSS for Windows. Figures were entered into the Statistical16.0 Package for Social Sciences (SPSS) version and the reliability coefficient Cronbach's alpha (α) was computed as shown in Table 30 below.

Table 30: Results of Cronbach's Alpha reliability coefficient

Constructs	Cronbach's Alpha
Independent Variables	
Diagnostics assessment practices	**0.830**
Formative assessment practices	**0.785**
Continuous assessment practices	**0.797**
Summative assessment practices	**0.725**
Dependent Variable	
Mathematics competence	**0.865**

All reliability correlation coefficients were large and positive (>0.7). Overall alpha is 0.8, which is very good and indicates strong internal consistency among the items of the constructs. Essentially this means that respondents who tended to select high scores for one item also tended to select high scores for the others; similarly, respondents who selected a low score for one item tended to select low scores for the other items in the constructs. Thus, knowing the score for one item would enable one to predict with some accuracy the possible scores for the other items of each construct. Had alpha been low, this ability to predict scores from one item would not be possible. After the reviews, it could be agreed that the instruments were effective in measuring what they were supposed to measure. Pupils' also agreed that the questionnaire was clear, readable, and understandable. Overall, all the research instruments were considered generally reliable and valid and the data collection process then started.

3.9 Data collection procedure

Firstly, the researcher-collected data during the pilot study used it to test validity and reliability of the instruments, crosschecked this using expertise, and input from the supervisor. The researcher had an agreement with the 64 schools authorities for the administration of questionnaires at the convene time of pupils under the supervision of their classroom teacher or their head teachers depending who handles class six. The researcher then solicited help in the administration of the tests, distribution and collection of the questionnaires. It depended on the appointment he had with each school head; the researcher collected the questionnaires at an interval of one to two weeks because some school administered on their convenience extra free periods. The researcher briefly acquainted them with the research problem before the administration of the test and questionnaires to their selected respondents.

3.10 Data coding schedule

After the collection of data, the following codes will be attributed for easy computations during analysis: Male= 1 Female= 2; ;items respond are classified for positive opinions in this order: SA=4 ,A=3,DA=2,SD=1 and reverse for negative opinions**.** Concerning school codes, the researcher presented as follows: Public school=1, Private = 2; Rural schools= 1, Urban=2

3.11 Operational framework of study variables

This operational framework permits to present operations in operationalization of factors into variables and indicators. The operations reduce the level of abstraction of the study variables and specify what will be measured in order to proceed into the verification of research hypotheses. To carry out the process, the researcher refers to the preceding theoretical framework of operationalization of variables, which consists to identify indicators otherwise called observables variables' characteristics. Hence, the chapter treats operationalization of general hypothesis, determination of the study variables and formulation of research hypotheses.

3.11.1 Recall of general research question

After realising problems as established in chapter 1, the researcher question was formulated as follows: How Competency Based Assessment practices influence the attainment of Mathematics Competence amongst class six pupils in the Centre Region of Cameroon ?

The purpose of the study is to investigate competency based assessment practices components, which contribute for the reinforcement of the attainment of mathematics competence amongst class six pupils in the centre of Cameroon.

3.11.2 General hypothesis

General hypothesis is a temporal response of the above research question. It has been formulated as follows: Competency based assessment practices significantly influence the attainment of mathematics competence amongst primary six pupils in the centre region of Cameroon.

3.11. 2.1 Operationalisation of general hypothesis

At this phase, the general hypothesis is operationalised in order to formulate research hypotheses that help for its verification.

3.11.2.2 General hypothesis variables

The above stated general hypothesis is made up of two principal's variables:

- Independent variable: Competency mathematics assessment practices
- Dependent variable: Attainment of Mathematics competence amongst class six pupils

➢ **Operationalisation of Independent Variable (IV)**

It is an attempt to determine whether, an independent variable provides an answer to the research question. This is to find out whether there is coherency between research question and the independent variable. As compared to general hypothesis is to identify susceptible indicators if they provide answers to the research question. Based on literature review and especially from the work of Harlen (2006) justified changes in assessment practices, she proposed four purposes: diagnostic, formative, summative, and evaluative. Meanwhile, Roegiers X (2004 p.97) proposed four different models in evaluation of students' attainment in academics. He discussed the following: Informal evaluations (Implicit evaluation Self-evaluation, Remediation); Pedagogic evaluations (diagnostic, formative, and descriptive and criterion); Validation of attainments (Competency based evaluation, State of level of competences, Portfolio's validation, Competitive entrance examinations) and Attainment's control (State of knowledge's level, Summative evaluation, Placement evaluation, normative evaluation). The researcher selected three of the purposes from Harlen (2006) and Roegiers X (2004) as the diagnostic, formative, summative, the researcher finally included continuous assessment in relevance to competency based assessment practices as indicated below:

- **IV 1:** Diagnostics assessment practices (DAP)
- **IV2:** Formative assessment practices (FAP)
- **IV3**: Continuous assessment practices (CAP)
- **IV4**: Summative assessment practices (SAP)
- **Operationalisation of Dependent Variable (DV)**

Attainment of Mathematics competence is the Dependent Variable in this study. Attainment of Mathematics competence has as indicators:

- Increased in attainment of Mathematics Competence
- No increased in attainment of Mathematics Competence

The operationalization of variables of the general hypothesis is recapitulated in Table 31 below.

Table 31: Operationalization of variables of the general hypothesis

General Hypothesis	Variables of General Hypothesis		Indicators of Variables of General Hypothesis
Competency Based Assessment practices, significantly influences attainment of Mathematics competence amongst Primary six pupils in the Centre region of Cameroon.	I V	Competency Based Assessment practices	Diagnostics assessment practices Formative assessment practices Continuous assessment practices Summative assessment practices
	D V	Attainment of Mathematics competence	- Increased in attainment of Mathematics Competence - No increased in attainment of Mathematics Competence

3.11. 3 Operationalisation of variables of competency based assessment practices

From the knowledge of literature review and theoretical framework earlier mentioned in subsequent paragraphs in the operationalisation of variables, four of them have been taken in consideration. These independent variables are susceptible to contribute to the attainment of mathematics competence amongst class six pupils in the centre region of Cameroon accordingly:

3.11.3.1 Operationalisation of diagnostics assessment practices

Wiggins and McTighe (2007) assert that diagnostics assessment or pre-assessments *"include checks of prior knowledge and skill levels and surveys of interests or learning-style preferences"* (p. 101). As Brown puts it, "*diagnostic testing often requires detailed information about the very specific areas in which students have strengths and weaknesses"* (Brown 1996 p.15). The purpose of a diagnostic test is not to judge success or failure, but to draw up a list of weaknesses, which need to be addressed, and, equally importantly, to establish in which areas the student has been successful. It is in the same light that the OECD (2013 pp.140-141) equally assert that, diagnostic assessment may serve to identify students who are at risk of failure, to either identify the areas students have and have not mastered or the sources of their learning difficulties and to plan for an appropriate supplemental intervention or remediation. Teachers use this information to adjust instruction. Based on literature review the researcher retrieved the following diagnostics assessment practices :- Review of previous knowledge through oral questions; Review of some lower skills/ competences through multiple-choice questions (MCQ) and true or false (T/F);Teacher's provision of oral feedback; Pupils' errors correction and Remedial works sequences as indicated in Table 32 below.

Table 32: Operationalisation of diagnostics assessment practices

Variable	Indicators	Modalities
Diagnostics assessment practices	- Review of previous knowledge through oral questions. - Review of some lower skills/ competences through multiple-choice questions (MCQ) and true or false (T/F) tasks. - Give oral feedback to pupil's responses. - Correct pupils' persistent errors constantly. - Plan remedial works in areas of mathematics pupils face difficulties.	Strongly Agree (S.A)=4 Agree (A)=3 ; Disagree(D)=2; Strongly Disagree (S.D) =1.

3.11.3.2 Operationalisation of formative assessment practices

Formative assessment is also referred to as Assessment for Learning(A f L), it has been defined as *'activities undertaken by teachers—and by their students in assessing themselves—that provide information to be used as feedback to modify teaching and learning activities'*(Black and Wiliam, 1998a). Black and Wiliam (1998a) underlined that an assessment is considered to be formative when the assessment information is used to improve students' performance. Formative assessment encompasses a variety of tools that provide feedback to teachers or students to help students learn more effectively. Formative assessment, according to Wiggins and McTighe (2007), occurs during instruction, as part of instruction rather than a separate activity. It has both formal and informal formats including ungraded quizzes, oral questioning, self-reflection, peer feedback, think-aloud, etc. Based on literature review the participants of in this study were to verify whether their teachers carry out some of the practices in class. The researcher therefore retrieved the following formative assessment practices: Integration activities with criteria success in respect to learning outcomes/ competences. The use of attitudinal questionnaires to observe pupils' behavior, mobilization of pupils to do group homework and allows us to mark them ourselves (self and peer assessments); Teachers' written feedback made on my mathematics quiz papers and the organization of remedial classes as indicated in Table 33.

Table 33: Operationalisation of formative assessment practices

Variable	Indicator	Modalities
Formative assessment practices	- Organization of integration activities that reflect communicated mathematics competence based statement with criteria success. - Use individual attitudinal questionnaire to assess pupils' behavior. - Mobilize pupils to correct group homework (self and peer assessments). - Mark and comment individual pupils' mathematics exercise books assignment - Organize remedial classes where pupils faced learning difficulties when correcting their books.	Strongly Agree (S.A)=4 Agree(A)=3 ; Disagree(D)=2; Strongly Disagree (S.D) =1.

3.11.3.3 Operationalisation of continuous assessment practices

Nitko (2004 p.4) defines continuous assessment as an ongoing procedures of gathering and interpreting information about student learning which is used in making decisions about what to teach and how well students have learned. According to Onuka,(2005, 2006) continuous assessment is considered as a technique to ascertain what a student gains from schooling in terms of knowledge, industry and character development, taking into account all his/her performances in tests, assignments, projects and other educational activities during a given period of term, year, or during the entire period of an educational level. It is also a method of using the recorded performances of each pupil to help him or her improve on his or her achievement through guidance. The researcher has chosen the following continuous assessment practices : Respect of monthly written tests calendar ; Consideration of marks of drawing practices assignments ; Involvement of pupils in the selection of assessment criteria ; Publication of best pupils mathematics competency test marks and Counting of the pupils' continuous assessment marks towards the final mark of mathematics competence module as indicated in Table 34.

Table 34: Operationalisation of continuous assessment practices

Variable	Indicator	Modalities
Continuous assessment practices	- Respect monthly mathematics competency written tests calendar. - Observe pupils 'attitude during drawing practices workshops and awards marks. - Encourage mathematics' high achievers pupils to assist low achievers. - Involve pupils in the selection of assessment criteria. - Add continuous assessment's marks quota to the final mathematics competency evaluation at the end of term.	Strongly Agree (S.A)=4 Agree (A)=3 ; Disagree(D)=2; Strongly Disagree (S.D) =1.

3.11.3.4 Operationalisation of summative assessment practices

Summative assessment is used to evaluate student learning, skill acquisition, and academic achievement at the conclusion of a defined instructional period- typically at the end of a project, unit course, semester, program, or school year' Abbott, 2014). Summative assessments are generally 'high stakes 'assessments and used to get a final judgment of how much learning has taken place—that is, of how much a student knows and has learned (Gardner, 2010). Summative assessment methods rely on an extrinsic motivation for students, represented by marks, transcripts and diplomas. They are built on strategies to motivate students, provide information about student performance, serve to select or group students, and certify learning and award qualifications (Bennett, 2011; OECD, 2013, Dixson and Worrell, 2016). The transformation of assessment practices, according to Herrera et al. (2007), is that "assessment of achievement has become increasingly standardized, norm referenced and institutionalized" (p. 13). Combrinck & Hatch (2012) have also criticized summative assessment for being Context-independent and inflexible. However, the way summative assessments are used in the classroom can present both opportunities and challenges for assessing key competences and transversal skills. The researcher focuses on assessment tools/instruments, on assessment activities for summative assessment practices thus depend on the chosen (norm referenced evaluation), or (criterion referenced evaluation). Evaluation with real life situations or complex integration situations in respect to criterion referenced testing (CRT). Evaluation with standardized objectives types of questions in respect to norm referenced testing (NRT). The use of Projects, Portfolios (all best past worksheets) and keeping pupils' records report sheets to inform different educational stakeholders are considered as indicated in Table 35.

Table 35: Operationalisation of summative assessment practices

Variable	Indicator	Modalities
Summative assessment practices	Evaluation with real life situations or complex integration situations in respect to criterion referenced (CR) Evaluation with standardized objectives types of questions in respect to norm referenced (NR) Projects Portfolios Keeping pupils' records report sheets to inform different educational stakeholders	Strongly Agree (S.A)=4 Agree (A)=3 ; Disagree(D)=2; Strongly Disagree (S.D) =1.

Operationalization of general hypotheses, variables and indicators are summarized in Table 36 below.

Table 36: Synoptic table of the study's research questions, hypotheses, variables and indicators

Principal question	Major factor	Secondary questions	General Hypothesis	Variables	Indicators	Research Hypotheses	Themes	Items /questions
How does competency based assessment practices, related assessment activities, and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst primary schools' pupils?	Competency Based Assessments Practices	How do diagnostics assessments practices, related assessment activities, and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?	Competency based assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. .	Independent Variables **IV1:Diagnostic assessment practices**		**HR1:** Diagnostic assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.	**Diagnostic assessment practices**	Q 1
					Oral questioning			
					Objectives testing (MCQ) and true or false (T/F),			Q 2
					Give oral feedback to pupil's responses.			Q 3
					Correction of pupils' persistent errors			Q 4
					Plan remedial works in areas of mathematics pupils face difficulties.			Q5

How do formative assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?	**IV2: Formative assessment practices**	Organization of integration activities that reflect communicated mathematics competence based statement with criteria success.	**RH2:** Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.	**Formative assessment practices**	Q 6
		Use individual attitudinal questionnaire to assess pupils' behavior.			Q 7
		Mobilize pupils to correct group homework (self and peer assessments).			Q 8
		Mark and comment individual pupils' mathematics exercise books assignment.			Q 9
		Organize remedial classes where pupils faced learning difficulties when correcting their books.			Q 10
How does continuous assessment practices, related assessment activities and assessment tools/instrume	**IV3:Continuous assessment practices**	Respect monthly mathematics competency written tests calendar.	**RH3:** Continuous Assessment practices, related assessment activities and assessment tools/instrume	**Continuous assessment practices**	Q 11

nts used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?		Observe pupils ‘attitude during drawing practices workshops and awards marks.	nts used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.		Q 12
		Encourage mathematics’ high achievers pupils to assist low achievers.			Q 13
		Involve pupils in the selection of assessment criteria.			Q 14
		Add continuous assessment’s marks quota to the final mathematics competency evaluation at the end of term.			Q 15
How does summative assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?	**IV4:Summative assessment practices**	Use of Real life situations or complex integration situations	**RH4:** Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in	**Summative assessment practices**	Q 16
		Use of standardized objectives and open questions			Q 17
		Projects presentation by pupils			Q 18
		Attribution of marks quota on pupils’ mathematics practical activities (Portfolios)			Q 19

		keeping pupils' records report sheets	the Centre Region of Cameroon.	Q 20
	<u>Dependent Variable</u> Attainment of Mathematics competence amongst primary schools pupils.	-Increased in attainment of Mathematics competence -No increased in attainment of Mathematics competence		

3.12 Recall of Research Hypotheses

Research hypotheses are anticipated answers to specific objectives of the research. Based on indicators of the main variable, the research hypotheses are in coherence to the theoretical framework and corresponding to the research questions formulated in the following manner:

RH_1: Diagnostic assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

RH_2: Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

RH_3: Continuous Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

RH_4: Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

3.13 Ethical and legal considerations

To handle the relevant ethical and legal implications:

a) The researcher applied for an authorisation research letter to the Dean of faculty of education of Yaoundé I university.

b) The researcher got the research authorization on 24 April 2019 confirming “to whom it may concern” that the doctoral candidate in evaluation was to conduct research on **competency based assessment practices in mathematics competence amongst primary six pupils in the Center region of Cameroon.** In addition to that, the researcher needed cooperation and assistance. The researcher used this letter to get entrance into the premises of the sampled schools see Appendix D.

c) The researcher applies to the various head teachers of selected schools, for permitting him to conduct research;

d) The researcher gets consent from parents/guardians for pupils since class six pupils are all under 12 year’s old from the school authorities who were acting in loco parentis,

e) The researcher explains to the respondents the significance of the study and the contributions it would make to the overall education system, before administering the instruments,

f) The researcher assures the respondents that their rights of confidentiality, anonymity, freedom of choice and expression will be adhered to,

h) The researcher asks the respondents to respond willingly, truthfully and objectively and tell them that they are free to withdraw at any given time,

The researcher would like to thank the head teachers in charge of sampled schools and their corresponding pupils for willingly supplying the required information during the data collection process. Their names, unfortunately, cannot be revealed here because of the agreement that was made not to reveal confidential company information or their names (see Appendix E).

3.14 Chapter summary

This chapter has described and explained the research design and methodology for this study. The design or plan of the procedures and processes used were articulated. A structured class six pupil's questionnaire constructed by the researcher was used to gather data. The researcher explained and discussed its validity and reliability. The second instrument used to measure attainment of mathematics competence amongst class six pupil's was retrieved from a combination of PISA past questions style which measures candidates' mathematics competency level. The researcher contextualized the items of the past questions in Cameroon context with respect to the 2018 new English primary school curriculum level three to ensure a valid mathematics competency test for class 6 pupils. Method of Data Presentation, Analysis and Interpretation procedures were discussed. First, the correlational data analysis techniques based on descriptive and inferential statistics, the statistical tool was Pearson's product moment correlation coefficients and secondly questionnaire contents' data analysis based on a theoretical framework of Sedlack& Stanley (1992) and Écuyer (1990) .The researcher took cognizance of the limitations of the study and was cautious of them when making recommendations. The next chapter (4) presents analyses and discusses the data and the emanating results.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND INTERPRETATION OF RESULTS

4.1 Introduction

This chapter includes the presentation, analysis and interpretation of data that have been gathered from the questionnaire distributed to the respondents and competency mathematics test administered to the respondents. This chapter also contains the presentation of data in tabular and textual form along in their corresponding interpretations. Two instruments were used, via, one pupil's questionnaire(respondents' perceptions as regards to the use of competency assessment practices related to diagnostic, formative, continuous and summative practices by teachers) and a Mathematics Competency Test(measuring class six pupils' attainment of mathematics competence) to collect quantitative data from the class six pupils under study. After Data Presentation in Section (4.2) including subsection (4.2.1) that presents tabular and textual thematic presentation of questionnaire data and subsection (4.2.2) that presents the competency mathematics tests results. The researcher analyzed and interpreted the data by means of the two most commonly used quantitative data analyses methods, which are the descriptive statistics and inferential statistics methods. Each of the methods has been discussed in details with emphasis on statistical tool used for data analysis accordingly: Section (4.3) presents data analysis categorised by different types of data analyses methods which first of all presents descriptive statistics in section (4.3.1) with emphasis on statistical tool used for data analysis sunder the following subsections. Sub section (4.3.1.1) presents Frequency count and percentages of data's analysis based on the questionnaire's content. Sub section (4.3.1.2) presents General Description of Data/Variables of the study. Secondly, section (4.3.2) presents inferential statistics with emphasis on statistical tool used for data analysis sunder the following subsections. Subsection (4.3.2.1) presents Correlation research analysis and verification of research hypotheses. Subsection (4.3.2.2) presents regression analysis and finally subsection (4.3.2.3) presents multiple regression analysis. Following results of the frequency count and percentages, the correlational analysis data and verification of hypotheses, regression analysis and multiple regression analysis Section (4.4) presents interpretation of results under the following subsections: Subsection (4.4.1) Diagnostic Assessment Practices (DAP). Subsection (4.4.2) Formative Assessment Practices (FAP). Subsection (4.4.3) Continuous Assessment Practices (CAP) and finally Subsection (4.4.4) presents Summative Assessment Practices (SAP). The major purpose of this study is to identify the types of competency-based assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of Mathematics competence amongst primary schools' pupils in the Centre region of Cameroon.

The study thus sets out to investigate the Competency Based Assessment practices that influence the attainment of Mathematics Competence amongst class six pupils in the Centre Region of Cameroon.

Specifically this study seeks to achieve the following objectives:

1. To investigate how diagnostics assessment practices, related assessment activities and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst class six pupils.
2. To investigate how formative assessment practices, related assessment activities and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst class six pupils.
3. To investigate how continuous assessment practices, related assessment activities and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst class six pupils.
4. To investigate how summative assessment practices, related assessment activities and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst class six pupils.

4.2- Data Presentation

According to Mika E. P. (2014), data presentation is a process of organizing data into a logical, sequential and meaningful categories and classifications in order to convert them to study and interpretation. In other words, data may be generated from experiments, survey, tests or measurements. Before applying statistical procedures to a set of such generated data, it is often necessary to arrange them in a form that will make the computation easy. The process of arranging data in an orderly form is not in itself a statistical process, but it facilitates the application of statistical methods ant tends to make the interpretation of data much easier. Mika Ella Perez (2014), outlines the following three ways of data presentation:

1-**Textual presentation** is made of statements with numerals or numbers that serve as supplement to tabular presentation.

2- **Tabular presentation** is a systematic arrangement of related idea in which classes of numerical facts or data are given each row and their subclasses are given each column in order to present the relationship of the sets or numerical facts or data in a definite compact and understandable forum. **Tabulation** is the classification of data in the form of tables. In other words tabular may be presented or represented by tables, frequency count and percentages, frequency distribution table.

3-**Graphic or Diagrammatic presentation** may be presented or represented by pictogram, pie chart, bar chart, histogram, frequency polygon, and ogive , bar lines, pie graph, statistical map, ratio charts etc..

However, diagrammatic presentation was not taken in consideration in this study due to the following limitations: classified and tabulated data provides more information than the diagrams if the data has various measurements and wide variation, then diagrams do not present a meaningful look. Sometimes diagrams are misused to present an illusory picture of the problem and restrict further data analysis.

4.2.1- Tabular and Textual thematic presentation of questionnaire data

The presentation of pupils' preliminary information or demographic data of section A is not presented in this work. The researcher did not include some of the cofounding factors generated from demographic data that could have influence attainment in mathematics competence amongst class six pupils because it does not have direct link with the study variables. In sections B,C,D and Class six pupils completed questionnaires with 20 structured items statements eliciting them to express their view related to the diagnostics, formative, continuous and summative assessments practices in each case, either assessment activities or instruments / tools teachers use to assess the attainment of mathematics competences in a classroom situation. Each respondent answered each question according to the degree of his or her opinion abides to in placing a cross (X) mark only on one of the four Likert scales below. Strongly Agree (S.A)=4 ;Agree (A)=3 ; Disagree(D)=2; Strongly Disagree(S.D)=1. The total number of respondents' degree of agreement for each of thematic competency assessments practices is presented according to the following tables 37, 38, 39 and 40 below.

Table 37: Pupils' view on diagnostic assessment practices (PVDAP).

S/N	Statements	S.A	A	D	S.D
1	-Ask oral questions to check pupil's mathematics prior knowledge.	100	150	50	20
2	- Review of some lower skills/ competences through either multiple-choice questions (MCQ) or true and false (T/F) tasks	120	175	10	10
3	- Give oral feedback to pupil's responses.	120	125	60	15
4	- Correct pupils' persistent errors constantly.	180	75	50	15
	- Plan remedial works in areas of mathematics pupils face difficulties.	110	90	75	45

Table 38: Pupils views on formative assessment practices (PVFAP)

S/N	Statements	S.A	A	D	S.D
1	- Organize integration activities that reflect communicated mathematics competence based statement with criteria success.	90	90	75	65
2	- Use individual attitudinal questionnaire to assess pupils' behavior.	30	60	140	90
3	- Mobilize pupils to correct group homework (self and peer assessments).	100	90	90	40
4	- Mark and comment individual pupils' mathematics exercise books assignment.	135	100	65	20
5	- Organize remedial classes where pupils faced learning difficulties when correcting their books.	85	95	75	65

Table 39: Pupil's views on continuous assessment practices (PVCAP).

S/N	Statements	S.A	A	D	S.D
1	- Respect monthly mathematics competency written tests calendar.	110	90	44	76
2	- Observe pupils 'attitude during drawing practices workshops and awards marks.	123	99	88	10
3	- Involve pupils in the selection of assessment criteria.				
4	- Encourage mathematics' high achievers pupils to assist low achievers.	35	25	105	155
5	- Add continuous assessment's marks quota to the final mathematics competency evaluation at the end of term.	127	93	55	45
		75	60	120	65

Table 40: Pupil's views on summative assessment practices (PVSAP).

S/N	Statements	S.A	A	D	S.D
1	He evaluates us using real life situations or complex integration situations in mathematics competence domain	80	55	120	65
2	He evaluates us using standardized objectives types of questions in mathematics competence domain	230	70	15	5
3	He evaluates our class Projects	85	80	75	80
4	He attributes extra marks to our mathematics practical activities (Portfolios)	25	30	200	65
5	He Keeps our progress report sheets for official uses	290	30	00	00

The data obtained were analyzed by first looking at frequencies of each response, categorizing the responses and then finding the emerging themes from those responses in section **4.3.1.1** thereafter.

4.2.2 - Competency Mathematics Tests Results

Table 41: Mathematics Competency Test Results

	BOYS	GIRLS	TOTAL
N° SAT	174	146	320
N° PASSED	36	29	64
% PASSED	20.69%	19.86%	20%

Source: researcher's competency Mathematics Tests results

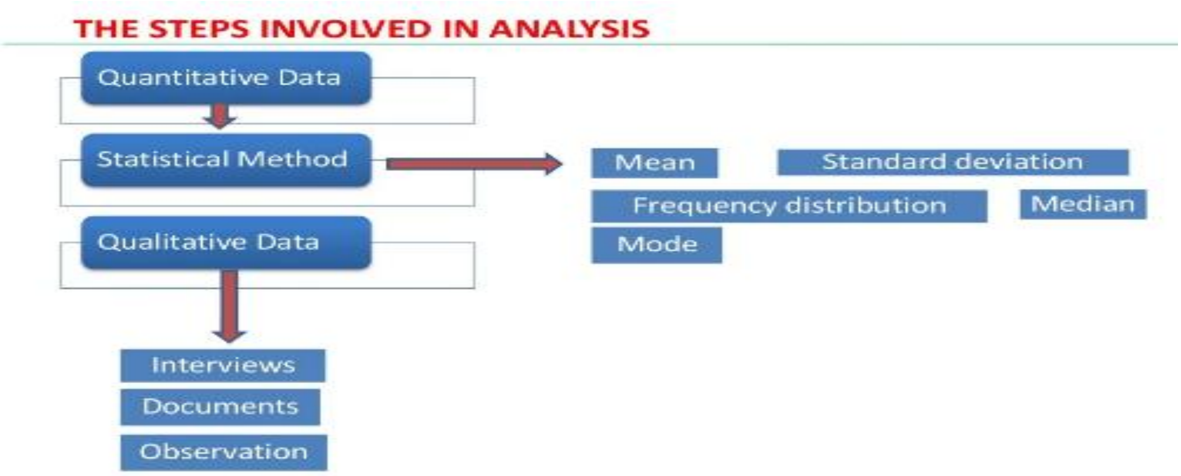
Teachers have been attending to pedagogic seminars and animations and were able to properly state the competency based statements and able to properly state the teachers' activities, students' activities and assessment plans. However, the researcher had observed that competency based teaching approaches were not well implemented in Cameroon schools and teachers have limited ability to demonstrate it. This showed that competency based teaching approach is superficially implemented and hypothetical rather than practical to the extent pupils fail examination in important subjects like basic mathematics. For instance, results of CEP and FSLC 2020 session indicated in section 1.2 and results of the Mathematics Competency Test administered to the general population under study as indicated in Table 40 above. The test results testified that, out of 174 boys who sat the test 36 passed that makes 20.69% of passers as compared to girls, 146 sat, 29 passed that makes 19.86% passers. In general, out 320 class six pupils who sat for the test, only 64 of them had an average passed mark above 50/100 leading to 20% of the passers.

4.3- Data Analysis

In preparation for data analysis in a quantitative research, the researcher started by data validation secondly data editing and ended up with data coding. **Data coding** that is categories of data are transformed into symbols that may be tabulated and counted. Unlike the quantitative data which can be analyzed directly after it has been collected and sorted, qualitative data needs to first be coded into numbers before it can be analyzed. This is because texts are usually cumbersome, and will take more time and result in many errors if analyzed in its original state. Coding done by the analyst should also be documented so that it can be reused by others and analyzed (Samaj.K . S 2021). **Data editing** is a process wherein the collected data are checked either manually or with the assistance of a computer. **Data validation** deals with the process of ensuring the accuracy and quality of data .Once data have been collected, the researcher now seeks how to analyse them. Analysis is the separation of a whole into its constituents parts (Merriam- Webster 2012). Calderon (1993) on his part defined analysis as the process of breaking up to specific questions under the statement of the problem. Kothari,C.R & Gaury;G(2014 p.17) and Mika Ella Perez (2014) in common, emphasized that, the analysis of data requires a number of closely related operations such as: Data analysis is a process of inspecting, cleansing, transforming, and modelling data with the goal of discovering useful information, informing conclusions, and supporting decision-making (Km Tripti Singh 2021). Kothari,C.R & Gaury;G(2014 p.126) instead defined data analysis as the computation of certain indices or measures along searching for patterns of relationship that exist among the data group. They noted, association or relationship does not imply causation. It is not that high or low score in mathematics caused high score in physics. It might only mean that the students have high aptitude for science subjects. The purpose of data analysis is to extract useful information from data and taking the decision based upon the data analysis.

Km Tripti Singh (2021) designed steps involved in data analysis as shown in figure 13 below.

Figure 13: Steps involved in analysis



Source: Km Tripti Singh (2021)

Kothari,C.R & Gaury;G(2014 p.4) emphasised that, there are two research approaches namely:

1-**Qualitative research approach** is one that concerned with subjective assessment of attitudes, opinions and behaviour**.** Such an approach to research generates results either in non-quantitative form or in the form, which is not subjected to rigorous quantitative, and analysis. It is not based on precise measurement and quantitative claims. The focus is on words, phrases, and expressions that cannot be reduced to numbers. Samaj.K . S(2021) cited several methods are available to analyze qualitative data. The most commonly used data analysis methods are:

- **Content analysis:** It is used to analyze documented information in the form of texts, media, or even physical items. It is usually used to analyze responses from interviewees.
- **Narrative analysis:** This method is used to analyze content from various sources, such as interviews of respondents, observations from the field, or surveys. It focuses on using the stories and experiences shared by people to answer the research questions.
- **Discourse analysis:** Like narrative analysis, discourse analysis is used to analyze interactions with people. However, it focuses on analyzing the social context in which the communication between the researcher and the respondent occurred. Discourse analysis also looks at the respondent's day-to-day environment and uses that information during analysis.
- **Grounded theory:** This refers to using qualitative data to explain why a certain phenomenon happened. It does this by studying a variety of similar cases in different settings and using the data to derive causal explanations. Researchers may alter the explanations or create new ones as they study more cases until they arrive at an explanation that fits all cases.

These methods are the ones used most commonly. However, other data analysis methods, such as **conversational analysis**, are also available.

The researcher earlier indicated this study adopted a quantitative research approach. It is the rationale for the researcher to lay much emphasis on the quantitative data analysis.

2-**Quantitative research approach** involves the generation of data in quantitative form, which can be subjected to rigorous quantitative analysis in a formal and rigid fashion**.** Quantitative data are of 2 main types, namely; discrete and continuous data. Continuous data is further divided into interval data and ratio data, with all the data types being numeric. Due to its natural existence as a number, analysts do not need to employ the coding technique on quantitative data before it is analyzed. Dereck.J & Kerryn.W(2020) enumerated three purposes of Quantitative data analysis which are:-

1 - To measure differences between groups;
2- To determine relationships between variables;
3- To test Hypothesis in scientifically rigorous way.

In contrast, to qualitative analysis which when is used to analyse peoples' perception and feelings about an event or a situation.

Dereck.J & Kerryn.W(2020) defines quantitative analysis as a means of analyzing numbers based data or data that can easily be converted into numbers without losing any meaning According to the authors, the two branches of quantitative analysis are **descriptive analysis** and **inferential analysis.**

Brittany Colette (2018) also mentioned that, the two most commonly used quantitative data analysis methods are descriptive statistics and inferential statistics. Brittany Colette (2018) distinguished descriptive statistics from inferential statistics as shown in Table 42 Below.

Table 42: Distinction between descriptive statistics from inferential statistics

Descriptive statistics	Inferential statistics
Descriptive statistics (also known as descriptive analysis) is the first level of analysis. This helps researchers' find absolute numbers to summarize individual variables and find pattern. A few commonly used descriptive statistics are: • **Mean**: numerical average of a set of values. • **Median**: midpoint of a set of numerical values. • **Mode**: most common value among a set of values. • **Percentage**: used to express how a value or group of respondents within the data relates to a larger group of respondents.(ratio as fraction of 100). • **Frequency**: the number of times a value is found or number of occurences. • **Range**: the highest and lowest value in a set of values	These complex analyses show the relationships between variables to generalize results and make predictions. A few commonly used inferential statistics are: - **Correlation:** describes the relationship between two variables. - **Regression:** shows or predicts the relationship between two variables**.** - **Analysis of variance:** tests the extent to which more than groups differ.

Source: Brittany Colette (2018)

4.3.1 -Descriptive analysis

This method of data analysis is used to describe the features of data in a study and provides simple summaries about the measures and sample. Dereck.J & Kerryn.W(2020) emphasize that descriptive statistic describes as sample population with the means of mean, median, mode, standard deviations and skewness. Similarly, Osuala E.C(20013 p.12) refers descriptive analysis to data description or descriptive statistics which consists of techniques and measures that help researchers turn data into meaningful information with the following tools: Graphs, charts, tables, and summary, and numerical measures such as mean, standard deviations etc... Descriptive statistics provide absolute numbers. However, they do not explain the rationale or reasoning behind those numbers. Before applying descriptive statistics, it is important to think about which one is best suited for your research question and what you want to show. Since descriptive analysis is mostly used for analyzing single variable, it is often called univariate analysis. Descriptive statistics permits to do data analysis collected from respondents' questionnaires depending on the sample population of the study. Descriptive statistics are most helpful when the research is limited to the sample and does not need to be generalized to a larger population. In other words, it helps researchers understand the details of a sample group and does not aim to make assumptions or predictions about the entire population. It is on the basis that the researcher anchors on a descriptive data analysis of questionnaire's contents on competency based assessment practices in terms of frequency and percentages, mean and standard deviations. The researcher had inspirations from Moché C.G (2017 p. 180- 181) who quoted Sedlack& Stanley (1992) and Écuyer (1990) content data analysis procedures. According to Écuyer (1990), content analysis is a method that permits to classify or codify the different elements of materials to be analyzed in order to know the characteristics and significance better. It is however noted that, it relies essentially on frequency analysis of the content in order to group and compare different categories of information. According to Sedlack& Stanley (1992) cited Moché C.G (2017 p. 180) content analysis is a relative procedure of collecting data from a sample of either written or verbal data. According to Moché C.G (2017 p. 181) , Écuyer (1990) propose a model of 6 operational stages of content data analysis as indicated in Table 43 below.

Table 43: General model of a 6 operational stages of content data analysis

STAGES	CHARACTERISTICS
I	Reading of collected data
II	Defining classification of collected data categories
III	Processing of collected data into categories
IV	Quantification and statistical treatment of data
V	Scientific description of those under study
VI	Results' interpretations in stage V

Concerning this study, it would be observed that, reading of collected data, defining classification of collected data categories, processing of collected data into categories and quantification and statistical treatment of data has being parts and parcels of data treatments.

4.3.1. 1 - Frequency count and percentages of questionnaire content data's analysis

Scientific description and interpretations of the results considered in Écuyer (1990), data' procedures are analyzed in respect to this study in questionnaire content data analysis. Questionnaires were analyzed item by item. Similarities or differences between different items were noted and emerging themes or ideas identified and noted. Findings were compared with those from any previous similar research. The study variables of competency-based assessment practices retained for study are diagnostic assessment practices, formative assessment practices, continuous assessment practices and summative assessment practices and were scrutinised by pupils' views in the following order:

- **Diagnostic assessment practices (DAP).**

Diagnostic assessment practices revealed - Review of previous knowledge/ prior knowledge through oral questions, Review of some lower skills/ competences through multiple-choice questions (MCQ) and true or false (T/F), Teacher's provision of oral feedback, pupils' persistent errors correction and remedial works sequences.

- **Review of previous knowledge/ prior knowledge through oral questions**

Table 44: **Respondents' partition in terms of the degree of agreement on review of prior knowledge through oral questions**

Review of mathematics previous knowledge/ prior knowledge through oral questions	Frequency	Percentage
Strongly agree	100	31.2
Agree	150	46.9
Disagree	50	15.6
Strongly disagree	20	6.3
Total	**320**	**100**

Concerning the review of previous knowledge through oral questions, respondents of the above-mentioned Table 44 expressed their views as follows: 100 strongly agree corresponding to 31.2% of the respondents, 150 agree at 46.9%. It reveals that, 78.1% of the respondents agree that teachers use oral questions to review pupils' previous knowledge in mathematics before beginning a new lesson. Only 50 disagree representing 15.6% and 20 strongly disagree at 6.3% of the respondents.

- **Review of some lower skills/ competences through either multiple-choice questions (MCQ) or true false (T/F) tasks**

Table 45: Respondents' partition in terms of the degree of agreement on review of some skills based on either multiple-choice questions (MCQ) or true or false (T/F) tasks

Review of some skills based on either multiple-choice questions (MCQ) true false (T/F) tasks.	Number	Percentage
Strongly agree	120	37.5
Agree	175	54.7
Disagree	15	4.7
Strongly disagree	10	3.1
Total	**320**	**100**

Concerning the review of some skills through either multiple-choice questions (MCQ) or true false (T/F) tasks , the respondents of the above-mentioned Table 45 expressed their views as follows: 120 strongly agree corresponding to 37.5% of the respondents, 175 agree at 54.7%. A quasi-totality of 92.2% respondents agreed that, teachers review some lower skills/competences through either multiple-choice questions (MCQ) or true or false (T/F) tasks. Only 15 disagree representing 4.7% and 10 strongly disagree at 3.1% of the respondents.

- **Praises pupil's responses through oral feedback**

Table 46: **Respondents' partition in terms of the degree of agreement on verbal praises (oral feedback)**

Verbal Praises (oral feedback)	Number	Percentage
Strongly agree	120	37.5
Agree	125	39.1
Disagree	60	18.7
Strongly disagree	15	4.7
Total	**620**	**100**

As far as praises with oral feedback is concerned, respondents of the above-mentioned Table 46 express their views in the following manner: 120 strongly agree corresponding to 37.5% of the respondents, 125 agree at 39.1%. Thus, 76.6% forming the majority of respondents agreed that, teachers praise pupils' performances orally (feedback) whenever possible depending the task given us. Only 60 disagree representing 18.7% and 15 strongly disagree at 4.7% of the respondents.

- **Teachers' correction of pupils' persistent errors constantly**

Table 47: **Respondents' partition in terms of the degree of agreement on Teachers' correction of pupils' persistent errors constantly**

• Teachers' correction of pupils' persistent errors constantly	Number	Percentage
Strongly agree	180	56.3
Agree	75	23.4
Disagree	50	15.6
Strongly disagree	15	4.7
Total	**320**	**100**

Due to teachers' correction of pupils' persistent errors constantly concerned, respondents of the above-mentioned Table 47 expressed their views in the following manner: 180 strongly agree corresponding to 56.3% of the respondents, 75 agree at 23.4%. Thus, 79.7% being the majority of respondents agreed that, teachers constantly correct pupils' persistent errors. Only 50 disagree representing 15.6% of the respondents and 15 strongly disagree at 4.7%.

- **Teacher's plan of remedial works in areas of mathematics pupils face difficulties**

Table 48: **Respondents' partition in terms of degree of agreement on teacher's plan of remedial works in areas of mathematics pupils face difficulties**

• **Teacher's plan remedial works in mathematics areas pupils face difficulties**	**Number**	**Percentage**
Strongly agree	110	34.4
Agree	90	28.1
Disagree	75	23.4
Strongly disagree	45	14.1
Total	**320**	**100**

As far as teacher's plan of remedial works in areas of mathematics pupils face difficulties is concerned, respondents of the above-mentioned Table 48 expressed their views in the following manner: 110 strongly agree representing 34.4% of the respondents, 90 agree at 28.1%. Thus 62.5% representing more than half of the respondents agreed that, teachers plan remedial works in areas of mathematics pupils face difficulties. Only 75 disagree representing 23.4% of the respondents and 45 strongly disagree at 14.1%.

In general, 77.8% of the respondents point of views were that their teachers used assessment instruments such as oral testing(oral questioning), objectives testing(MCQ & T/F) and also carried out assessments activities such as praising pupils orally(feedback), correcting pupils' persistent errors constantly and planning of remedial works in areas of mathematics pupils face difficulties. All of these are in favor to respondents' diagnostic purposes that influence the attainment of their mathematics competence as compared to 22.2% who had the contrary point of views.

- **Formative assessment practices (FAP)**

Formative assessment encompasses a variety of tools that provide feedback to teachers or students to help students learn more effectively. The researcher's questionnaire verifies pupils' appraisals whether teachers organized integration activities that reflect communicated mathematics competence based statement with criteria success. Use individual attitudinal questionnaire to assess pupils' behavior. Mobilize pupils to correct group homework (self and peer assessments). Mark and comment individual pupils' mathematics exercise books assignment. Organize remedial classes where pupils faced learning difficulties after correcting their books.

Teachers' organization of integration activities that reflect communicated mathematics competence based statement with criteria success

Table 49: **Respondents' partition in terms of the degree of agreement on teachers' organization of integration activities that reflect communicated mathematics competence based statement with criteria success.**

Teachers' organization of integration activities that reflect communicated mathematics competence based statement with criteria success	Number	Percentage
Strongly agree	90	28.1
Agree	90	28.1
Disagree	75	23.5
Strongly disagree	65	20.3
Total	**320**	**100**

As far as teachers' organization of integration activities that reflect communicated mathematics competence based statement with criteria success is concerned, respondents of the above-mentioned Table 49 expressed their views in the following manner: 90 strongly agree representing 28.1% of the respondents, 90 agree at 28.1%. Thus 56.2% just almost than half of the respondents agreed that, their teachers organized integration activities that reflect communicated mathematics competence based statement with criteria success. Only 75 disagree 23.5 % representing the respondents and 65 strongly disagree at 20.3%.

- **Observations of pupils' behavior through *individual attitudinal questionnaire***

Table 50: **Respondents' partition in terms of the degree of agreement on observations of pupils' behavior through *individual attitudinal questionnaire***

Observations of pupils' behavior through individual attitudinal questionnaire	Number	Percentage
Strongly agree	30	9.4
Agree	60	18.8
Disagree	140	43.7
Strongly disagree	90	28.1
Total	**320**	**100**

Concerning teacher's observations of pupils' behavior through individual attitudinal questionnaire, respondents of the above-mentioned Table 50 expressed their views in the following manner: 30 strongly agree representing 9.4% of the respondents, 60 agree at 18.8%. Desperately, only 28.2% of the respondents agreed that, teachers observe pupils' behavior through individual attitudinal questionnaire. While 71.8% disagrees in respect to 140 disagree at 43.7 % and 90 strongly disagree at 28.1%.

- ***Mobilization of pupils to correct group homework (self and peer assessments)***

Table 51: Respondents' partition in terms of the degree of agreement on mobilization of pupils to mark and correct group homework by themselves (self and peer assessments).

Mobilization of pupils to mark and correct group homework (self and peer assessments).	Number	Percentage
Strongly agree	100	31.3
Agree	90	28.1
Disagree	90	28.1
Strongly disagree	40	12.5
Total	**320**	**100**

As far as teacher's mobilization of pupils to correct group homework (self and peer assessments) is concerned, respondents of the above-mentioned Table 51 expressed their views in the following manner: 100 strongly agree representing 31.3%, 90 agree at 28.1%. Thus 59.4% slightly more than half of the respondents agreed that, teachers mobilize pupils to correct group homework themselves (self and peer assessments). While 90 disagree at representing 28.1 % of the respondents and 40 strongly disagree at 12.5%.

- **Marking and commenting individual pupils' mathematics exercise books assignment.**

Table 52: Respondents' partition in terms of the degree of agreement on marking and commenting individual pupils' mathematics exercise books assignment;

Marking and commenting individual pupils' mathematics exercise books assignment.	Number	Percentage
Strongly agree	135	42.2
Agree	100	31.3
Disagree	65	20.3
Strongly disagree	20	6.2
Total	**320**	**100**

As far as marking and commenting individual pupils' mathematics exercise books assignment, respondents of the above-mentioned Table 52 expressed their views in the following manner: 135 strongly agree representing 42.2% of the respondents, 100 agree at 31.3%. Therefore 73.5% as majority of the respondents agreed that, their teachers mark and comment individual pupils' mathematics exercise books assignment**.** Only 65 disagree representing 20.3 % and 20 strongly at 6.2%.

- ***Organization of remedial classes where pupils faced learning difficulties after correcting pupils' exercise books***

Table 53: Respondents' partition in terms of the degree of agreement on organization of remedial classes especially where pupils faced learning difficulties after teachers must have corrected pupils' exercise books.

Organization of remedial classes	Number	Percentage
S.trongly agree	85	26.6
Agree	95	29.7
Disagree	75	23.4
Strongly disagree	65	20.3
Total	**320**	**100**

As far as the organization of remedial classes is concerned, respondents of the above-mentioned Table 52 expressed their views in the following manner: 85 strongly agree representing 26.6% of the respondents, 95 agree at 29.7 %. Thus 56.3% just almost than half of the respondents agreed that, teachers organize remedial classes. While 75 disagree representing 23.4 % of the respondents and 65 strongly disagree 20.3%.

In a nutshell, 54.7% of the respondents viewed that, their teachers used an attitudinal questionnaire despite its low used because 28.2% of the teachers practiced and also carried out assessments activities such as teachers organized integration activities that reflect communicated mathematics competence based statement with criteria success. Use individual attitudinal questionnaire to assess pupils' behavior. Mobilize pupils to correct group homework (self and peer assessments). Mark and comment individual pupils' mathematics exercise books assignment. Organize remedial classes where pupils faced learning difficulties after correcting their books. All of these are in favor to respondents' formative purposes that influence the attainment of their mathematics competence as compared to 45.3% who had the contrary point of views.

- **Continuous assessment practices (CAP).**

Specifically, it asked for information concerning the various types of continuous assessment practices teachers administer to learners informally in order to evaluate their progress and achievement of learners within a classroom situation. The researcher emphasized on administration of unexpected frequent written tests , evaluations of learners on drawing practices workshops, participation of pupils in the selection assessment criteria in mathematics competency test, publication of best mathematics competency test pupils' marks and counting of the pupils' continuous assessment(CA) marks towards the final mark for the course module.

- **Respect of planned monthly mathematics competency written tests**

Table 54: **Respondents' partition in terms of the degree of agreement on respect of planned monthly mathematics competency written tests**

Respect of planned monthly mathematics competency written tests	Number	Percentage
Strongly agree	110	34.3
Agree	90	28.1
Disagree	44	13.8
Strongly disagree	76	23.8
Total	**320**	**100**

Concerning planning written tests, respondents of the above-mentioned Table 54 expressed their views in the following manner: 110 strongly agree corresponding to 34.3% of the respondents, 90 agree at 28.1%. Thus, 62.4% in majority agreed that, teachers respect the planning timetable of monthly mathematics competency written tests. Only 44 disagree representing 13.8 % and 76 strongly disagree 23.8%.

- ***Evaluation of pupils 'attitudes during drawing practices assignments***

Table 55: Respondents' partition in terms of the degree of agreement on evaluation of pupils' drawing practices assignments.

Evaluation of pupils' attitudes during drawing practices assignments	Number	Percentage
Strongly agree	123	38.5
Agree	99	30.9
Disagree	88	27.5
Strongly disagree	10	3.1
Total	**320**	**100**

Concerning the above-mentioned Table 55 results, respondents expressed their views in the following manner: 123 strongly agree corresponding to 38.5% of the respondents, 99 agree at 30.9%. Thus 69.4% being the majority agreed that, teachers evaluate pupils' drawing practices assignments. Only 88 of them disagree representing 27.5 % and 10 strongly disagree at 3.1%.

- ***Pupil's participation in the selection of assessment criteria in a given mathematics competency test***

Table 56: **Respondents' partition in terms of the degree of agreement on pupil's participation in the selection of assessment criteria in given mathematics competency tests**

Pupil's participation in the selection of assessment criteria in given mathematics competency tests	Number	Percentage
Strongly agree	35	10.9
Agree	25	7.8
Disagree	105	32.8
Strongly disagree	155	48.5
Total	**320**	**100**

Concerning pupil's participation in the selection of assessment criteria in given mathematics competency tests, respondents of the above-mentioned Table 56 expressed their views in the following manner: 35 strongly agree corresponding to 10.9 % of the respondents, 25 agree at 7.8%. Desperately, just 18.7% of respondents agree that, teachers allow pupils to participate in the selection of assessment criteria in given mathematics competency tests. Meanwhile 105 disagree representing 32.8 % and 155 strongly disagree at 48.5% of respondents generally leading to 81.3%. Which tight with Agborbechem P.T(2010) as he emphasized that, teachers are the major participants in making decisions on students' fate sometimes involving very few parents who are not knowledgeable about examinations procedures and a very negligible number of students whose opinions are limited or not even listened to.

- **Encourage mathematics' high achievers pupils to assist low achievers**

Table 57: **Respondents' partition in terms of the degree of agreement that encourage mathematics' high achievers pupils to assist low achievers**

Encourage mathematics' high achievers pupils to assist low achievers.	Number	Percentage
Strongly agree	127	39.6
Agree	93	29.1
Disagree	55	17.2
Strongly disagree	45	14.1
Total	**320**	**100**

Concerning whether teachers encourage mathematics' high achievers pupils to assist low achievers., respondents of the above-mentioned Table 57 expressed their views in the following manner: 127 strongly agree representing 39.6% of the respondents, 93 agree at 29.1%. Thus 68.7% of the respondents agreed that, teachers encourage mathematics' high achievers pupils to assist low achievers. Only 55 disagreed at a corresponding rate of 17.5 % and 45 strongly disagree at 14.1%.

- ***Counting of pupils' CA marks towards the final mark of mathematics competence at the end of term evaluation***

Table 58: Respondents' partition in terms of the degree of agreement to count pupils' CA marks towards the final mark of mathematics competence at the end of term *evaluation*

Counting of pupils' CA marks towards the final mark of mathematics competence at the end term evaluation	Number	Percentage
Strongly agree	75	23.5
Agree	60	18.6
Disagree	120	37.5
Strongly disagree	65	20.4
Total	**320**	**100**

Concerning the counting of pupils' CA marks towards the final mark of mathematics competence at the end term evaluation, respondents of the above-mentioned Table 58expressed their views in the following manner: 75 strongly agree corresponding to 23.5 % of respondents, 60 agree at 18.6%. Desperately, just 42.1% of respondents agree that, teachers add pupils' CA marks to the final mark of mathematics competence at the end term evaluation. Meanwhile 120 disagree at a corresponding rate of 37.5 % and 65 strongly disagree at 20.4% leading to 57.9% in general who disagreed.

Generally , 52.3% of the respondents viewed that, their teachers observed pupils 'attitude during drawing practices workshops and awards marks, some involved pupils in the selection of mathematics 'assessment criteria, respected mathematics competency test planned calendar, encouraged mixed abilities grouping whereas mathematics high achievers pupils assist low achievers and took in consideration continuous assessment marks to the final mathematics scores evaluation . All of these are in favor to respondents' continuous purposes that influence the attainment of their mathematics competence as compared to 47.7% who had the contrary point of views.

- ***Summative assessment practices(SAP)***

Assessment tools/instruments or an assessment activities for ***summative*** assessment practices thus depend on the chosen (norm referenced testing) or (criterion referenced testing). Evaluation with real life situations or complex integration situations in respect to criterion referenced testing (CRT). Evaluation with standardized objectives types of questions in respect to norm referenced testing (NRT). The use of Projects, Portfolios (all best past worksheets) and keeping pupils' records report sheets to inform different educational stakeholders are considered.

- **Evaluation using real life situations or complex integration situations**

Table 59: **Respondents' partition in terms of the degree of agreement on evaluation using real life situations or complex integration situations in mathematics competence domain**

Evaluation using real life situations or complex integration situations in mathematics competence domain	Number	Percentage
Strongly agree	80	25.0
Agree	55	17.2
Disagree	120	37.5
Strongly disagree	65	20.3
Total	**320**	**100**

Concerning evaluation with real life situations or complex integration situations in mathematics competence domain, respondents of the above-mentioned Table 59 expressed their views in the following manner: 80 strongly agree corresponding to 25 % of respondents, 55 agree at 17.2%. Desperately, just 42.2 % of respondents agree that teachers evaluate pupils' mathematics competences with real life situations or complex integration situations in contrast to 57.8% being a relative majority disagree as 120 disagree representing 37.5 % of the respondents and 65 strongly disagree at 3 %.

- **Evaluation using standardized objectives types of questions**

Table 60: **Respondents' partition in terms of the degree of agreement on evaluation using standardized objectives types of questions in mathematics competence domain**

Evaluation using standardized objectives types of questions in mathematics competence domain	Number	Percentage
Strongly agree	230	71.9
Agree	70	21.9
Disagree	15	4.7
Strongly disagree	5	1.5
Total	**320**	**100**

Concerning evaluation using standardized objectives types of questions in mathematics competence domain , respondents of the above-mentioned Table 60 expressed their views in the following manner: 230 strongly agree corresponding to 71.9% of the respondents, 70 agree at 29.1%. Thus 93.8% a quasi-total majority of respondents agree that, teachers evaluate pupils' mathematics competences using standardized objectives types of questions. Only 15 disagreed at the rate of 4.7 % and 5 strongly disagree at 1.5 %.

- **Evaluation of pupils' class Projects**

Table 61: **Respondents' partition in terms of the degree of agreement on evaluation pupils' class Projects**

Evaluation of pupils' class Projects	Number	Percentage
Strongly agree	85	26.6
Agree	80	25.0
Disagree	75	23.4
Strongly disagree	80	25.0
Total	**320**	**100**

As far as, the evaluation pupils' class Projects is concerned, respondents of the above-mentioned Table 61 express their views in the following manner: 85 strongly agree corresponding to 26.6% of the respondents, 80 agree at 25.0% leading to 51.6% of the respondents who agree that, teachers evaluate pupils' class Projects. Only 75 disagreed at a corresponding rate of 23.4 % of the respondents and 80 strongly disagree at 25.0 %.

- **Attribution of marks quota on pupils' mathematics practical activities (Portfolios)**

Table 62: **Respondents' partition in terms of the degree of agreement on marks' attribution to pupils' mathematics activities (portfolios);**

Marks' attribution to pupils' mathematics activities(portfolios)	Number	Percentage
Strongly agree	25	7.8
Agree	30	9.4
Disagree	200	62.5
Strongly disagree	65	20.3
Total	**320**	**100**

As far as, marks' attribution to pupils' mathematics activities (portfolios) is concerned, respondents of the above-mentioned Table 62 expressed their views in the following manner: 25 strongly agree corresponding to 7.8% of respondents, 30 agree corresponding to 9.4% leading to 17.2% of the respondents who agreed that, teachers evaluate pupils' mathematics activities (portfolios). Meanwhile, 200 disagreed at a corresponding percentage rate of 62.5 % and 65 strongly disagree at 20.3 % leading to a quasi-total of 82.8% of the respondents who disagree.

- **Keeping pupils' records report sheets for official's uses**

Table 63: **Respondents 'partition in terms of the degree of agreement on keeping pupils' progress report sheets for official uses**

Keeping pupils' progress report sheets for official uses	Number	Percentage
Strongly agree	290	90.6
Agree	30	9.4
Disagree	00	00
Strongly disagree	00	00
Total	**320**	**100**

As far as, the keeping of pupils' progress report sheets to inform different educational stakeholders is concerned, the entire respondents of the above-mentioned Table 63 express a 100% total agreement of the fact that, teachers keep progress report sheets of their pupils for official's uses.

Generally, 61% of the respondents' point of views were that their teachers used assessment instruments such as real life situations, standardized objectives tests, projects, portfolios and assessments activities such as keeping pupils 'progress report sheets for official uses. All of these are in favor to respondents' summative purposes that influence the attainment of their mathematics competence as compared to 39% who had the contrary point of views.

4.3.1. 2 - General Description of Data/Variables of the study through mean and standard deviations

This study was designed to investigate how Competency Based Assessments practices influence the attainment of Mathematics Competence amongst primary schools' pupils in the Centre Region of Cameroon. Descriptive data analyses for all variables in the study are presented in Table 64 below.

Table 64: **Descriptive data for the variables of concern**

Descriptive Statistics			
	N	Mean	Std. Deviation
Mathematics competence	320	36.64	14.489
Diagnostic assessment practices	320	17.81	5.538
Formative assessment practices	320	22.58	4.308
Continuous assessment practices	320	27.14	4.283
Summative assessment practices	320	19.28	3.399

The result of the study in Table 64 indicates a positive perception in the mean scores of diagnostic assessment practices; formative assessment practices continuous assessment practices, summative assessment practices for the attainment of mathematics competence. It could be noted that all the four types of assessment practices had a mean scores above 15.0. This implies that, competency based assessment practices influence the attainment of mathematics competence of primary schools pupils in the Centre of region of Cameroon. Again, diagnostic assessment practices had the highest variation of scores(5.538) followed by formative assessment practices(4.308) then, continuous assessment practices(4.283) while summative assessment practices had the least variation of scores(3.399) in the attainment of mathematics competence. Pupils had an increase in Mathematics competence (36.64) the mean score is above 15.0 with a S.D=14.489.

4.3.2 - Inferential analysis or statistical analysis

Inferential statistics is to test the degree of dependence or the significant relationship between variables. Inferential statistic is different from descriptive as its aims to make inferences about population, rather than specific data or sample. Osuala E.C(20013 p.13) refers to inference or inferential statistics as an area of statistics in which conclusions about a large body of data are reached by examining only part of those data. According to Dereck.J & Kerryn.W(2020) Inferential statistics makes predictions about the population based on the findings within the sample. It allows researchers to make assumptions and predictions about an entire population. Dereck.J & Kerryn.W(2020) made mention of the two main kinds of predictions in inferential statistics.

1- Predictions about the differences between the groups within a population;

2- Predictions about the relationship between variables relevant to a population, which are used to test hypothesis, that predict changes or differences.

Olatunji S.O & Igbokwe U.O(2006 p.2) emphasized that, analysis of data leads to generalization of the result to the larger group that was not studied. According to them, there are two aspects of inferential statistics namely:

1 - Parametric statistics analysis yield correlated data nature with measurement taken at interval and ratio scales level**.** Scores are Continuous. Parametric tests are very useful in establishing Cause and Effect. Parametric Tests Include Student's Tests, T Tests, For Uncorrelated Sample, Z- Test, F- Test, Analysis Of Variance(ANOVA), Pearson Product Moment Correlation Coefficient, Regression Analysis and Analysis of Variance and Analysis of Covariance(ANCOVA).

2 – Non-parametric statistics yield both correlated (Spearman rank order correlation, Wilcoxon's Matched Pairs, Friedman two ways ANOVA. For uncorrelated data, (Chi-square(X^2) one sample test, MannWhitney U-test, Signed RanTest and Kruskal- Wallis Analysis of Variance by Ranks) with measurement taken at nominal and ordinal scales. The researcher rejects the null hypothesis only when the calculated value is less the critical value.

It implies the alternative hypothesis is accepted and thus, the significance has been achieved. It is more advantageous to use non-parametric devices whenever the sample size is small.

Each statistical method has its own assumptions and limitations. For instance, some methods only work with distributed (parametric) data, while others methods are designed for (non-parametric) data. Dereck.J & Kerryn.W(2020) made mention of the two important factors when to choose the right analysis method.

1- The type of quantitative data you have (specifically level of measurement i.e ordinal, nominal, interval and ratio scales measurement) and the shape of the data i.e bell curved, skewed).
2- Your research questions and hypotheses;

This study anchors on the following parametric statistics analysis since data collected from competency mathematics test, scores from the questionnaires are continuous at the interval, and ratio scales levels. There are correlational analysis of data and Verification of hypotheses of Pearson Product Moment Correlation Coefficient (PPMC) (Γ_{xy}), Regression Analysis and the Multiple Regression Analysis. Each of the tests tools are suitable to test the degree of dependence or the significant relationship between variables and to find the strength of the relationship between the mathematics competency tests and the questionnaires administered to the sample population under study.

4.3.2.1 - Correlational analysis of data and Verification of hypotheses
The Correlational analysis assesses the relationship between two variables. Olatunji S.O& Igbokwe (2006 p.79) emphasized that; the degree of relationship that exists between two variables can be expressed as a number that lie between -1 and +1. The relationship between two variables could be:
i- Perfect negative (-1) ; ii-Non perfect but negative (<- 1); iii- there is zero or no relationship (0) iv-Perfect positive relationship (+1) and v- Non perfect but positive relationship (1).

Olatunji S.O& Igbokwe (2006 p.81) outlined the following most commonly used correctional techniques:

i-Point biserial correlation coefficient(Rpb)
ii-Rank biserial correlation coefficient(Rrb)
ii- Phi coefficient(φ)

iii- Spearman rank order correlation coefficient(Rs)

iv- Pearson Product Moment Correlation Coefficient (PPMCC) (Γ_{xy})

Denga D.I(2003 p.61) enumerates several others such as Tetrachoric correlation and contingency coefficient.

The choice of the correlation coefficient depends on the nature of measurement data of the two variables under study.

Table 65 below indicates the appropriate correlation coefficient to be computed based on the mode of measurement of variables under study.

Table 65: Types of correlation coefficients

	Types of correlation coefficients	**Levels of measurement of variables**
v-	Point biserial correlation coefficient (Rpb)	Nominal dichotomous and nominal dichotomous
vi-	Rank biserial correlation coefficient (Rrb)	Nominal dichotomous and ordinal
vii-	Phi coefficient	Nominal dichotomous and interval
viii-	Spearman rank order correlation coefficient(Rs)	Ordinal and ordinal or ordinal and interval
ix-	Pearson Product Moment Correlation Coefficient (PPMCC) (Γ_{xy})	Interval and ratio

Source: Olatunji S.O& Igbokwe (2006 p.82)

Uses of coefficient of correlation

- It is used to describe the relationship between variables. This is an aspect of descriptive statistics
- It can be used to test hypothesis. This is an aspect of inferential statistics
- It can be used to predict one variable from the knowledge of the other (Olatunji S.O& Igbokwe 2006 p.88) .

4.3.2.1.1- Verification of hypotheses by Pearson Product Moment Correlation Coefficient (PPMC)(Γ_{xy})

Olatunji S.O& Igbokwe(2006 p.84) present two approaches in the computation of Pearson Product Moment Correlation Coefficient (PPMC)(Γ_{xy}):

1. Deviation approach: $\Gamma_{xy} = \frac{xy}{\sqrt{(\sum x^2)(Y^2)}}$
2. Raw score or machine approach that applies the formula:

$$\Gamma_{xy} = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where x is the independent variable, y is the dependent variable and Γ_{xy} is the correlation coefficient for x and y , n= sample size $\sum$= sum of X= scores of variable 1, Y= scores of variable 2.

In order to determine the significance of Pearson Product Moment Correlation Coefficient (PPMC) may be determined in two ways:

1. **Using the table of(PPMC**)

Decision rule: The decision rule for testing statically significance of Pearson Product Moment Correlation Coefficient (PPMC) is that if the calculated value of Γ_{xy} is greater than the critical or tabulated value, we would reject the null hypothesis.(if Rcal > Rtab, then, reject the null hypothesis). The implication of rejecting a null hypothesis is that there is significant relationship between the variables under study.

2. The use of t-test

Decision rule: The decision rule for t-test is that if t calculated is greater than t tabulated, we would reject the null hypothesis. This implies that the relationship between the two variables is significant. (Olatunji S.O& Igbokwe 2006 pp. 104- 105).

The significance of Pearson Product Moment Correlation Coefficient (PPMC)(Γ_{xy}) may be measured in two ways at significance level of .05 and 5 degree of freedom (df). The significance level is the amount of error a researcher agrees to make while taken decision on an already statically results. Therefore, the choice of .05 implies that the researcher is 95% confident and that the probability of being wrong is only .05%.

However, before proceeding to the correlational analysis and the verification of hypotheses, it is important to recall research hypotheses.

- **Recall of research hypotheses**

In order to provide temporal responses to research questions, the following specific research hypotheses were formulated:

RH1

H01: Diagnostic assessment practices through related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Ha1: Diagnostic assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

RH2.

H02: Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Ha2: Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

RH3. .

H03: Continuous Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Ha3: Continuous Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

RH4.

. H04: Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Ha4: Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

To test the significance of the study variables in this study, the researcher adopted the Pearson Product Moment Correlation Coefficient (PPMC)(Γ_{xy}) since data yielded from the study are continuous at the interval and ratio level of measurement scales.

For this study, correlational analyses are made based on Table 66 below, representing the correlation matrix table.

Table 66: Correlation Matrix

	Diagnostic Assessment	**Formative Assessment**	**Continuous Assessment**	**Summative Assessment**	**Attainment of Mathematics Competence**
Diagnostic Assessment	1	0.190**	0.186**	0.176**	0.40*
Formative Assessment	0.190**	1	0.347**	0.278**	0.22*
Continuous Assessment	.186**	0.347**	1	0.379**	0.30*
Summative Assessment	0.176**	0.278**	0.379**	1	0.18*
Attainment of Mathematics Competence	- 0.016	- 0.009	0.005	0.012	1

Critical value 0.113

4.3.2.1.2.1 Diagnostic assessment practices and attainment of Mathematics competence amongst class six pupils

- **Formulation of statistical hypotheses**

Hypothesis One:

. H01: Diagnostic assessment practices through related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Ha1: Diagnostic assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

In this study like others social studies, the significant level of error α= .05 which means 95% of no risk for errors.

The independent variable in this hypothesis is Diagnostic assessment practices using the competency-based assessment, while the dependent variable is attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. The scores of the independent variable were gotten from the responses recorded from the five items of a four-point Likert scale questionnaire that measured the use of diagnostic assessment practices using CBA. The scores of the dependent variable were gotten from the scores obtained by the class six pupils in a Mathematics competence test. The statistical analysis technique used to test this hypothesis was the Pearson Product Moment Correlation analysis.

The formula using deviation from the mean method is;

$$\Gamma_{xy} = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where x is the independent variable, y is the dependent variable and Γ_{xy} is the correlation coefficient for x and y

The result of the analysis is presented in Table 67 below.

Table 67: Pearson Product Moment Correlation analysis of the influence of the use of diagnostic assessment practices using CBA and pupils' attainment of mathematics competence (N= 320)

Variable	$\sum X$	$\sum X^2$			
	$\sum Y$	$\sum Y^2$	$\sum XY$	Γ_{xy}	p-value
Use Of Diagnostic Assessment (X)	5699	111242	219119	0.40*	0.001
Attainment Of Mathematics Competence (Y)	11725	497461			

$p^* < 0.05$; df=318; critical Γ_{xy} =0.113

The result of the analysis of the influence of the use of diagnostic assessment practices using CBA reveals the calculated Γ_{xy} -value of 0.40 that is higher than the critical Γ_{xy} -value of 0.113 at .05 level of significance with 318 degrees of freedom. In addition, the p-value of 0.001 is lower than 0.05. It indicates that the null hypothesis was rejected and the alternative hypothesis retained. This result therefore means diagnostic assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Since diagnostic assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon, a further exploration of the influence showed that the Γ_{xy} =0.40 was positive. This indicates that as the diagnostic assessment practices using the competency based assessment improves the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon increases.

4.3.2.1.2.2- Formative assessment practices and attainment of Mathematics competence amongst class six pupils

- **Formulation of statistical hypotheses**

Hypothesis Two

H02: Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Ha2: Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

The independent variable in this hypothesis is Formative assessment practices using the competency-based assessment, while the dependent variable is attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. The scores of the independent variable were got from the responses recorded from the five items of a four-point Likert scale questionnaire that measured the use of formative assessment practices using CBA. The scores of the dependent variable were gotten from the scores obtained by the class six pupils in a Mathematics competence test. The statistical analysis technique used to test this hypothesis was the Pearson Product Moment Correlation analysis.
The formula using deviation from the mean method is;

$$\Gamma_{xy} = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where x is the independent variable, y is the dependent variable and Γ_{xy} is the correlation coefficient for x and y

The result of the analysis is presented in Table 68below.

Table 68: Pearson Product Moment Correlation analysis of the influence of the use of formative assessment practices using CBA and pupils' attainment of mathematics competence (N= 320)

Variable	$\sum X$	$\sum X^2$			
	$\sum Y$	$\sum Y^2$	$\sum XY$	Γ_{xy}	p-value
Use Of Formative Assessment (X)	7226	169092	269228	0.22*	0.03
Attainment Of Mathematics Competence (Y)	11725	497461			

$p^* < 0.05$; df=318; critical $\Gamma_{xy} = 0.113$

The result of the analysis of the influence of the use of formative assessment practices using CBA reveals that the calculated Γ_{xy} -value of 0.22 is higher than the critical Γ_{xy} -value of 0.113 at .05 level of significance with 318 degrees of freedom. In addition, the p-value of 0.03 is lower than 0.05. It indicates that the null hypothesis was rejected and the alternative hypothesis retained. This result therefore means formative assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Since formative assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon, a further exploration of the influence showed that the $\Gamma_{xy} = 0.22$ was positive. This indicates that as the formative assessment practices using the competency based assessment improves the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon increases.

4.3.2.1.2.3- Continuous assessment practices and attainment of Mathematics competence amongst class six pupils

- **Formulation of statistical hypotheses**

Hypothesis Three

H03: Continuous Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Ha3: Continuous Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

The independent variable in this hypothesis is Continuous assessment practices using the competency-based assessment, while the dependent variable is attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. The scores of the independent variable were got from the responses recorded from the five items of a four-point Likert scale questionnaire that measured the use of continuous assessment practices using CBA. The scores of the dependent variable were gotten from the scores obtained by the class six pupils in a Mathematics competence test. The statistical analysis technique used to test this hypothesis was the Pearson Product Moment Correlation analysis.

The formula using deviation from the mean method is;

$$\Gamma_{xy} = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where x is the independent variable, y is the dependent variable and Γ_{xy} is the correlation coefficient for x and y

The result of the analysis is presented in Table 69 below.

Table 69: Pearson Product Moment Correlation analysis of the influence of the use of continuous assessment practices using CBA and pupils' attainment of mathematics competence (N= 320)

Variable	$\sum X$ $\sum Y$	$\sum X^2$ $\sum Y^2$	$\sum XY$	Γ_{xy}	p-value
Use Of Continuous Assessment (X)	8685	241622	324236	0.30*	0.002
Attainment Of Mathematics Competence (Y)	11725	497461			

$p^* < 0.05$; df=318; critical Γ_{xy} =0.113

The result of the analysis of the influence of the use of continuous assessment practices using CBA reveals that the calculated Γ_{xy} -value of 0.30 is higher than the critical Γ_{xy} -value of 0.113 at .05 level of significance with 318 degrees of freedom. In addition, the p-value of 0.002 is lower than 0.05. It indicates that the null hypothesis was rejected and the alternative hypothesis retained. This result therefore means continuous assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Since continuous assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon, a further exploration of the influence showed that the Γ_{xy} =0.30 was positive. This indicates that as the continuous assessment practices using the competency based assessment improves the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon increases.

4.3.2.1.2.4- Summative assessment practices and attainment of Mathematics competence amongst class six pupils

- **Formulation of statistical hypotheses**

Hypothesis Four

H04: Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers do not influence significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Ha4: Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

The independent variable in this hypothesis is Summative assessment practices using the competency-based assessment, while the dependent variable is attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. The scores of the independent variable were gotten from the responses recorded from the five items of a four-point Likert scale questionnaire that measured the use of summative assessment practices using CBA. The scores of the dependent variable were gotten from the scores obtained by the class six pupils in a Mathematics competence test. The statistical analysis technique used to test this hypothesis was the Pearson Product Moment Correlation analysis.

The formula using deviation from the mean method is;

$$\Gamma_{xy} = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where x is the independent variable, y is the dependent variable and Γ_{xy} is the correlation coefficient for x and y

The result of the analysis is presented in Table 68 below.

Table 70: Pearson Product Moment Correlation analysis of the influence of the use of summative assessment practices using CBA and pupils' attainment of mathematics competence (N= 320)

Variable	$\sum X$ $\sum Y$	$\sum X^2$ $\sum Y^2$	$\sum XY$	Γ_{xy}	p-value
Use Of Summative Assessment (X)	6170	122650	228945	0.18*	0.002
Attainment Of Mathematics Competence (Y)	11725	497461			

$p^*<0.05$; df=318; critical Γ_{xy} =0.113

The result of the analysis of the influence of the use of summative assessment practices using CBA reveals that the calculated Γ_{xy} -value of 0.18 is higher than the critical Γ_{xy} -value of 0.113 at .05 level of significance with 318 degrees of freedom. In addition, the p-value of 0.002 is lower than 0.05. It indicates that, the null hypothesis was rejected and the alternative hypothesis retained. This result therefore means summative assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Since summative assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon, a further exploration of the influence showed that the Γ_{xy} =0.18 was positive. This indicates that as the summative assessment practices using the competency based assessment improves the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon increases.

4.3.2.2 Regression analysis or Causal analysis

Regression analysis is quite similar to correlation in that it assesses the relationship between variables. However, it goes a step further to understand cause and effect between variables, not just, whether they move together. According to Kothari,C.R & Gaury;G(2014 p.12), Regression analysis or Causal analysis is concerned with the study of how one or more variables affect changes in another. Regression involves the measurement of the strength of relationship between two variables that have been generated from one sample or element. Olatunji S.O& Igbokwe(2006 p.124) emphasized that regression does not show effects of relationship. It is a case of two measurements made on each element of a sample. Simple linear regression involves one Dependent Variable(Y) and one Independent Variable(X). The objective of regression is to study relationship between variables X and Y.

Regression can be denoted by the formula: Y= a+ bx.

Where, Y= Dependent Variable; a= intercept; b= slope; x= Independent Variable

$$b=\frac{\sum xy}{\sum x^2} \; ; \quad xy=\sum xy - \frac{\sum X \sum Y}{n} \; ; \quad x^2 = \sum x^2 - \frac{(\sum X)^2}{n} \; ; \; a= Y - bx \; ;$$

Y= a+bx …Regression Equation

For the sake of this study, **Regression Analysis** was computed out.

With the availability of computer facilities, Kothari,C.R & Gaury;G(2014 p.12) emphasized on **Multivariate analysis** and the following different forms:

a- Multiple regression analysis;
b- Multiple discriminant analysis;
c- Multivariate analysis of variance(or multi- ANOVA);
d- Canonical analysis.

For the sake of this study, the researcher tested **Multiple Linear Regression Analysis.**

4.3.2.2.1 Multiple Linear Regression Analysis

Multiple Linear Regression Analysis is due to the reason that, it involves one Dependent Variable(Y) and more than one Independent Variable(X). A number of independent variables usually affect a dependent variable Y. The dependent variable denoted Y, which is presumed to be a function of two or more independent variables. The objective this analysis is to make a prediction about the dependent variable based on its covariance with all the concerned independent variables. When the independent variables are quantifiable and are quantified, multiple regression analysis models can be used to express their relationship to the dependent variable.

$Y= a+ b_1X_1+ b_2 X_2 + b_3X_3 + b_4X_4$ a+……… bnxn

Where, Y= dependent variable

a= intercept

$a+ b_1X_1+ b_2 X_2 + b_3X_3 + b_4X_4$ +……..bnxn= independent variables

As in the case of this study the general hypothesis is Competency Based Assessment practices with respect to diagnostic Assessment (X_1), Formative Assessment (X_2), Continuous

Assessment (X_3) and Summative Assessment (X_4) do not significantly predict the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon (Y).

This hypothesis was tested using the multiple regression analysis procedure to obtain a regression equation, which predicted the effect of the predictors X_1, X_2, X_3 and X_4 on the criterion variable the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon (Y). Multiple linear regression equation with four independent variables is expressed as shown below.

$Y = a + b_1X_1 + b_2 X_2 + b_3X_3 + b_4X_4$

The final regression analysis results shows the contribution for each of the predictor variables to the criterion variable, is shown in Table 71 below.

Table 71: Regression analysis results of predictor variables on the criterion variable

Multiple R	0.025^a				
R^2	0.001				
Adjusted R^2	0.012				
Standard error	14.576				
Sources of variation	**SS**	**df**	**Mean Square**	**F**	**p-value**
Regression	28588.698	4	7147.175	58.658	0.000
Residual	38381.149	315	121.8449		
Total	66969.857	319			
Variable	**B**	**SEB**	**Beta**	**t**	**p-value**
(Constant)	36.567	6.464		5.657	.000
Diagnostic Assessment (X_1)	0.387	0.106	0.069	0.476	0.002
Formative Assessment (X_2)	0.433	0.117	0.334	2.168	0.035
Continuous Assessment (X_3)	0.466	0.126	0.147	0.983	0.004
Summative Assessment (X_4)	0.417	0.109	-0.042	-0.284	0.012

Calculated $F_{4,47}$ =58.658; Critical F-value = 2.41

The calculated F-value of 58.658 is higher than the critical F-value of 2.41 at 4 and 315 degrees of freedom. This indicates that the selected predictor variables: X_1, X_2, X_3 and X_4 significantly predict the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

From this table the constant (A) has the unstandardized B value of 36.567 and for the predictor variables ((X_1), (X_2), (X_3),) and X_4 are 0.387, 0.433, 0.466, and 0.417 respectively. The prediction equation thus obtained was:

$Y = 36.567 + 0.387X_1 + 0.433X_2 + 0.466X_3 + 0.417X_4$

This equation means that the predicted attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon (Y) for each of the respondents can be determined if the values for X_1, X_2, X_3, $X_{4,}$ are known. Hence, if all these values are all zero, the respondent will have a score of 36.567. Furthermore, an increase in any of the predictor variables will result to an increase in the criterion variable the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

After the collection, presentation and data analyses from the field, hypotheses 'verification earlier formulated, presently the researcher is now proceeding to into interpretation of results on one hand, and in other hand, present the different components of competency assessment practices.

- **Recall of Research Questions**

Based on research problem(s), the principal research question was formulated as follows: How does competency based assessments practices influence significantly the attainment of mathematics competence amongst primary schools' pupils in the Centre region of Cameroon?

Four of the following specific research questions were also asked in this study:

How does competency based assessment practices, related assessment activities, and assessment tools/instruments used by teachers influence the attainment of mathematics competence amongst primary schools' pupils?

1.5.2 Specific research questions

1. How do diagnostics assessments practices, related assessment activities, and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?

2. How do formative assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?

3. How does continuous assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?

4. How does summative assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of mathematics competence amongst class six pupils?

In order to answer the above questions, a review of literature on competency based assessment practices and theories based on behaviourism, cognitivism, constructivism through works of Piaget's theory of cognitive development, Brunner's cognitive theory of learning and Kolb's Experiential Learning theory); the social constructivist theory of Lev Vygotsky and Tara's measurement theory. These permitted the researcher to construct his research instruments such as the class six pupil's questionnaires and a mathematics competency tests for class six pupils. Data collected from the instruments provided answers to the above research questions under this study. The intention of the researcher was to identify the types of competency-based assessment practices, related assessment activities and assessment tools/instruments used by teachers susceptible to influence the attainment of Mathematics competence amongst primary schools' pupils in the Centre region of Cameroon. Meanwhile, the mathematics competency test was to measure the state of level of pupils' mathematics competence attainment. The researcher explored the various data in order to select the types of competency-based assessment practices used in this study and they are interpreted in the following below:

4.4 Interpretation of Results

Data, when collected in raw form, may be difficult for the nonprofessional to understand, which is why analysts need to break down the information gathered so that others can make sense of it. By so doing, data are interpreted. Data interpretation is the process of reviewing data through some predefined processes, which will help assign some meaning to the data and arrive at a relevant conclusion. It involves taking the result of data analysis, making inferences on the relations studied, and using them to conclude. Therefore, before one can talk about interpreting data, they need to be analyzed first. Data analysis is the process of ordering, categorizing, manipulating, and summarizing data to obtain answers to research questions. It is usually the first step taken towards data interpretation. Researchers have identified some data interpretation methods to aid this process (Formplus Blog 2022). Data interpretation methods are therefore, how analysts help people make sense of numerical data that has been collected, analyzed and presented. According to Samaj.K. S (2021), there are two main methods in which this can be done, namely; quantitative methods and qualitative methods.

The qualitative data interpretation method is used to analyze qualitative data, which is also known as categorical data. This method uses texts, rather than numbers or patterns to describe data. He emphasized that, there are two main types of qualitative data, namely; nominal and ordinal data. The two data types are both interpreted using the same method, but ordinal data interpretation is quite easier than that of nominal data. In most cases, ordinal data is usually labelled with numbers during the process of data collection, and coding may not be required. This is different from nominal data that still needs to be coded for proper interpretation.

The quantitative data interpretation method is used to analyze quantitative data, which is also known as numerical data. This data type contains numbers and is therefore analyzed with the use of numbers and not texts. Since the researcher adopted the quantitative analysis method, emphasis is led on the quantitative data interpretation method. Following results of the frequency count and percentages in Section 4.2 and Section (4.4) of the correlational analysis of data and verification of hypotheses earlier discussed.

4.4.1 - Diagnostic assessment practices (DAP)

After the administration of the questionnaires, data collected and analyzed have resulted into satisfactory results. Respondents have agreed on all indicators of diagnostics assessment practices favorably. In fact, 78.1% respondents agreed favorably that, teachers review mathematics prior knowledge through oral questioning. 92.2% of respondents agreed in favor that teachers assess mathematics lower skills/competences through Multiple-Choice Questions (MCQ) or True False (T/F). 76.6% of the respondents agreed that, teachers use verbal praises (oral feedback). Certainly teachers use positive oral feedback as an extrinsic motivation factor to encourage pupils to work harder therefore, positive oral feedback influence class six pupils' attainment of mathematics competence. 79.7% of respondents agreed that, teachers involve pupils in correction of persistent errors constantly. Certainly, teachers who involve pupils to do correction of errors, there is Meta cognition and a socio constructivist approach that encourage deep learning when similar exercises are given to them. 62.5% of the respondents agreed that, teachers involve their pupils in remedial works. Following the results generally, 77.8% of the respondents favorably agreed that, diagnostics assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. The statistical testing of Pearson Product Moment Correlation and multiple regression analysis confirmed the result. It reveals that the calculated Γ_{xy} -value of 0.40 is higher than the critical Γ_{xy} -value of 0.113 at .05 level of significance with 318 degrees of freedom. In addition, the p-value of 0.001 is lower than 0.05. It indicates that the null hypothesis was rejected and the alternative hypothesis retained. A further exploration of the influence showed that the $\Gamma_{xy} = 0.40$ was positive. This indicates that as the continuous assessment practices using the competency based assessment practices improve the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon, it also increases it.

4.4.2- Formative assessment practices (FAP)

Similarly, the same procedures were followed for the formative assessment practices (FAP). However, not all indicators received a total agreement of the respondents although the majority agreed on some of them. It is in this respect that, 56.2% of the respondents agreed that teachers communicate mathematics competence statement and organize weekly integration activities with specific criteria success. 59.4% of the respondents agreed that teachers mobilize pupils to correct group homework (self and peer assessments). 73.5% of the respondents agreed that, teachers mark and comment individual pupils' mathematics exercise books assignment. Certainty the marks and grades scored are encouraging them to work harder and thus perform better in future tests. 56.3% of the respondents agreed that teachers organize remedial classes when they discover pupils' low attainment of mathematics competence in integrations activities. This certainly encourages pupils to work harder and thus perform better in future tests. Desperately 71.8% of respondents disagreed on item 7, which was to verify if teachers use individual attitudinal questionnaire in order to assess their behaviors. Consequently, teacher's observations of pupils' behavior through individual attitudinal questionnaire have no influence to their attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. This implies that, observations of pupils' behavior through individual attitudinal questionnaire are not used because most teachers do not assess pupils with individual attitudinal questionnaire. All the same, 61.3% of the respondents agreed positively that, their teachers communicate mathematics competence statement and organize weekly integration activities with specific criteria success, mark and comment individual pupils' mathematics exercise books assignment and organize remedial classes, which influence attainment of mathematics competences amongst class six pupils in the Centre Region of Cameroon. The statistical testing of Pearson Product Moment Correlation and multiple regression analysis confirmed the result. It reveals that the calculated Γxy -value of 0.22 is higher than the critical Γxy -value of 0.113 at .05 level of significance with 318 degrees of freedom. In addition, the p-value of 0.03 is lower than 0.05. It indicates that the null hypothesis was rejected and the alternative hypothesis retained. A further exploration of the influence showed that the $\Gamma_{xy} = 0.22$ was positive. This indicates that as formative assessment practices using the competency based assessment improves the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon, it also increases it.

4.4.3- Continuous assessment practices

In a similar manner, not all the indicators of continuous assessment practices had a total support in favor of attainment of mathematics competence. Three out of five of the indicators present the following results favorable: 62.4% of the respondents agreed that, teachers respect planned monthly mathematics competency written tests. This implies that; pupils are encouraged to prepare for the test instead of testing them in a surprisingly manner further it is to avoid testing to death the pupils. It will enable both teachers and learners to cover the curriculum strands necessary before assessment. A competence cannot be assessed after a single or two lessons. To evaluate a learner' competence through complex integrations situations or real-life situations, Knowledge, skills and attitudes need to be accumulated within a period of at least two to three weeks. 69.4% of the respondents agreed that, teachers observe pupils 'attitude during drawing practices workshops and awards marks.68.7% of the respondents agreed that, teachers encourage mathematics' high achievers pupils to assist low achievers. The higher achiever encourages the lower achiever to work harder. This conflictual spirit boosts competitively pupils amongst them. Unfortunately, 69.4% of pupils disagreed that, pupils participate in the selection of assessment criteria in given mathematics competency tests. This implies that, teachers hardly involve pupils in the selection of assessment criteria in a given mathematics competency test despite the fact that they are informed when to write the test. 57.9% of the respondents equally disagreed that, teachers add continuous assessment's marks quota to the final mathematics competency evaluation at the end of term. This implies that, pupils' CA marks towards the final mark of mathematics competence module has no influence to the attainment of mathematics competence amongst class six pupils in the Centre region of Cameroon. The 2018 English primary school curriculum has not made any provision. Although, there are guidelines only for monthly evaluation for teachers to administer monthly tests, which marks are registered in pupil's progress report cards. Neither the number of tests/ CA nor Percentages of marks to be considered is mentioned in this new curriculum. While within the month, teachers administer intermittent tests, which are times even not marked, or when marked, since the marks are not counted, pupils do not take seriously such tests because to them it is waste of time. All the same, 66.33% of the respondents generally favorably agreed that, continuous assessment practices using the competency based assessment practices significantly influence the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. The statistical testing of Pearson Product Moment Correlation and multiple regression analysis confirmed the result. It reveals that the calculated Γxy -value of 0.30 is higher than the critical Γxy -value of 0.113 at .05 level of significance with 318 degrees of freedom. In addition, the p-value of 0.002 is lower than 0.05. It indicates the null hypothesis was rejected and the alternative hypothesis retained. A further exploration of the influence showed that the $\Gamma xy = 0.30$ was positive. This indicates that as the continuous assessment practices using the competency based assessment practices improve the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon, it also increases it.

4.4.4- Summative assessment practices

Concerning summative assessment practices, similarly three of the five indicators received favorable responses. Amongst which were: 71.9% of respondents agree that, teachers use standardized objectives types tests. This implies that, teachers continue with the format because the educational authorities continue to implement it in the evaluation of final year class six pupils' official's examinations. Both teachers and pupils have been practicing this widely used evaluation format in class. 51.6% of respondents agree that, teachers evaluate pupils' class Projects. This implies that, half of the respondents acknowledge that teachers take in consideration class projects as one of the summative assessment practices' strategies. 100% of the respondents agreed that, teachers keep pupils' progress report sheets information and can be retrieved for official's uses purposes. It is worth to remind that, the educational authorities and head teachers use pupils' progress report to help classroom teachers to monitor pupil's progress and pupils' guidance for success of educational aspirations. 57.8% and 62.5 % of respondents disagreed respectively that, their teachers evaluate pupils' mathematics competences with real life situations or complex integration situations and the use of portfolios. This implies that most teachers do not use real life situations and portfolios when assessing their pupils. This would have been a contrary view because competence is exercised on real life situations in order to solve our daily life problems. Obviously, teachers are not yet conversant to the statement of competency and the techniques or procedures of setting real-life situations and organizing pupils' portfolios despite the numerous pedagogic seminars and animations organized by rungs of the pedagogic chain from the Ministry of Basic Education (MINEDUB). However, to reinforce the building capacities of teachers' various assessment skills in competency-based assessment practices properly as recommended from school curricula. The Minister of Basic Education, Pr. Laurent Serge Etoundi Ngoa signed in Yaoundé 1st April 2019 a radio and press communique No A/171/MINEDUB/CAB informing the educational community that, the 2019 and 2020 sessions shall follow the old format of setting examination questions. The press released reinstated that; it is as from 2021 session, that the format of official examinations shall be in conformity with the specifications of the new curriculum for primary schools. The dilemma of the communicate is that, instructions given this format instead started being in implemented in level 1(classes 1&2) from the 2018-2019 school year followed by level 2(classes 3&4) from the 2019 – 2020 school year. However, the level 3 (classes 5 &6) was expected to implement this system of evaluation from the 2020 -2021 school year but it is reluctant. This state of affairs has made teachers to be confused because the educational authorities still emphasize on the old format which is in conformity of order No 054/1454/MINEDUB/CAB of the 27th March 2015 reorganizing, First School Leaving Certificate (FSLC) and order No 055/1454/MINEDUB/CAB of the 27th March 2015 reorganizing the " Certificat D'études Primaires' (CEP). The researcher keenly observed the 2021session of the officials' examinations, which still respected the old format instead of applying the press, released No A/171/MINEDUB/CAB, which reinstated that; it is as from 2021 session that the format of official examinations shall be in conformity with the specifications of the new curriculum for primary schools. All the same, three out of five indicators were favorably agreed by respondents, leading to 74.5% of the general respondents who confirmed that, summative assessment practices using the competency based assessment significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon. The result of the analysis reveals that the calculated Γ_{xy} -value of 0.18 is higher than the critical Γ_{xy} -value of 0.113 at .05 level of significance with 318 degrees of freedom. In addition, the p-value of 0.002 is lower than 0.05. With the result of this analysis, the null hypothesis was rejected and the alternative hypothesis retained. A further exploration of the influence showed that the Γxy =0.18 was positive. This indicates that as the summative assessment practices using the competency based assessments practices improve the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon, it also increases.

CHAPTER FIVE

SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATIONS AND SUGGESTIONS

5.1 Introduction

The last chapter in this thesis is Chapter 5. It gives an overview of summary, findings, conclusion, recommendations and suggestions of the whole thesis. The recommendations are gleaned from the suggestions given by the education stakeholders, such stakeholders for this study were the pupils, teachers, and parents. The chapter then ends with specific recommendations and proposals on which Competency Based Assessment practices influence the attainment of Mathematics Competence amongst primary schools pupils in the Centre Region of Cameroon.

5.2 The thesis summary

In chapter one, the researcher discussed the Background to the study , Statement of the problem, Purpose of the study, Objectives of the study, Research questions , Significance of the study, Delimitations of the study , Limitations of the study, Budgetary plans and implications, Operational definition of terms, Chapter Summary. The problems identified in this study is observed from the fact that. At the international level, Cameroon is position at the bottom line of Trends in International Mathematics and Science Study (TIMSS) and Program for International Students Assessment (PISA). Results of past First School Leaving Certificate showed that roughly 85% of pupils' populations have been performing poorly in mathematics. This state of affairs will not only increase numeracy illiterates (citizens who are unable to count or solve simple daily or real life problems situations) despite the fact that, we are in an era of global digital world. Also steps backward STEM education policy which is the backbone of future local careers specialists in scientific, technical and engineering domains and which learners require mathematical competences or skills involving in the above domains as a prerequisite for the emergence vision of Cameroon by 2035. A shift from the Objective-Based Pedagogy (OBP) to the Competency-Based Approach (CBA) was implemented from the 2018/2019 academic year in Cameroon under the auspices of the Ministry of Basic Education. A new curriculum based on Competency-Based Approach (CBA) for both nursery and primary schools was drafted. The innovation from Objective-Based Pedagogy (OBP) to the Competency-Based Approach (CBA moves from lecturing teaching to mathematics problem-solving teaching, from teaching objectives to expected learning outcomes/competences, from exercises to tasks/ simple and complex integrations activities. Subjects are no more to be taught as a subject with more emphasis on theory, but must prepare the learners to develop competences. In the same light, Ravotto, (2011) and Williams, (2015) support that competence-based education focuses on student-centered learning, and represents a shift from the content of teaching and learning paths to ‘learning outcomes’ that are likely to be achieved and which can be used either in further educational pathways, or in the world of work and any other social context. As such the traditional’ role of the teacher being transmitter of knowledge becomes learners’ guide, facilitator, mediator between the learner and the content knowledge. The purpose is for certification of **competence performance** and not **certification of ability** to learn or to completion of a learning program.

In fact, competence based assessment practices implies new orientations which entails a comprehensive assessment of how well learners perform academically in education looking at the cognitive, affective and attitudinal aspects in relation to active learning through constructive activities that not only build knowledge but develop skills and attitude in learner’s mathematic competence. The orientation leads the socio constructivism model of learning and could be considered a new paradigm of learners’ competence based evaluations. Unfortunately, the assessment experiences for many students in the classroom is still one that is based on a behaviourist approach where discrete facts and skills are tested, where grading and ranking are the primary goals (Niss, 1993). This traditional assessment practices, however, focus in large part on the individual and fail to account for knowledge building and learning in context. In terms of assessment, the competency-based assessment approach does not make any provision for assessing and recording the progress of lower attaining pupils. Teachers use the same approach for assessing all pupils to assess progress in learning and outcomes attainments. In addition, there are no special provisions for children with needs, particularly those who record lower attainments in classrooms. The challenge for the 21st century, as far as mathematics educators are concerned, is to produce an assessment practice that does more than measures a person's mind and then assign a mind treatment. We need to understand how people, not apart from but embedded in their cultures, come to use mathematics in different social settings and how we can create a mathematics instruction that helps them use it better, more rewardingly, and more responsibly. To do that will require us to transcend the crippling visions of mind as a hierarchy, school as a machine, and assessment as engineering (Kilpatrick, 1993, p. 44). That is why it becomes an essential need of the new evaluative practices for the teachers to allow the students to participate in the development of their own value judgments.

In an effort to identify and examines variables believed to be indicators of Competency based assessment practices for lower attainment of mathematics competence, this research work specifically investigated the types of Competency Based Assessment practices and assessment activities as well as assessment tools that influence attainment of Mathematics competence amongst primary schools' pupils in the Centre region of Cameroon. The research questions and objectives also aimed at addressing whether Competency Based Assessment practices influence attainment of Mathematics competence amongst class six pupils in the Centre region of Cameroon. The purpose of which is to improve the attainment of class six pupils mathematics competences. The thesis objectives went on to look on which and how diagnostics formative, continuous and summative assessments practices using the competency based assessment approaches influence the attainment of mathematics competence amongst class six pupils. The complex nature of the research problem resulted in focusing on some expected selected important stakeholders in the education system, namely pupils, teachers and parents in the Centre region of Cameroon.

In chapter 2, in its conceptual framework, the competency based assessment practices was discussed in light for the purposes of diagnostic assessment, formative assessment, continuous assessment and summative assessment including their assessment instruments /tools and assessment activities. This enabled the researcher to draw conclusion as to whether teachers' diagnostics, formative, continuous and summative assessment practices support and enhance lower attaining pupils' learning in classrooms. In prelude, Competency-based approach (CBA) or integration pedagogy definition and objectives was discussed for its clarification since the Ministry of Basic Education (MINEDUB) adopted this approach in the educational system since 2018-2019 academic year.

In the theoretical framework, the chapter discussed the cognitivists, behaviourists and social constructivism as a possible philosophy for mathematics education. However, Social constructivism was chosen as the theoretical framework for the research because it helps people to generate or construct their own mathematical knowledge, be it subjective knowledge or objective knowledge. This mathematical knowledge, which is created, should help in the development and well-being of the individual and the society and suggests how teachers and students can use this teaching/learning theory to develop good 'habits of mind' (Tuge, 2008) and be useful problem solvers and developers of their societies.

The empirical on its turn, reviewed an insight into the study area and methodologies of others writers on the subject. The storehouse of knowledge has served as a springboard for the current study.

Chapter 3 discussed the research methodology, which is a quantitative approach and justified why the survey research and the quasi-experimental design methods approach were used. The survey (by questionnaires) and quasi-experimental (by tests) designs were used to gather and analyse data. Issues of sampling, choice and design of instruments, reliability, validity, and ethical and legal considerations were also explained.

Chapter 4 presented the descriptive and the inferential data analyses techniques in details as the main branches of a quantitative data analysis. For the descriptive data analysis, a tabular and a textual frequency count and percentage questionnaires' content's analysis was made. the General Description of Data/Variables through Mean and Standard deviation was equally made. As far as inferential analysis is concerned, the statistical tool used for this research is the Pearson Product Moment Correlation Coefficient to test Hypothesis-by-Hypothesis describes the relationship between the variables. In addition, a multiple regression analysis predicted the relationship between the variables as the prediction equation thus obtained was: $Y = 36.567 + 0.387X_1 + 0.433X_2 + 0.466X_3 + 0.417X_4$. This equation means that the predicted attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon (Y) for each of the respondents can be determined if the values for X_1, X_2, X_3, X_4, are known. Hence, if all these values are all zero, the respondent will have a score of 36.567. Furthermore, an increase in any of the predictor variables will result to an increase in the criterion variable the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Chapter 5 then discussed the findings, conclusions and recommendations.

5.3 Summary of findings

As mentioned earlier, results of this study emanated from class six pupils of Mfoundi and Lekié divisions of the Centre region of Cameroon. Questionnaires, test, documentary analysis were used to collect relevant data. Frequency count and percentages of data in chapter 4 Sections (4.3.1.1) and (4.3.1. 2) for General Description of Data/Variables of the study through mean and standard deviations were used to interpret research questions. In Section (4.3.2.1) - Correlational analysis of data and Verification of hypotheses with the help of Pearson Product Moment Correlation which, tested statistically correlations of variables and described associations (causal comparative analysis) and possible cause and effect relationships. A multiple regression analysis of Section (4.3.2.2) predicted and confirmed that, an increase in any of the predictor variables resulted to an increase in the criterion variable (attainment of Mathematics competence amongst primary schools pupils in the Centre Region of Cameroon).

5.4 Conclusions

Having providing answers to the research questions and statistical interpretation of research hypotheses, the following general conclusions are made:

1. Diagnostic assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.
2. Formative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.
3. Continuous Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.
4. Summative Assessment practices, related assessment activities and assessment tools/instruments used by teachers influence significantly influences the attainment of Mathematics competence amongst class six pupils in the Centre Region of Cameroon.

Evidence from the ‘causal comparative analysis’ and from the findings in this study is necessary to help in the formulation of recommendations to address significant differences which were observed. It is against the findings and conclusions of this study that the following recommendations are made.

5.5 Recommendations and suggestions

5.5.1 Recommendations

Teaching, learning, and assessment of mathematics pose many challenges to teachers, stakeholders, government, parents and schools in education. Failure in this subject raises a debate on how children learn and how teachers teach and evaluate learners. Some scholars argued that, there are probably many reasons for a learner’s failure in mathematics and most of them are likely to be based within the curriculum and the teaching methods rather than within the learner. In the same perspective, some debated and agreed that the cause of low mathematical skills to most of primary schools pupils may be poor teaching methods or strategies and teachers' inabilities of competency based assessment.

In this study, pupils identified some aspects of teachers' inabilities of competency-based assessment. For instance, 28.2% of the respondents agreed that, teachers observe pupils' behaviour through **individual attitudinal questionnaire**. It implies 71.8% teachers did not use individual attitudinal questionnaire, which is an assessment tool. The researcher recommends teachers to use attitudinal questionnaires quite often for the observation of pupils' behaviour.

69.4% of pupils disagreed that, they participated in the **selection of assessment criteria** in given mathematics competency tests. It implies that, most teachers did not involve pupils to participate in the selection of assessment criteria. For pupils to be familiar to assessment criteria in advance, teachers should involve pupils to participate in the selection of assessment criteria.

57.8% of respondents disagreed that teachers evaluated pupils' mathematics competences with **real life situations or complex integration situations**. This implies that most teachers do not use real life situations while assessing their pupils simply because they are not conversant to them. Teachers are recommended to continuously attain pedagogic seminars that will enrich their skills in the innovations of competency based assessment practices and should have the skills to elaborate real life situations or complex integration situations, which are suitable in pupils' competences evaluation.

57.9% of the respondents disagreed that teachers **count pupils' CA marks** towards the final mark of mathematics subject area. This implies that, teachers do not take into account pupils' marks of continuous assessment towards the final mark of mathematics competence module. Therefore, the educational policies makers are recommended to revise the new curriculum and make provisions where continuous assessment should have a quota in terms of percentage and be taken into account towards final terminal evaluation in general and mathematics evaluation in particular. This will certainly motivate pupils to work harder and never miss a test since they know it is going to count.

62.5% of respondents disagreed that, portfolios influence attainment of mathematics competence amongst class six pupils in the Centre region of Cameroon. That is to say, teachers did not consider **pupils' portfolios** and are not taken into consideration neither in their term nor in end of year examination. The government should draft a policy where portfolios evaluation is taken into account in the final examination with a certain percentage weigh score.

- Curriculum developers should revise the GTTC syllabus and include into its contents didactics of competency assessment literacy as a module that will clarify the newly trained teachers of assessment skills needed in CBA approaches.
- Teachers, pupils as well as parents should use ICT tools such as android or I phones as means of communications for the regular exchange of academic information about their children and for teachers, it will be research tools to update their competency based instructional approach and its related assessment skills in mathematics.

5.5.2. Researcher's Suggestion(s) to teachers of a competency based assessment mastery trajectory.

Academic achievement assessment in mathematics cannot be enhanced without effective learning strategy. 40% of the respondents' opinions in this study indicated that, their teachers did not use some aspects of competency based assessment activities as well as some assessment tools/instruments that could help them improve the attainment of mathematics competences. As an indicator, 80% of the respondents performed poorly in the mathematics competency test administered by the researcher to them. It implies that, most primary schools pupils under this study had low attainment level in mathematics competence. In attempt to increase the level of low attainment in mathematics competence, the researcher attributed the responsibility to teachers because of the limited use of some assessment tools/ instruments as earlier indicated above. It therefore depend the mastery level of teachers' possession in competency assessment skills as well as how well they engage their learners during the teaching and learning process since the underlying philosophy of the CBA requires that learning should be based on the potentials of the learner. In this case, learners are placed at the center and are considered as the main actor in learning process. As such the traditional' role of the teacher being transmitter of knowledge becomes learners' guide, facilitator, mediator between the learner and the content knowledge. Therefore, the teacher must be more knowledgeable than the learners must in order to scaffold them wherever learners have difficulties. Since the aim of this study was for primary school to give, their opinions through questionnaires about the types of competency based assessment activities and assessment tools/instruments carried out or used by their teachers that could either increase or decrease their mathematics competence.

The researcher suggested a competency based assessment mastery trajectory to teachers in order to improve teachers' mastery in mathematics subject basic knowledge; mastery of competency based pedagogic skills that will involve learners in deep learning; mastery of competency based assessment skills in cognitive, affective and psychomotor domains and finally the mastery of the structure of primary school curriculum of Cameroon.

5.5.2.1 Teachers' mastery of the structure of Cameroon English subsystem primary school curriculum

Mathematics subject area is the centre of interest in this study so; the structure has been restricted to the implementation of mathematics curriculum. Teachers should have the mastery of:

- Government's educational policies orientations in STEM education
- The aim of the curriculum
- The profile of the learner at end of Primary Education
- Domains, weighting ,Competences to be developed and Related Subjects
- Mathematics Subject area's components and transversal competence(s) to be developed
- Mathematics Subject Area's Annual Learning Hours per Level in a Single Shift and Double Systems
- Mathematics Subject Area's Weekly Learning Hours per Level in a Single Shift and Double Systems
- Elements of comparison of the old and the new curriculum
- Monthly Integrated Learning Themes

5.5.2.1.1 Government's educational policies orientations in STEM education

Each country has its educational policy for the vision of its citizens and the country itself. Cameroon has its educational system and its educational policy that ties with international conventions related to compulsory education. These conventions range from the Jomtien Education Framework of 1990, the Salamanca Statement of 1994, and the Dakar Framework of 2000 to the Incheon Declaration of 2015 precisely the fourth Sustainable Development Goal (SDG4). The Constitution of the Republic of Cameroon guarantees the right of the child to education and further highlights it in the1998 Law to Lay down Guidelines for Education.

Teachers should read the new curriculum thoroughly to be in cognizance of government's educational policies orientations and the structuration of the curriculum. It States in Section 4 that: "The general aim of education is to ensure the intellectual, physical, civic and moral development of the child as well as its economic, socio-cultural, political and moral integration in the society." It equally aligns with world pedagogic evolutions and to the 21st Century economy that is technologically driven and skill-based. In view of becoming an emergent nation by the year 2035, the government developed the Growth and Employment Strategy Paper (GESP) in 2009 to provide major orientations to all sectors of the society. The document-tasked ministries in charge of education to develop the human capital required to attain this vision. The 2013-2020 Education and Training Sector Strategy Paper (ETSSP) clearly defines the missions of each sub-sector in the educational system. In 2018, the Ministry of Basic Education (MINEDUB) designed a curriculum that guided the development of knowledge, skills and attitudes in the learners and set the foundation for learning with emphasis on Science, Technology, Engineering and Mathematics (STEM). Science, Technology and Mathematics (STEM) and practical skills are the key driving forces for the fourth industrial revolution for the development of more productive citizens.

5.5.2.1.2 The aims of the curriculum

- Engage learners to be competent, Independent, more active, creative and cooperative learning processes with opportunities to develop their potentials;
- Produce skilled learners, capable of contributing to lifting Cameroon to an emergent country by 2035;
- Learners become actors of their Personal development;
- Empower teachers with pedagogic opportunities as well as the possibility to adapt the teaching-learning process to their contexts;
- Transfer classroom knowledge to real life situations;
- Develop not only pupils' knowledge but also their skills and attitudes.
- Participate in quarter, village, and community.

5.5.2.1.3 The profile of the learner at end of Primary Education

The State of Cameroon prescribes that at the end of Primary Education in Cameroon, learners will have the following characteristics:

Seven National Core Skills

1. Communication in the two official languages (English and French) and use of at least one national language
2. Use of basic notions in mathematics, science and technology

3. Practice of social and citizenship values (morality, good governance and budgetary transparency)

4. Demonstration of the spirit of autonomy, a sense of initiative, creativity, and entrepreneurship

5. Use of basic information and communication technology concepts and tools

6. Practice of lifelong learning

7. Practice of physical, sport and artistic activities

Four Broad-based competences

1. Intellectual competences
2. Methodological competence
3. Personal and interpersonal competences
4. Communication competences

5.5.2.1.4 Domains, Weighting, Competences to be developed and Related Subjects

The new primary school curriculum contains 10 subjects with their related competences to be developed per subject grouped under five domains as shown in Table 72 below.

Table 72 : Domains, Weighting, Competences to be developed and related carrier Subjects areas

N°	Domain/Weighting	Competences to be Developed	Subjects areas
1	Basic knowledge (60%)	- Communication in the two official languages (English and French) and use of at least one national language - Use of basic notions in mathematics, science and technology - Practice of lifelong learning - The four broad-based competences	- English Language and Literature - Mathematics - Science and Technology - *Français*
2	Communal life and national integration (5%)	-Practice of social and citizenship values (morality, good governance and budgetary transparency) - Practice of lifelong learning - The four broad-based competences	- Social Studies
3	Vocational and life skills (20%)	- Demonstration of the spirit of autonomy, a sense of initiative, creativity, and entrepreneurship - Practice of physical, sports and artistic activities - Practice of lifelong learning - The four broad-based competences	- Vocational Studies - Arts - Physical Education and Sports
4	Cultural identity (5%)	- Practice of lifelong learning - The four broad-based competences	- National Languages and Cultures
5	Digital Literacy (10%)	- Use of basic information and communication technology concepts and tools - Practice of lifelong learning - The four broad-based competences	- Information and Communication Technologies (ICTs)

Source: C P S C English Subsystem - Level III: Class 5 & Class 6(2018 p.15)

5.5.2.1.5 Mathematics Subject area's components and transversal competence(s) to be developed

Mathematics is the subject area of interest as such; teachers should in detail identify mathematics competence(s) to be developed by the learners as presented in Table 73 below based on the National Core Skills, Broad based competences and Disciplinary Competences.

Table 73: Mathematics Subject area's components and transversal competence(s) to be developed

Sources and types of Mathematics Competences		Competence to be developed
I. National Core Skills • Use of basic notions in Mathematics, Science and Technology • Practice of lifelong learning and the four broad-based competences.	•Thinking and reasoning mathematically	To reason with mathematical logic to assess evidence or arguments, check a given justification, or provide a justification; as well as have the ability to devise a mathematical strategy to solve problems arising from the task or context.
	• Posing and solving mathematical problems	To transform a real-world problem into a mathematical problem and interpret mathematical information in problem-solving situations.
	• Mathematical modeling and representation	To create or use mathematical objects or relationships, including equations, formulas, graphs, tables, diagrams, and textual descriptions.
	• Making use of mathematical symbols and formalisms	To understand, manipulate, and make use of symbolic expressions (e.g., algebra), and use procedures and definitions appropriately.
	•Making use of tools and technology	To use tools and technology that aid in mathematical procedures, such as analysis of data and complex calculations.
II. Broad based competences	Methodological competences	Help learners to mobilize knowledge, reinvest, and reason briefly arouse the desire to learn other subjects in general and mathematics in particular and organize the procedures of the problem solving.
	Communication or Language	Help learners to read the problem situation and understand a competency

		competences	statement, sort out useful information, intervene in class, asks questions, bring out precision, explain stages, respond and interpret others questions and write down the problem solving steps. In other words, To read, decode, and interpret statements and math information, as well as have the ability to explain, present, and argue with mathematics.
		Transversal competences	Help learners the desire to know, find out, learn, think, reason, develop a critical spirit, socialize and listen to others in other words cooperate with others.
III.	Disciplinary Competences	Sets and Logic	*Solve problems involving sets and logic*
		Numbers and Operations	solve problems involving number operations
		Measurement and Size	solve problems involving measurement units
		Geometry and Space	Construct different geometric shapes
		Statistics and Graphs	categorize statistics on graphs

Source: researcher's initiative

5.5.2.1.6 Mathematics Subject Area's Annual Learning Hours per Level in a Single Shift and Double Systems

In referenced to the curriculum, teachers should be acknowledged of the fact that the weighting of Mathematics subject area's Annual and Weekly Learning Time in terms of Hours per Level are the same for the Single Shift and double shift Systems as presented in Tables 74, 75 respectively below.

Table 74: Mathematics Subject Area's Annual Learning Hours per Level in a Single Shift and Double Systems

Subject Area	**Level 1**	**Level 2**	**Level 3**
Mathematics	69	69	103.5

Source extracted from Cameroon Primary School Curriculum English Subsystem – Level III: Class 5 & Class 6(2018 p.20)

5.5.2.1.7 Mathematics Subject Area‘s Weekly Learning Hours per Level in a Single and Double Shift System

Table 75: Mathematics Subject Area‘s Weekly Learning Hours per Level in a Single and Double Shift System

Subject Area	**Level 1**	**Level 2**	**Level 3**
Mathematics	3	3	4.5

Source extracted from Cameroon Primary School Curriculum English Subsystem – Level III: Class 5 & Class 6(2018 p.20)

5.5.2.1.8 Elements of comparison of the old and the new curriculum

Table 76 : Elements of comparison of the old and the new curriculum

Curriculum Elements	**Old Syllabus**	**New Curriculum**
Learning goals	Knowledge acquisition	Development of competences
Objectives	Content based objectives	Behavioral objectives
Contents	Independent activities/ subjects	Broad fields
Curriculum experiences	Highly teacher based and transmission of knowledge	Appropriation of knowledge through Learning/Teaching approaches PBL CL with ILT
Assessment	Norm referenced	Criteria referenced

Source: researcher’s initiative

5.5.2.1.9 Monthly Integrated Learning Themes

In order to make learning relevant to daily life, eight integrated learning themes have been identified to develop skills necessary for the harmonious integration of learners in the society. Teachers should select the integrated learning theme that corresponds to the teaching/learning period of each pedagogic month per levels of primary school cycle as indicated in Table 77below.

Table 77: Monthly Integrated Learning Themes

Level I	Month	Level II	Month	Level III	Month
- The home	**September**	- The home	**September**	- Nature	**September**
- The village/town	**October**	- The village/town	**October**	The village/town	**October**
- The school	**November**	- The school	**November**	- The school	**November**
- Occupations	**December**	- Occupations	**December**	- Occupations	**December**
- Travelling	**January**	- Travelling	**January**	- Travelling	**January**
- Health	**February**	- Health	**February**	- Health	**February**
- Games	**March**	- Games	**March**	- Sports and leisure	**March**
-Communication	**April**	- Communication	**April**	- The universe and space	**April**

Source: Cameroon Primary School Curriculum English Subsystem - Level III: Class 5 & Class 6(2018 p.16)

5.5.2.2 Teachers' mastery of basic knowledge in mathematics Subject area

Teachers should acquire an in-depth mathematics basic' knowledge by reading the:

i. Knowledge of history of mathematics

ii. Knowledge on epistemology of mathematics

iii. Knowledge of the philosophy of mathematics from the net

iv. Knowledge of the content of mathematics syllabus from Cameroon English subsystem primary schools level 3 (2018 pp.51-53) .

The basic knowledge helps teachers to relate concept construction, formalization and theoretical framing in the domain of mathematics and the relationship between mathematics and other socio-cultural field.

5.5.2.3 Teachers' mastery of pedagogic skills

Teachers should have a mastery to conceive pedagogic tools in one hand and in other hand have a mastery of competency instructional approaches. Emphasis should be laid on:

- Computerization of the Annual and Monthly number of mathematics lessons per level and per class based on the annual and weekly learning hours from the curriculum for example level 3, class 6.
- Conception of monthly Schemes of work
- Formulation of mathematics competency statement
- Conception of Weekly and individual lesson plans

- Competency instructional approaches through project-based learning (PBL), Cooperative learning (CL), Problem based learning, Scaffolding and Differentiation.

5.5.2.3.1 Computerization of the Annual and Monthly number of mathematics lessons for level 3, class 6

Teachers should computerize the Annual number of mathematics lessons as follows:

- Annual Learning Time in Hours= 103.5 obtained from Table 74 above.
- Annual Learning Time in minutes= 5 H × 60= 6 210 Minutes
- Annual Number of lessons = 6210 ÷ 45= 138

NB. 45 minutes is the duration of a mathematics lesson in class for level 3, class 6 pupils.

As for monthly number of mathematics lessons per component is presented respectively in Table 78 and Table 79 below.

Table 78: Annual number of mathematics lessons per component table for level 3, class 6

Components	Numbers of Expected learning outcomes	% in relation to expected learning outcomes	Annual number of lessons	Total number of lessons	Observations
Sets and Logic	4	4/39×100/1=10.26	10.26/100×138/1= 14.16	14	
Numbers and Operations	11	28.21	38.92	40	
Measurement and Size	8	20.51	28.30	28	
Geometry and Space	8	20.51	28.30	28	
Statistics and Graphs	8	20.51	28.30	28	
Total	**39**	**100%**	**137.99**	**138**	

Source: researcher initiative

Table 79: Monthly number of mathematics lessons per component table for level 3, class 6

Months / **Components**	**Month 1**	**Month 2**	**Month 3**	**Month 4**	**Month 5**	**Month 6**	**Month 7**	**Month 8**	**Total**
Sets and Logic	1	2	2	2	2	1	2	2	14
Numbers and Operations	4	6	6	5	5	4	5	5	40
Measurement and Size	3	4	4	4	4	3	3	3	28
Geometry and Space	3	4	4	4	4	3	3	3	28
Statistics and Graphs	3	4	4	4	4	3	3	3	28
Total	**14**	**20**	**20**	**19**	**19**	**14**	**16**	**16**	**138**

Source: researcher initiative

5.5.2.3.2 Conception of monthly scheme of works

Instructors should elaborate the monthly scheme of work taken in consideration monthly-integrated learning theme earlier mentioned in section 5.5.2.3.1 Table 80, an envisaged project chosen by both learners and teachers and the class timetable Table 71 as presented in the sample template.

Table 80: **a sample monthly schemes of work for the month of December 2020**

Integrated learning theme-------Occupation

Envisaged project: Both learners and teachers select the project.

		Week	**Day**	**Subject or component (s) activity**	**Units/ contents**	**Expected learning outcomes**	**Suggested teaching and learning strategies**	**Suggested resources**	**Didactic materials**
1st TERM	**PEDAGOGIC MONTH (occupation) N° 4**	**1st Week**	**Monday**	**Mathematics** -Sets and Logic	Finite/Infinite sets; -	To identify and classify finite and infinite sets correctly	Discovery method -Problem Solving method -Laboratory method -Cooperative learning	-Curriculum level III p.51 - Mathematics text books	-Real objects -Audio video tapes -Pictures -Charts

			- Individualized instruction - Task approach		
Numbers and Operations	Mathematical operations;	-Solve problems involving vulgar and decimal fractions	- Discovery method - Guided inquiry - Problem solving method - Laboratory method - Cooperative learning - Individualized instruction	-Curriculum level III p. 51 - Mathematics text books	-Real objects - Audio video tapes - Pictures - Recycled materials - Calculator
Measurement and Size	13 Lunar months;	-Solve problems involving Distance, speed and time	- Discovery method - Guided inquiry - Problem solving method - Laboratory method - Cooperative learning - Individualized instruction	-Curriculum level III p. 52 - Mathematics text books	-Metre rule -Scale and litre containers - Globe/maps - Calendars -Cartons
Geometry and Space	Angles and measurements	Measure angles using protractor	- Discovery method - Guided inquiry - Problem solving method - Laboratory method - Cooperative learning - Individualized instruction	-Curriculum level III p. 53 - Mathematics text books	-Real objects -Pictures - Bacus -Charts -Recycled materials -Maths set -Cardboard -Cartons
Statistics and Graphs	Mapping	Interpret relationships on maps	- Discovery method - Guided inquiry - Problem solving method - Laboratory method - Cooperative learning	-Curriculum level III p. 53 - Mathematics text books	- Pictures - Charts - Models - Maths set

				- Individualized instruction
			English language **…..** **…..** **…..**	
		Tuesday **Wednesday** **Thursday** **Friday**		
	2nd Week	**Monday**		
		Tuesday **Wednesday** **Thursday** **Friday**		
	3rd Week	**Monday**		
		Tuesday **Wednesday** **Thursday** **Friday**		
	4th Week	**Monday**	-integration activities	
		Tuesday	-Evaluation and correction	
		Wednesday	-Results' analyses and remedial works begin	
		Thursday	Remedial works continue	
		Friday	Final evaluation and correction	
Pedagogic month N°5	**1st Week**	**…..**	**……**	
	2nd Week	**…..**	**……**	
	3rd Week	**…..**	**…..**	

Source: researcher's initiative

NB: Expected learning outcome are expressed in terms of Knowledge Skills and Attitude

An example of mathematics component: Expected learning: Sets and Logic

Knowledge: intersect sets

Skills: use the intersection in the description and interpretation of everyday life situations;
Attitude: have a coherent and logical reasoning.
A simple exercise is in connection with a specific objective on knowledge or skill. For example, add or subtract two numbers, identify the greatest number, read the time….

- An integration activity is proposed at the end of a pedagogic month that requires the mobilization of many concepts taught during the pedagogic month. For example, "I bought 20 bags of cement to plaster the walls of my house. The bricklayer discovered that, 1 bag covers a surface area of 4 m^2. If the total surface area of the house is 100 m^2, how many bags of cement should I buy again?

5.5.2.3.3 Formulation of mathematics competency statement

Teachers should formulate mathematics competency statement at the beginning of each pedagogic month in respect to the expected learning outcomes to the three weeks of effective teaching and learning from the monthly scheme following the given example below.

From (texts, charts, pictures, images, video etc.) describing a complex real life situation related to occupation(ITL N° 4) and with the help of knowledge, skills and attitudes acquired in Sets and Logic, Numbers and Operations, Measurement and Size, Geometry and Space and Statistics and Graphs through the month of December, pupils should be able to solve significant problem situations :

- To identify and classify finite and infinite sets correctly
- Solve problems involving vulgar and decimal fractions
- Solve problems involving Distance, speed and time
- Measure angles using protractor
- Interpret relationships on maps

Solving problems should take note of the following the criteria.

- In written and practical the evaluation criteria are same
  - Correct use of symbols, signs and diagrams
  - Appropriate use of operations and formulae
  - Correct use of mathematics operations.
  - Coherence in the answers.
- In oral
  - Coherence in the answers.

In fact, a competency statement has three parts, which are the context (support), tasks and evaluation criteria.

5.5.2.3.4 Conception of integrated weekly plan / template

From a monthly scheme of work, teachers should conceive an integrated weekly plan / template, which sample is illustrated below in Table 71 below with an example of a sample of mathematics subject area filled.

Table 81: **A sample integrated weekly plan**

Integrated Weekly Plan

Period:

Level:

Class:

Number on Roll:

Integrated Learning Theme (Context):

Envisaged Project:

Day/date	Periods	Subject activity	Expected learning outcomes	Units	contents	Facilitating activities	Learners' activities	Suggested strategies	Suggested resources
Monday	1st	**Mathematics** -Sets and Logic.	To identify and classify finite and infinite sets correctly	Finite/Infinite sets; -					
	4th	Measurement and Size	-Solve problems involving Distance, speed and time	Lunar months;					
Wednesday	1st	-Numbers and Operations	-Solve problems involving vulgar and decimal fractions	-Mathematical operations;					
Thursday	2nd	-Geometry and Space	Measure angles using protractor	Mathematical set and content;					
Friday	1st	-Statistics and Graphs	Interpret relationships on maps	Mapping; -					

From Table 81 above, periods indicate the order of subjects classified in the instructor's class timetable.

5.5.2.3.5 The writing of lessons notes

Teachers write lessons notes following the sample in Table 82 below. The design of lessons has to be centered on the learner and oriented towards activities through which learners construct their knowledge because of the learning experience based on a chosen pedagogic project and related integrated learning theme of the month.

Table 82: A sample of a lesson notes

Individual Lesson Plan On --------------------For ………………

Unit.......................

Lesson...............................

Level : Class: Number On Roll: Average Age:

Integrated Learning Theme:

Envisaged Project:

Specific Objective:

Entry Behavior: Time:

Resources:

Didactic material(s): Duration:

Reference:

Stages	Contents	Facilitating activities	Learners' activities	Resources	Teaching and learning strategies
Introduction					
Presentation					
Conclusion/evaluation					

5.5.2.3.6 Competency learning approaches through project-based learning (PBL), Problem based learning, Cooperative learning (CL), Scaffolding and Differentiation

When many teachers undertook their initial education, knowledge about learning and teaching was less developed, many teaching tools were not available and the role of education and training was more narrowly conceived. However, teaching staff nowadays need the competences to constantly innovate and adapt novelties of competence based approach; this includes having critical, evidence-based attitudes, enabling them to respond to learners' outcomes, new evidence from inside and outside the classroom, and professional dialogue, in order to adapt their own practices.

To ensure an effective implementation of the teaching and learning process, teachers start by:

- Identifying the competence(s) to be developed, over a given period in a unit (this unit should be related/ based on a chosen theme, which should run through a given number of subjects);
- Conceive a project, together with your pupils;
- Plan the activities from the monthly scheme of work, weekly-integrated plan to the writing of the lessons notes.
- Plan and organize evaluation activities to be carried out;
- Plan and organize integration activities;
- Foresee evaluation activities on identified competences from the beginning and organize them (summative evaluation);
- Organize remediation or remedial works;
- Go to the next learning-teaching unit.

In terms of teaching, the researcher wanted to develop skills rather than knowledge to teachers obviously by creating situations that we will call "problem situations". Here the role of the teacher is no longer the one in which he is the absolute holder of knowledge, but he is a mediator, a facilitator between knowledge and the learner. With implicit instruction, teachers focus on explanations, demonstrations, feedback and practice until the skill is mastered. In terms of learning in a Competency-Based Approach, the learner is the main actor in his/her own knowledge. Here we see that two summits (the teacher and the learner) of the pedagogical triangle have changed their role. The teacher is no longer the one who must transmit knowledge to the learner and the learner is no longer an empty box that the teacher must fill. The underlying philosophy of the CBA requires that learning should be based on the potentials of the learner. The learner in the learning process constructs his knowledge with the help of the teacher who, here, plays only the role of guide, mediator, facilitator. The focus is on learning and not on teaching. The learner should be responsible for his/her own learning.

When teaching mathematics, teachers also need to consider different learning styles. Some children are slow reflective learners, while others like their learning to be fast. Some happily use trial and error but others work systematically through the problem until they get an answer. Some rely on intuitive thinking while others prefer concrete, practical ways of working things out. The new curricula give the teacher, the latitude to use the methods or pedagogic strategies that enable them to easily attain their objectives and develop competences in the learners. The use of variety in teaching methods for pupils with low mathematical skills motivates pupils, improves their learning skills, and enables them to learn quickly. Teachers are advised to select and use a variety of instructions that suit the types of learning involved in a lesson, as well as suiting the age, ability of the learner that could enhance mathematics competence to the learners. Instructions are through project-based learning (PBL), problem based learning, Cooperative learning (CL), Scaffolding, Mediation and Differentiation.

5.5.2.3.6.1 Project-Based Learning

When it concerns a project base learning, children present their monthly project if possible in the presence of their parents and other members of educational community. Project based learning is thus a teaching model that enables the learner to acquire knowledge, build knowledge and develop competences. In others words, projects are designed to allow learners with a variety of different learning styles to demonstrate their acquired knowledge, skills and attitudes. Therefore, a well-designed Project-Based Learning activity is one which addresses different learning styles and does not assume that all learners can demonstrate their knowledge, skills and attitudes in a single or standard way. Four conditions are necessary for a pedagogic project to succeed preparation, implementation, evaluation and publication. Commitment to project-based learning enables the learner to solve many problems and makes the teaching-learning process more skill-based. The first stage consists of structuring the project in stages, specifying the contents, defining and distributing tasks, roles and responsibilities. Establishing a calendar of activities, defining rules for the proper functioning of the teams, identifying the method of collecting data and ICT tools to be used, determining the modes and criteria of evaluation and specifying the follow up of the project. A general evaluation of the project should be done with learners focusing on the strong and weak points of the project, what they can do better if they had to do the project again. Teachers for learners who have not yet meet the expectation/not yet competent organize remedial works out.

5.5.2.3.6.2 Problem based learning

Many studies show that pupils with low mathematical skills may lack one of the three domains of math skills, which are knowing, applying and problem solving (Männamaa, et al., 2012). NCTM (2000) advocates teaching and learning mathematics through problem solving. Allsopp et al. (2007) argues that, problem solving should be a regular part of classroom instruction to help students with low mathematical skills become critical thinkers and independent learners. Pupils with low mathematical skills should be taught problem-solving skills, as it is one of the mathematical skills every individual should have either in or out the classroom. Problem solving is the process of applying previously acquired knowledge to new and unfamiliar situations. According to principles and standards for school mathematics (NCTM) (Number standard for Grades Pre-K-12, 2000) states that: *"Without the ability to solve problems, the usefulness and power of mathematical ideas, knowledge, and skills are limited" (P.182).* NCTM (2000) advocates teaching and learning mathematics through problem solving. The essentials should be developed through focusing on problem solving and underlying concepts so that students can use ideas that are closer to their ways of thinking, which increases the likelihood success (Allsopp et al., 2007).

5.5.2.3.6.3 Cooperative learning

In cooperative learning, the pupils themselves often become teachers of each other in guided participation and shared understanding in routine problem solving activities. In order for a child to understand mathematics well he or she should interact with fellow peers through selected well-defined activities and exercises as well as the use of range of assessments method that helps produce valid decisions and recognizes that learners demonstrate competence. Pupils thus work together in small teams organized by teachers on structured activities. In this interaction, a capable peer may help the child where he or she failed to solve mathematical problems. The basic principles are group size, the composition and formation of groups, the learner's role, and positive independence, individual and collective, abilities. The activity and the pedagogic environment determine the following regrouping:

- **Spontaneous regrouping or informal teams** (learners quickly regroup themselves to accomplish a simple task for a short time)
- **Permanent regrouping or base team** (it regroups three or four pupils who work together for a long duration)

- **Divided regrouping or a constituted team (description:** in class, there are base groups and groups of experts. Each member of the base group is given a topic or a particular content. After, the group of experts is constituted in function of the topic regrouping pupils from the base group. At the end of the period, each pupil goes base to his base group and explains to group members what he learnt in the group of experts**.**

- **The regrouping of intermediaries or mouthpieces** (each team chooses a pupil who will represent it. Team representatives meet to organize tasks)

- **Mixed regrouping or associated teams** (this is a regrouping of teams which discuss or compare their work)

- **Mixed ability regrouping** (it is a regrouping of two pupils, one is very intelligent and the other one is week. The more intelligent pupil has the responsibility to help the week pupil to be intelligent too).

5.5.2.3.6.4 Scaffolding

The scaffolding concept is derived from Vygotsky's theory (1978) and was described for the first time by Bruner (1990). Scaffolding is the process by which an experienced person, or adult, provides help to a child who failed in performing the task by him or herself Vygotsky introduced the idea of scaffolding through the notion of Zone of Proximal Development (ZPD). Vygotsky (1978) defined the ZPD as:

The distance between the child's actual developmental level as determined by independent problem solving and the higher level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p.75). Scaffolding instruction as a teaching strategy is of high necessity in the mathematical classrooms to support pupils with number problems (Rogoff, 2003.). That is a child who cannot solve a mathematical problem might be able to do so with a little help or guidance from their teacher, parent, guardian or any other more knowledgeable person.

5.5.2.3.6.5 Mediation

Mediation is the kind of communication between parents and child, teacher and pupil, pupil and pupil and it can be a kind of teaching. The teacher acts as facilitator, interpreter and mediator of meaning. This form of learning is beneficial to both the learner and teacher in that it:

- Facilitates the cognitive development of learners
- Improves learners’ reasoning capacities
- Uses more effective strategies
- Improves learners’ aptitudes for generalization

5.5.2.3.6.6 Differentiation

Differentiation is the use of different teaching techniques and strategies to teach pupils concepts. UNESCO (2004) argues that, giving different learning tasks to pupils with different proximal learning possibilities, varying in study content, learning task, length of study content and length of time for solving a task are traditional ways of differentiating. According to Jonsen (2003) asserted differentiation as cited in UNESCO (1994) in the following way:

Curriculum education is the process of modifying or adapting the curriculum according to the different ability levels of the students in one class. Teachers can adapt or differentiate the curriculum by changing the content, and methods, for teaching and learning content (sometimes referred to as the process), and, methods of assessment (sometimes referred to as the product) (p.14). The aim of differentiation is to meet the diversity of pupils’ educational needs by applying a variety of instructions. However, teachers making the decisions about differentiation have in mind the diversity of pupils and they believe that effective instruction is based on pupils’ active participation in decision-making and problem solving (Tomlinson, 1995). Therefore, teachers should use different strategies and techniques for pupils with low mathematical skills so that they can learn the concepts in mathematics.

5.5.2.4 Teachers ‘mastery of competency assessment skills to be developed

In terms of evaluation, evaluation is an integral part of the teaching and learning process. Teachers must evaluate what they have taught; it is not easy to assess the competences of the learners because it is not clear what complex situations are involved or the subject matter to be dealt with in the learner's outputs in these situations in order to estimate their level of mastery of Skills. Diverse tools are used to collect information about the learner in order to moderate and increase learners’ chances of learning from one another. This fact has implications for what and how to assess pupils’ achievement of competences that is in the cognitive, psychomotor and affective learning domains. The competence-based approach thus gives the teacher the task of giving evidence of children's achievements in the affective, cognitive and psychomotor domains learning outcomes. The new curriculum emphasized on three forms (oral, written, practical) of assessment in both nursery and primary schools levels. In assessing pupils' mathematics learning outcomes or competences, teachers need to assess factual knowledge, understanding of concepts, computational ability, appropriate application of techniques, and the practical skills of doing, communicating and solving real life situations. The different procedures of assessing these outcomes are enumerated below.

5.5.2.4.1 Assessing cognitive skills/competences

Cognitive components are intellectual outcomes of instruction, thinking, memory, knowing and problem solving arrangement. It has six levels, which include remembering, understanding, applying, analyzing, synthesizing, evaluating and creating. The assessment of the lower-cognitive skills/competences comprises obviously tests or examinations of the **objective such as MCQ & TF questions or short-answer type such filling the blank spaces.** For the Assessment of higher-cognitive skills/competences, tests, examinations, and assignments based on extended-answer questions came into their own in this area, as do other types of **assignments and projects**. **Situational assessment** should also be considered, particularly if you are trying to assess a broad group of skills or a multi-faceted competence.

5.5.2.4.2 Assessing affective skills/competences

Affective domain deals with description of changes in interest, feelings, emotions, attitudes, values, and development of appreciation and adequate adjustment. The affective component has five levels that consist of receiving, responding, valuing, organization and characterization. The curriculum demands that children develop individual positive values and attitudes. All the various methods that are suitable for assessing higher-cognitive skills/competences can again be used in this area, with oral **assessment and portfolios** being suitable methods in some cases. Here, it is obviously necessary to set the students a task that requires them to use the particular interpersonal skills/competences that you wish to test. Written communication skills/competences can be tested by getting them to write an **essay**, **produce a seminar paper or report**, and so on. **Oral communication** skills/competences can be tested by placing them in a situation where they have to speak, e.g by making them give an oral presentation of some sort. Interpersonal and leadership skills/competences are probably best assessed through some form of situational assessment, **group project or portfolio,** and may well require some form of **peer assessment** to be incorporated.

5.5.2.4.3 Assessing psychomotor skills/competences

Psychomotor components cover those objectives involving muscular and motor abilities or manipulations of materials and objects, activities that have to do with muscular coordination (Izuagba, ayanwu, Obiefuuna&Afurobi, 2009). Psychomotor involves imitation, manipulation, precision, articulation, and naturalization. It has five levels made up of reflex movement, basic fundamental movement, perceptual abilities, non-discursive communication, physical abilities and skilled movement. Here, the various types of practical test clearly come into their own, as do the various forms of situational assessment. In the school context, some authors speak of terminal competencies, to highlight their connection with an exit profile. In practice, the departure point for curriculum construction is the fact that one regards a situational (terminal) competency as an element of a measurable exit profile of the learner. In a school context, they are of a disciplinary nature because they form part of the curriculum of a discipline. Nevertheless, this disciplinary character has nothing to do with the actual notion of situational competency, which, on the contrary and by nature, more readily relates to **complex interdisciplinary situations**. **Assignments and projects** can also be used to assess in this area. In respect to this study, the researcher outlined four competency based assessment practices approaches focusing on their purposes, related assessment activities and assessment tools/instruments taken in consideration the affective, cognitive and psychomotor domains learning outcomes if appropriately used by teachers will increase primary schools pupils' attainment in mathematics competence.

5.5.2.5 Teachers 'mastery of Mathematics competency assessment skills template

Table 83: Teachers 'mastery of Mathematics competency assessment skills template

Types of competency based assessment practices based on purposes	Assessment Activities	Assessment Tools/Instruments	Teaching-Learning Techniques/ strategies	Instruments for assessing Cognitive and Non-cognitive outcomes		
				Cognitive outcomes	Affective outcomes	Psychomotor outcomes
D A P	-Teachers asks oral questions to check pupils mathematics	Oral tests	-Teachers are advised to select and use	X	X	
	prior knowledge and skill levels; - Pupils respond	Test (Written tests such as	a variety of instructions that suit the	X		
	orally; -Teachers give	Objective MCQ or T&F	types of learning	X		

	oral feedback to pupil’s responses; - Teachers correct pupils’ persistent errors constantly in mathematics arears children face difficulties;	Practical tests	involved in a lesson, as well as suiting the age, ability of the learner that could enhance mathematics competence to the learners. -Project-based learning (PBL), - Problem based learning, -Cooperative learning (CL), -Scaffolding, -Mediation and Differentiation		X
F A P	- Teachers communicate mathematics competence based statement to pupils at the beginning of the week, lesson’s objective(s) at the beginning of a lesson; -Teachers set a didactic problem situation at the beginning of the lesson in relation to the integrated learning theme of the month and observe pupils; - Pupils exchange and mark each other’s mathematics exercise books assignment or homework given by the teachers ;	Stating competency based statement in mathematics; Stating lesson(s) Objective(s) - Use individual attitudinal questionnaire to assess pupils’ behavior.	- Teachers mobilize pupils in group work: -Spontaneous regrouping or informal teams ; -Permanent regrouping or base team; -Divided regrouping or a constituted team; - The regrouping of intermediaries or mouthpieces ; - Mixed regrouping or associated teams; - Mixed ability regrouping	X	

	- Teachers verify and comment on individual pupils mathematics assignment books;	- Self and peer assessments.	X	X	X
		Assignments	X	X	X
	- Teachers organize weekly integration activities with specific criteria success selected by both teachers and pupils;	Integration situations	X	X	X
	- Teachers organize remedial classes where pupils faced learning difficulties after correcting their books	Remedial forms			
C A P	- Respect monthly mathematics competency written tests calendar.				
	- Observe pupils 'attitude during drawing practices workshops and awards marks.	-Oral tests	X	X	
	- Involve pupils in the selection of assessment criteria.	-Written tests such as:			
		i- Objective MCQ or T&F	X		
	- Encourage mathematics' high achievers pupils to assist low achievers.	ii- Subjective (essay)	X	X	
		-Practical tests			X
	- Add continuous assessment's marks quota to the final mathematics competency evaluation at the end of term.				
S A P	- Teachers	- Criteria			

elaborate real life situations or complex integration situations.	referenced test such as: Real life situation or complex situations/		X	X	X
- Teachers conceive Standardized objectives and subjective types of questions	-Multiple Choice Questions,	X			
	-Problem Solving	X			
- Projects presentation by pupils	Projects	X	X		X
- Give marks quota on pupils' geometric practical's activities	Portfolios	X	X		X
- Teachers fill and keep pupils' progress report sheets for official's uses;	-Progress reports booklets; - Progress report sheets - First School Leaving Certificate				

Source: Researcher's initiative

Note :

D A P = Diagnostics Assessment Practices

F A P= Formative Assessment Practices

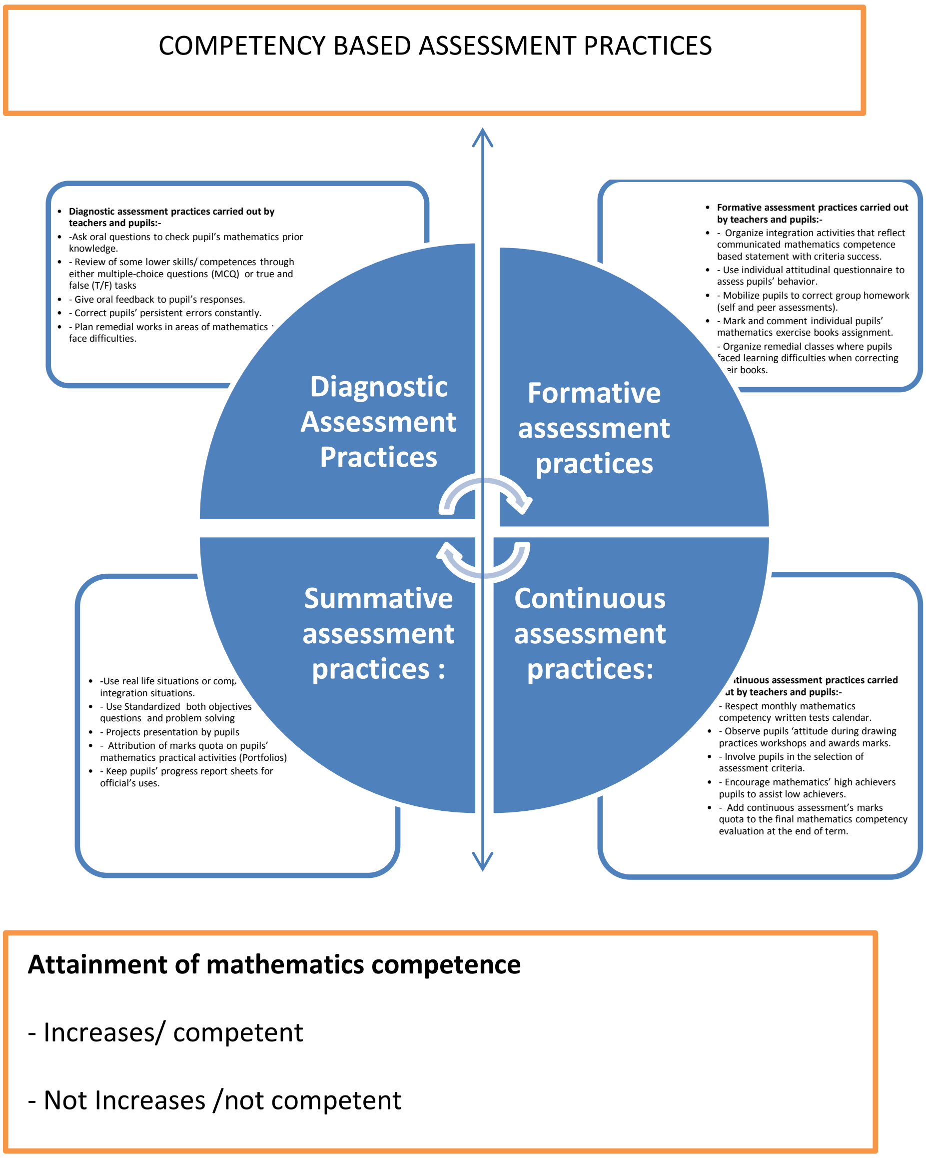
C A P = Continuous Assessment Practices

S A P= Summative Assessment Practices

Reality in teaching/learning, teachers still has difficulties to create problem situations that develop skills in the teaching/learning process based on the fact that, they are satisfied with the starting situations found in the pedagogical guide and some workbooks. The main problem at this level is that teachers are still undergoing in training services workshops throughout the country in the formulation of real-life situations. The other observation is that the conditions for implementing the Competency-based approach are not uniform throughout the national territory because some localities are electrified while others are not. In electrified localities, access to photocopying is relatively easy, which would facilitate the implementation of this approach compared to non-electrified rural areas, while all learners in the exam class undergo the same type of certification assessments in third or in terminals.

Figure 14 below indicates a diagrammatic of teachers' mastery in mathematics competency assessment skills.

Figure 14: Diagrammatic of teachers' mastery in mathematics competency based assessment skills.



At each stage of the teaching and learning process, teachers monitor learners' progress through assessment activities and varieties of instruments or tools for different purposes. Learners' involvements in competency assessment skills are not taught. They are being built. The learner is necessarily the first actor in the construction of his skills. It is also through the participation of the subject in the evaluation of his or her learning that the learner develops his /her autonomy; it is truly at the heart of construction expertise.

- For diagnostics purpose, the researcher proposed a number of assessment activities as well as assessment tools/ instruments in order to draw up a list of weaknesses, which need to be addressed by planning for an appropriate supplemental intervention or remediation, and, equally importantly, to establish in which areas of mathematics the learner has been successful. The assessment activities as well as assessment tools/ instruments include: the use of objective MCQ or T&F questioning; oral questioning technique to check pupils mathematics prior knowledge and skill levels; given oral feedback to pupil's responses; correction of pupils' persistent errors constantly and planning remedial works in mathematics arears children face difficulties.
- For formative purpose, teachers assess learners' competences (knowledge, skills and attitudes) in relation to the specific objective of a lesson during and after the lesson based on a didactic problem situation or family situations more appropriate in competence assessment. A problem situation is a learning situation. It should be in congruence to the chosen monthly mathematics competence statement. It is a means to learn and not result. A learning strategy engages learners. It constructs knowledge and should be mastered in a lesson plan. It is a global, complex and significant task.
- i) Problem situation as a global task has a context and a purpose; it requires more than an operation, an action, an action to undertake.
- ii) Problem situation as a complex task mobilizes many resources; causes a cognitive conflict without an evident solution; it presents both realistic and realizable challenge to the learner.
- iii) Problem situation as a significant task has a sense of direction to the learner because it calls for what the learner knows and which is in link with its reality. The tasks of each problem situation should be able to evaluate each of the minima criteria. An example of a didactic situation in Mathematics is illustrated below. It is made up of a context, instructions and tasks.
- **Topic:** intersection of sets
- **Expected learning outcome:**
- **Knowledge on**: Sets and Logic
- **Skills:** use the intersection in the description and interpretation of everyday life situations;

- **Attitude:** have a coherent and logical reasoning.

Given the importance of children's education, the proprietor of "THE BEST STANDARD BILINGUAL NUSERY AND PRIMARY SCHOOL OBALA" at the end of first term holidays has decided to organize a price giving ceremony of his institution. He bought cartons of text and exercise books, pencils, colors pens, ball pens, rulers and mathematics sets, chalk, soaps, buckets, rags, brooms, saw, scissors, meters, shovels, hoes and cutlasses to distribute to most outstanding pupils of all the classes. Farmers, teachers, tailors and carpenters use some of the items related to their occupations.

Instructions: Read the text above and use the information to,

Task1. Using the symbol of sets and write items used by:

a- Farmers as set A
b- Teachers as set B
c- Tailors as set C
d- Carpenters as set D

Task 2. List a set of the first four months during 1st term children often come to school before going on holidays as Set E

Task 3. Classify the above sets into finite or the infinite under the table below.

Finite sets	Infinite sets

- For continuous purposes, after a number of mathematics lessons, at the end of the week, teachers organized partial integration activities in respect to the school year calendar. Others continuous strategies include:, take-home assignments, observation of students, group homework (self and peer assessments) , project work and portfolios, oral presentation, practical test and interviewing learners are marked based on a score rubric or marking guide . Marks obtained should have a quota percentage to be added to the terminal or end of year final mathematics competency evaluation.

- For summative purpose, after chosen and defined competences to be evaluated, the learner is placed to accomplish a complex task from the knowledge, skills and attitudes acquired in different resources within a given period through real life situations or complex integration situations. learners are assessed either at the end of each pedagogic month, term, end of year and certificate purpose e.g. to obtain their FSLC at the end of primary cycle. Questioning approaches may involve structured or open-ended, interviews, self-questioning, using higher-order questions or fact recall. Tests construction measure cognitive aspects of learning outcomes with the primary purpose to measure only the mastery skills, factual knowledge through the traditional paper and pencil standardized or unstandardized tests. These assessment instruments are less appropriate in competence based assessment approach. Therefore, real life situations or complex integration situations are more appropriate in competence based assessment approach.

An integration situation is made up of 3 parts: the context or the support, tasks or what to be done by learners and evaluation criteria grouped in minima and performance criteria. The criteria identify the aspects of learner performance that are assessed and /or evaluated, and they serve as a guide to what teachers look for. Descriptors/indicators indicate the characteristics of the learner's performance, with respect to a particular criterion, on which assessment or evaluation is focused. The most important criteria are the minima as compared to performance criteria. The criteria differ from different subject areas. For instance, Essay writing in English language. The following criteria are operationalized into marking indicators/descriptors to determine the success rate of a learner score are indicated in Table 84 below.

Table 84: **Essay writing evaluations criteria operationalized into marking indicators**

Criteria	Indicators
- Presentation of work correctly	- Title identity
	- No title
	- Clear words
- Syntax	- Verb used
	- Correct arrangement of words
	- Correct use of substitutes

Source: researcher's initiative

An indicator can be qualitative for instance the case above or quantitative when a precision is made for a rate of success. e.g 4 characteristics out 5 enumerated.

For competence 2: Use basic notions in mathematics, science and technology (100 marks) is concerned, it is split into competence 2a: Use basic notions in mathematics (50 Marks) and competence 2b science and technology (50 Marks). The researcher interest is the use of Use basic notions in mathematics and Table 85, which indicates evaluation criteria and marking guides.

Table 85: Use basic notions in mathematics 50 (Marks)

PARTS	CRITERIA	MARKS
Oral 15 marks	C1- relevance in the vocabulary	7
	C2- pertinence of logical thinking	8
	Total for oral	**15**
Written 20 marks	C1- correctness of figures and formula	5
	C2- correct choice of operations	5
	C3-coherence of ideas in relation to instruction	5
	C4- correctness of answers	5
	Total for written	**20**
Practical 10 marks	C1- respect of the norms	5
	C2- respect of instructions	2
	C3- correctness of the procedure	3
	Total for practical	**10**
Attitude 5 marks	C1- collaboration	2
	C2-creativity	3
	Total for attitudes	**5**

Source: Recommended officials Marking Guide for Level 2 and 3 from MINEDUB

After the marking and commenting individual pupils' assignments, integration activities and real-life situations based on selected evaluation criteria above. Teachers should plan to organize remedial activities in areas children faced difficulties.

5.5.2.6 Teachers' mastery in the conception of remedial works form for the use of basic notions in Mathematics

During remediation, exercises are administered to learners who are not yet meeting expectation/ not competent. The target here is to focus on learners' weakness in the teaching and learning progress in order for all learners to be competent. To carry out, the teacher must conceive a remedial works form as shown in Table 86 below.

Table 86: Remedial works form for the use of basic notions in Mathematics

N°	Pupils' names as found in class list	Evaluation criteria				Failure Rate	Nature of failure	Origin of failure	Envisaged remedial activities
		C1	C2	C3	C3				
1		*	*	*	*	0%			
2		*	-	-	-	75%	Poor reading	No text book	Parents should buy a mathematic s text book
3		-	-	-	-	100%			
4		-	-	+	-	25%			
	Failure rate	50%	25%	50%	75%				

Source: researcher's initiative

<u>Key</u>

C1- correctness of figures and formula

C2- correct choice of operations

C3-coherence of ideas in relation to instruction

C4- correctness of answers

- Total mastery *
- Partial mastery+
- No mastery ×
- Total no mastery –

5.5.2..7 Teachers' mastery in filling and keeping of pupils' progress sheets for official's uses.

Once an assessment has been developed, test designers must establish cut scores to separate masters from non-masters. In the case of CBE, the assessment cut scores distinguish those who receive credit (or various levels of credit) from those who do not. Because cut scores are central to the use and interpretation of CBE assessments, test designers must also gather validity evidence to support cut-score placement. Notwithstanding, the ranks of learners should be evident in their individual marks in the report cards. A learner is either competent or not based on the following evaluation criteria or holistic scoring rubrics.

Competence evaluation criteria

From 0 to 10/20 = Not yet meeting expectation (**NYE**): CA (competence not acquired)

From 11 to 14/20 = Approaching Expectation (**AE):** CBA (competence being acquired)

From 15 to 17/20 = Meeting Expectation **(ME):** CA (competence acquired)

From 18 to 20/20 = Above Expectation (AE) : A+ (expert) Competence acquired means that the competence has been acquired for life.

Holistic scoring rubrics of attitudes are:

Exhibit the attitude without reminder: **Excellent**

Exhibit the attitude when reminder: **Satisfactory**

Exhibit the attitude when compelled to **Average**

Exhibit the attitude when he/she wants **Poor**

Teachers fill report booklets to inform their parents about the performances of their children and fill progress sheets, which are kept in school for official's uses.

In perspectives to others researches, the results of this study will be a springboard of others researchers to carry out further researches in competency-based assessment designs.

5.6 Chapter summary

This chapter has given a brief summary of the whole thesis by explaining what prompted the researcher to embark on this study. Choices of the appropriate methodology and instruments were made and justified and these are explained in the relevant chapters of the thesis. Data were presented and analyzed in chapter four and major findings were again highlighted in chapter 5. Objectives of this research were also achieved but it should be noted one finger alone could not kill a louse. With reference to this research, it means that it needs all stakeholders to work together with the same spirit, energy, zeal and 'habit of mind' to make things work. As the Ministry of Basic Education has already spearheaded initial stages to review the whole school curricula, findings and recommendations of this study could also be of great benefit to them.

It will need further research to find out what the contents of this 'new school curricula' would be and how it would be implemented. This thesis has contributed a foundation on the use of assessment activities and tools used by teachers through diagnostic, formative, continuous and summative assessment practices purposes, which primary schools' pupils viewed as contributing elements that influence the attainment of mathematics competence amongst them in the Centre region of Cameroon. Based on the interpretations of results from Section 4.4

obtained from the study, the researcher conceived a model of competency based assessment practices that seemed to not only enhance the learning of mathematical competences that encompass knowledge, skills, and abilities (KSAs) and unwanted (non-target) but also improved pupils attainment level of mathematics competence.

This thesis has also contributed to new knowledge on any missing gaps, relationships regarding challenges of competency based assessment design, and implementation and further research in these areas are recommended.

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APPENDICES

APPENDIX A: INFORMED PARENTAL CONSENT TEMPLATE FOR RESEARCH

This informed consent for parents of girls and boys participating in the research titled “competency based assessment practices and attainment of mathematics competence amongst class six pupils in the centre region of Cameroon. Research project sponsored and conducted by the researcher himself MVOGO MVOGO Ephrem, from the University of Yaoundé 1.

PART I: INFORMATION SHEET.

I am Mvogo Mvogo Ephrem a PhD student from the University of Yaoundé I. I am doing some research which might help to identify identify types of competency based assessment practices and activities as well as tools used by teachers susceptible to contribute the attainment of mathematics competence amongst class six pupils.

After you must have heard about the study, and if you agree, then the next thing I will do is to ask your daughter or son for their agreement as well. Both of you have to agree independently before I can begin.

You do not have to decide today whether or not you agree to have your child participate in this research .Before you decide, you can talk to anyone you feel comfortable with.

There may be some words that you do not understand .Please ask me to stop as we go through the information and I will take time to explain .If you have questions later, you can ask them from me or of another researched .

PURPOSE

The purpose of which is to improve the attainment of class six pupils mathematics competences.specifically based on the following objectives:

1. To investigate how diagnostics assessment practices using the competency based assessment approaches influence the attainment of mathematics competence amongst class six pupils.

2. To investigate how formative assessment practices using the competency-based assessment approaches influence the attainment of mathematics competence amongst class six pupils.

3. To investigate how continuous assessment practices using the competency-based assessment approaches influence the attainment of mathematics competence amongst class six pupils.

4. To investigate how summative assessment practices using the competency-based assessment approaches influence the attainment of mathematics competence amongst class six pupils.

TYPES OF RESEARCH INTERVENTION

The researcher has drafted the questionnaire related to the study. Class six pupils will fill sections A to E namely:

Section A: Preliminary information's of pupils (PIP)
Section B: Pupils' view on diagnostic assessment practices (PVDAP)
Section C: Pupils' view on formative assessment practices (PVFAP)
Section D: Pupils' view on continuous assessment practices (PVCAP)
Section E: Pupils' view on summative assessment practices (PSDAP)

In each of the section, pupils have clear instructions how to answer the questions, a tick I is place in the night box corresponding what a particular pupil considers the appropriate answer. Each of the statements describes how competency-based assessment practices under various variables that the researcher seemed very crucial for pupils to grade them as from the 4 Likert's scale which Strongly Agree(S.A)=4 points for a student ; Agree (A) =3 points; Disagree(D) =2 points and Strongly Disagree=1Point.

VOLUNTARY PARTICIPATION

You do not have to agree that your daughter/son can answer the questionnaire if you are not willing. You can choose to say no and any of you and your family do not have any problem even if the school is one related to any member of my family or relatives you may ask as many questions as you like and we take the time to answer them. You do not have to decide today .You can think about it and tell me what you decide later.

PROCEDURE

Your daughter/son will find out a questionnaire either, which will be presented by the researcher himself or the head teacher /class six teachers your child depending where he/she is schooling. After been filled they will still be responsible to hand them to the researcher 3 days latter .Where there is any ambiguity they will explain to you and you are free to ask questions where ever there is a word you do not understand or embarrassed it. If your daughter/son does not wish to answer some of the questions included in the questionnaire, she/he may skip them and move on to the next question. The information recorded is confidential. It is recommended that, your child should not sign or write his/her name anywhere on the questionnaire. The questionnaire will be destroyed after exploited for about 3 months later.

DURATION

We are asking your child to participate in answering the questionnaire, which will take about 1h30 hours, although, we are asking for about 2 hours of his/her time. The fact that, the researcher has many schools , either the head teachers or class teachers of concerned will receive a working session with the researcher and guide them how they will equally guide pupils when filling them .

RISKS AND DISCOMFORTS

There is risk that if you share some personal or confidential information to anybody or your teacher you will feel very uncomfortable with him/her especially if the teacher discovers that you have appreciated their inadequacy of assessment activities of teachers, he will certainly hates you. This inconvenient situation can rather increase disliking Mathematics since the teacher might frustrate you with poor relationship. In respect to avoid such a situation, complete and submit your questionnaire to the researcher or the head teacher of the school without writing your name any way.

BENEFITS

This study will permit pupils to develop their critical thinking as they will discover much how competency based assessment practices are conceptualized in context. They are given free opportunity to assess their teachers too in quest to endeavor teachers ameliorate some of the assessment practices variables if taken in consideration will benefit pupils in the sense that, they will improve on their attainment of mathematics competence and hence increase on academics and mathematics competence. Parents will equally benefit much due to the fact that, economically they will no longer waste resources unnecessary since there is both qualitative and quantities' school successes.

At the nation’s level it matches with government policy, which entails that repeat rates, should be reduced largely and by 2035. Cameroon should be an emergent nation therefore Sciences ,Technology, Engineering and Mathematics(STEM) education should be encouraged by the state for the eventual rapid growth of the industrial ,technological scientifically and economically development sectors. The key subject to study these fields of studies is Mathematics so; Cameroonian labor should rely by them instead of relying on experts from abroad. Having a greater number of students passing this subject at Advanced Level it opens doors to many students at the tertiary level to attain gradually the ambitions.

REIMBURSEMENT

Your daughter/son will not be provided by any payment to take part in the research. However, she/he will be praised and thanked very much for their precious time lost to answer questions.

CONFIDENTIALITY

We will not share information about your Son/daughter outside the research team. The information that we collect from this researcher project will be put away and no one but the researcher will be able to see it. Any information about your child will have a number on it instead of his/her name. Only the researcher will know what his/her number and we will lock that information up with a lock and keep. It will not be shared with or given to any person.

SHARING OF RESEARCH FINDINGS

At the end of the study, the researcher will meet first the participants and then with the larger community. Nothing that your child will tell you today will be shared with anybody outside the research team, and nothing will be attributed to him/her by name. A written report will also be given to the participants, which they can share with their families. The researcher will also publish the results in order that other interested people may learn from the research.

RIGTH TO REFUSE OR WITHDRAW

You may choose not to have your child participate in this study and your child does not have to take part in this research if she/ he does not wish to do so choosing to participate or not will not affect either you or your child in any circumstances. Your child may stop answering the questionnaire at any time that you or she/he wish without either of you losing any of your rights here.

WHO TO CONTACT

If you have any questions, you may ask them now or later, even after the study has started. If you wish to ask questions later, you may contact any of the following Mvogo Mvogo Ephrem, Phd student, University of Yaoundé 1, Tel: 670106108 e-mail: mvogomvogoephrem859@ gmail.com

CERTIFICATE OF CONSENT

I have been asked to give consent for my daughter/son to participate in this research study, which will involve her/him completing one questionnaire. I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntary for my child to participate as a participant in this study.

Print Name of Parent or Guardian---------------------------------

Signature of Parent or Guardian----------------------------------

Date---

Day/month/year.

If illiterate

I have witnessed the accurate reading of the consent form to the parent of the potential participant, and the individual has had the opportunity to ask question. I confirm that the individual has given consent freely.

Print name of witness--------------------------

And Thumb Print of participant

Signature of witness----------------------------

Date---

Day/month/year.

Statement by the researcher/ Person taking consent

I have accurately read out the information sheet to the parent of the potential participant and to the best of my ability made sure that the person understands the following will be done:

1-

2-

I confirm that the parent was given an opportunity to ask questions about the study, and all the questions asked by him/her have been answered correctly and to the best of my ability. I confirm that the individual has not been covered into giving consent, and the consent has been given freely and voluntarily.

A copy of this informed consent form has been provided to the parent or guardian of the participant-

Print name of Researcher/ Person taking the consent---

An informed Assent Form Will-----------------------or will not--------------------------------------- be completed.

APPENDIX B: CLASS SIX PUPILS' QUESTIONNAIRE

SCHOOL CODE: ....

UNIVERSITY OF YAOUNDÉ 1 : DEPARTMENT OF CURRICULUM AND EVALUATION

CLASS SIX PUPILS' QUESTIONNAIRE

Preamble

The purpose of this questionnaire is to find out from you, the class six pupils, your opinions or views about the Competency based Assessment Practices your teachers practice in the classroom in respect to the attainment of your mathematics competence. The results of the study will advance our understanding of both teachers and class six pupils' competence based assessment practices. We would be very grateful if you could spare a few minutes of your precious time to kindly complete the questionnaire below. The information you provide will be treated with the confidentiality and anonymity it deserves. No names of schools and persons are to be revealed. Ask if you do not understand any terms used in this questionnaire. Thank you.

Section A: Preliminary information's of pupils (PIP)

Please read and put a cross (×) in the right box and write when necessary.

1- Sector belonging to your school

Government /public ☐ confessional/missions schools ☐ lay private ☐

2- Division located the school Mfoundi ☐ Lekié ☐

3- Precise the Subdivision……………………………………………………

Date of administration of the questionnaire…………………………………………………

SECTION B : Pupils' view on diagnostic assessment practices (PVDAP).

This part of the questionnaire asks questions about the way you perceive how individual teachers use competence based assessment practices in a typical classroom. You should answer each question according to the degree your opinion abides to in placing a cross (X) mark only one of the four Likert scales below. Strongly Agree (S.A)=4 ;Agree (A)=3 ; Disagree(D)=2; Strongly Disagree(S.D)=1.

S/N	Statements	S.A	A	D	S.D
1	- He asks oral questions to check pupil's mathematics prior knowledge.				
2	- He reviews some lower skills/ competences through either multiple-choice questions (MCQ) or true and false (T/F) tasks				
3	- He gives oral feedback to pupil's responses.				
4	- He corrects pupils' persistent errors constantly.				
5	- He plan remedial works in areas of mathematics pupils face difficulties.				

Section C: Pupils views on formative assessment practices (PVFAP)

S/N	Statements	S.A	A	D	S.D
1	- He organizes integration activities that reflect communicated mathematics competence based statement with criteria success.				
2	- He uses individual attitudinal questionnaire to assess pupils' behavior.				
3	- He mobilizes pupils to correct group homework (self and peer assessments).				
4	- He marks and comments individual pupils' mathematics exercise books assignment.				
5	- He organizes remedial classes where pupils faced learning difficulties when correcting their books.				

Section D: Pupil's views on continuous assessment practices (PVCAP).

S/N	Statements	S.A	A	D	S.D
1	- He respects monthly mathematics competency written tests calendar.				
2	- He observes pupils 'attitude during drawing				

	practices workshops and awards marks.				
3	- He involves pupils in the selection of assessment criteria.				
4	- He encourages mathematics' high achievers pupils to assist low achievers.				
5	- He adds continuous assessment's marks quota to the final mathematics competency evaluation at the end of term.				

Section E: Pupil's views on summative assessment practices (PVSAP).

S/N	Statements	S.A	A	D	S.D
1	He uses real life situations or complex integration situations.				
2	- He uses Standardized and objectives types of questions in end of term evaluation				
3	- He attributes marks to projects presentated by pupils				
4	- He attributes marks quota on pupils' mathematics practical activities (Portfolios)				
5	- He keeps pupils' progress report sheets for official's uses.				

Part two: Mathematics Competency Test battery see appendix C.

APPENDIX C : MATHEMATICS COMPETENCY TEST FOR CLASS SIX PUPILS

School:	***Sub division:***
Date Administered:	***Administered by:***
Date Corrected :	***Date Analysed:***

Name of pupil:	
	AGE:

Instructions: answer the following questions and show working where possible in the space provided

Question 1

(a) **Calculate** (a) 26 + 15 **Answer (a)** ___________________ (1)

(b) 38 X 5 **Answer (b)** ___________________ (1)

(c) 67 – 38 **Answer (c)** ___________________ (1)

(b)

(i) Find the number that is **15** bigger than **32**.	Answer: (2)
(ii) Increase **56** by **11**.	Answer: (2)
(iii) Decrease **250** by **135**	Answer: (2)
(iv) Find a number that is **4 *times bigger*** than **15**	Answer: (2)

Question 2

(a) Calculate (i) 3×5 (ii) $6\times(3+2)$ (iii) $3+2\times3$

Answer (i) ______ Answer (b) _______ Answer (c) ________ (3)

(b)

(i) Add 2.31 and 1.59 ....(2)

(ii) From 10.23 take 5.55 ....(2)

(iii) Double 1.24 ....(2)

Answer (i)______ Answer (ii)_______ Answer (iii) _______

Question 3

Look at the list of numbers given below

From the list, choose:

(a) An odd number	**Answer**: (1)
(b) A prime number	**Answer**:

	(1)
(c) A number that is 13 bigger than 12	**Answer**: (1)
(d) A number that is divisible by 7	**Answer**: (1)

Question 4

(i)Starting with the smallest, place the following fractions in order of size (2)

$\frac{2}{3}$ $\frac{5}{8}$ $\frac{4}{5}$ $\frac{7}{8}$

(ii) A baker uses $\frac{2}{3}$ of a bag of flour to make 6 big bread.

How many bags of flour will he need to make 48 of such bread? (2)

(iii)

Shade in $\frac{3}{5}$ of the rectangle shown above (1)

(iii) What fraction of the rectangle has not been shaded?
Answer________________(2)

(iv) What percentage of the rectangle above has not been shaded?
Answer________________(2)

Question 5

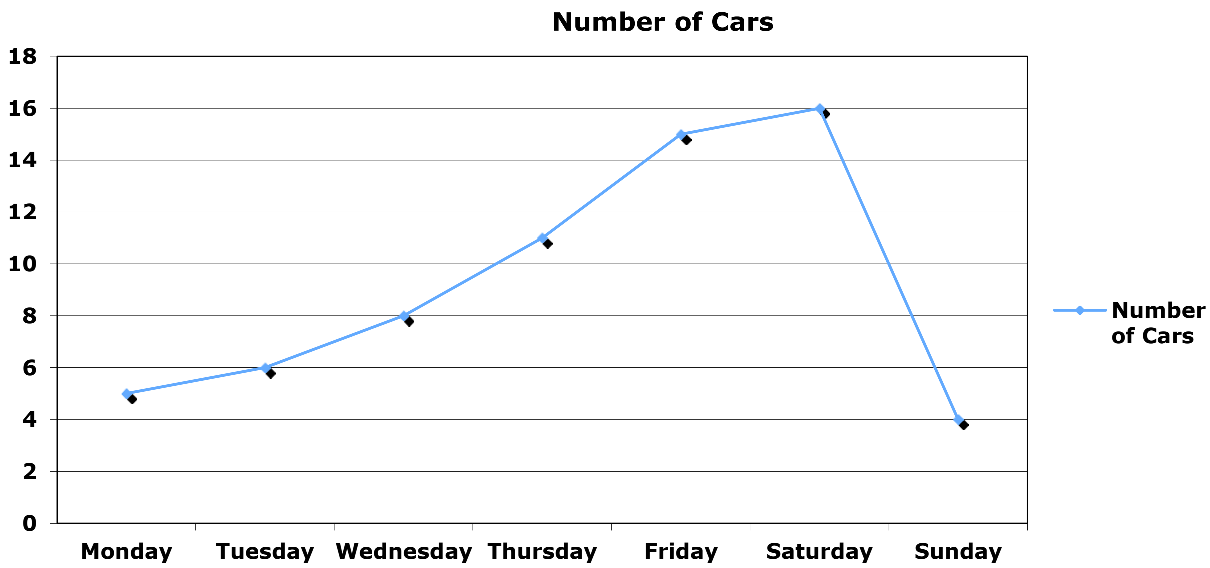
(a) Calculate (i) $\frac{1}{4}+\frac{2}{5}$ (ii) $\frac{5}{6}-\frac{1}{12}$ (iii) $\frac{3}{4}\times\frac{5}{6}$

Answer (i) _______________ **Answer** (ii) ________________

Answer (iii) _______________ (6)

Question 6

The graph below shows the number of cars parked in a car park on each day of the week in a small town.



(a) How many cars were parked in the car park on Friday?

Answer ____________________________ (1)

(b) On which day of the week were fewest cars parked in the car park?

Answer :______________________________ (1)

(c) Find the total number of cars parked in the car park during the week.

Answer :______________________________ (1)

Question 7

(a)

From the table below select the metric unit that would be most useful for measuring:

(i) the capacity of a car's petrol tank,

(ii) the weight of an elephant,

(iii) The distance from Yaoundé to Douala,

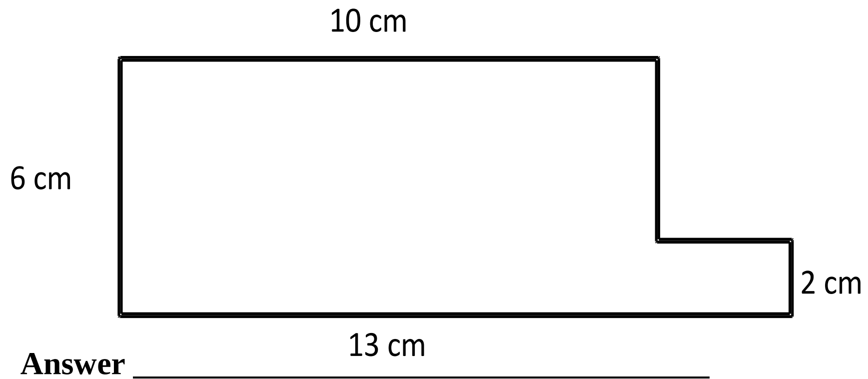
(iv) The length of a mouse's tail,

(v) the weight of a bag of sugar (5)

Centimeter (cm)	Kilogram(kg)	Litre (l)	Tonne (t)	Kilometer(km)

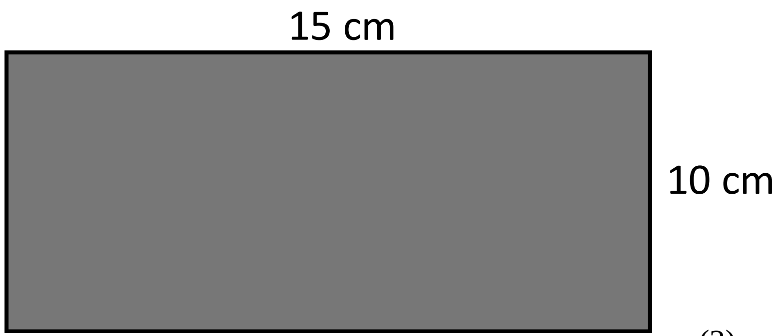
(b)

(i) Find the perimeter of this shape.



Answer ____ (2)

(ii) Find the area of the rectangle shown below.

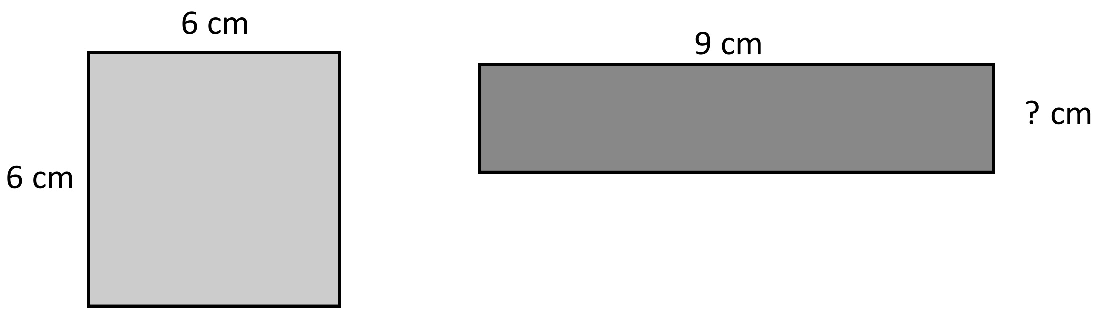


Answer ____ (2)

(c)

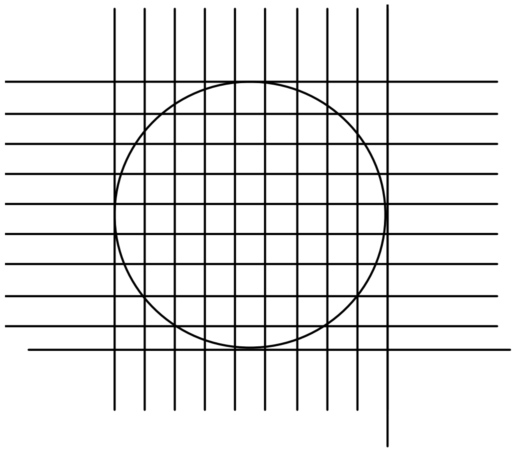
(i) The two shapes shown have the same area, find the missing measurement

Answer ____________ (2)



(ii) A circle is drawn on a square grid.

Each square on the grid has area 1 cm^2. Estimate the area of the circle to the nearest cm^2



Answer ________________________ (2)

REAL LIFE SITUATION

In the celebration of a school, Christmas holiday feast, the head teacher of the school has a preparatory PTA meeting with parents. Each parent was to contribute 1500 F CFA for a child. The school has a population of 145 girls and 125 boys. At the end of the feast, both parents and pupils will be entertained. The head teacher has decided to give a bottle of beer and a sandwich to each parent while pupils will receive biscuits and a bottle of sweet drink.

Instructions: respond to the following tasks and marks will be based according to the following criteria:

ORAL PART: explain whether if the items to be bought by the head teacher will be sufficient in case only half of the pupils' population pay the contribution.

-appropriate vocabulary 7 marks;

-logical thinking 8 marks;

WRITTEN PART: -correctness of formula 5 marks;

- correct choice of operations 5 marks;

-correctness of answers 5 marks;

TASK 1

Calculate the amount of money parents contributed given that; there were 220 of them. (3 MARKS)

TASK 2

Estimate the expenditures made by the head teacher given the fact that one bottle of beer cost 650 F, a sandwich for 350 F, a bottle sweet drink costs 250 F , a packet of biscuit costs 125F and Music for animation 15000 F. (9 marks)

TASK 3

Determine the balance of parents' contributions. (3 marks)

PRACTICAL PART: - respect of instructions (2 marks)

- Correctness of the procedures (3 marks)
- Respect of the norms (5 marks)

TASK 4

Draw the set of boys and girls in a veen diagram.

ATTITUDE PART:- cleanliness of the work (1mark)

- Group work spirit (2 marks)
- Creativity spirit (2 marks)

APPENDIX D : MARKING GUIDE OF MATHEMATICS COMPETENCY TEST

Criteria / Questions No	Correct choice of operations	Correctness of answers	Total marks
1a	/	1	1
1b	/	1	1
1c	/	1	1
bi	1	1	2
bii	1	1	2
biii	1	1	2
biv	1	1	2
2ai	/	1	1
2aii	/	1	1
2aiii	/	1	1
2bi	1	1	2
2bii	1	1	2
2biii	1	1	2
3a	/	1	1
3b	/	1	1
3c	/	1	1
3d	/	1	1
4i	1	1	2
4ii	1	1	2
4iii	/	1	1
4iv	1	1	2
4v	1	1	2
5i	1	1	2
5ii	1	1	2
5iii	1	1	2
6a	/	1	1
6b	/	1	1
6c	/	1	1
7ai	/	1	1
7aii	/	1	1
7aiii	/	1	1
7aiv	/	1	1
7av	/	1	1
7bi	1	1	2
7bii	1	1	2
7ci	1	1	2
7cii	1	1	2
Total :1	18	37	55

APPENDIX E : MARKING GUIDE FOR THE REAL-LIFE SITUATION

Criteria / Tasks No	Appropriate Vocabulary	Logical Thinking	Correct of formulae	Correct choice of operations	Correctness of answers	Total marks
Oral task	5	5	2	1	2	15
1	/	/	1	1	1	3
2	2	3	1	2	1	9
3	1	/	/	1	1	3
Respect of instructions for T4	/	/	/	/	/	2
Respect of the norms for T4	/	/	/	/	/	5
Correctness of procedures for T4	/	/	/	/	/	3
Cleanliness of the work	/	/	/	/	/	1
Group wok spirit	/	/	/	/	/	2
creativity	/	/	/	/	/	2
Total :2	7	8	5	5	5	45
Total score mathematics competency test						100 marks