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THE USE OF DIGITAL LEARNING REPOSITORIES AND ITS IMPACT ON STUDENTS' ENGAGEMENT AND SATISFACTION IN SELECTED PUBLIC SECONDARY SCHOOLS IN MFOUNDI DIVISION

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LIST OF ABBREVIATION

ARCS	:	Attention, Relevance, Confidence, and Satisfaction
ASTI	:	Advance School of Translation Interpretation
AVU	:	African Virtual University
CD-ROM	:	Compact Disk – Rip only Memory
CIS	:	Computer and Internet – efficacy
CMP	:	Classroom Management Platform
CMS	:	Course Management System
CoI	:	Community of Inquiry
DLM	:	Digital Learning Education
DLP	:	Digital learning Platforms
DVD	:	Digital Video Disk
HCI	:	Human Computer Interaction
ICT	:	Information Communication Technology
IT	:	Information Technology
LCMS	:	Learning Content Management Systems
LDS	:	Learning Destination Sites
LDS	:	Learning Digital System
LME	:	Learning Management Ecosystems
LMS	:	Learning Management System
MOOCS	:	Massive Open Online Courses
NCES	:	National Centre for Education Statistic
NSSE	:	National Survey of Student Engagement
OCS	:	Online Communication Self-efficacy
OLRS	:	Learners Readiness Toward Online Learning
OSE	:	Online Student Engagement
RETRIDAL	:	Research Institute for Open Online Learning
SASSE	:	South African Survey of Student Engagement
SDT	:	Self Determination Theory
SPSS	:	Statistical Package for Social Sciences
TEL	:	Technology Enhance Learning
UNESCO	:	United Nation Education and Culture Organization
UVL	:	Video Based Learning
VLE	:	Virtual Learning Environment
WBL	:	Web Based Learning
WWW	:	World Wide Web

ABSTRACT

The purpose of this study is to examine the use of Digital L earning repository (DLR) and it impact on students' engagement and satisfaction in some selected public secondary schools in Mfoundi Division. This study was guided by three (3) research objectives which focuses on student engagement, and students' satisfaction and the mediating effect among the two constructs (satisfaction and engagement in the use of DLR). The study used a descriptive survey design, the accessible population of this study was drawn from seven (07) government bilingual high schools from the seven subdivisions of Mfoundi where students of the English sub-system of education were targeted. The researcher, therefore, had access to 315 students drawn from the seven (07) government bilingual high schools in Mfoundi division.

The researcher also used two main sampling technics which were the probability and the non-probability technics as a self- administered questionnaire were used to capture the views of students on the use of DLR. The correlation, simple linear regression as well as the statistically more advanced method of Structural Equation Modelling (SEM) was used to analyse data collected from the field. Data analysis proved that a significant relationship exists between use of digital learning on student's engagement and satisfaction. The study found that digital learning repository is a strong determinant of student's engagement and satisfaction. In terms of mediating effect there is a strong mediating effect between student's satisfaction and the use of digital learning repository and student's engagement. Hence effective students' satisfaction will enhance effective students' engagement in the use of digital learning repository. Thus, the study concludes that a well design digital learning repository will lead to an effective student engagement through satisfaction.

Keywords: Digital Learning Repositories, Student Engagement, Student Satisfaction, Interaction, E-Learning

RESUME

Le but de cette étude est d'examiner l'utilisation de la repository d'apprentissage numérique (DLP) et son impact sur l'engagement et la satisfaction des élèves dans certaines écoles secondaires publiques sélectionnées du département du Mfoundi. Cette étude a été guidée par trois (3) objectifs de recherche qui se concentrent sur le DLR et l'engagement des étudiants, le DLR et la satisfaction des étudiants et l'effet médiateur entre les deux construits (satisfaction et engagement dans l'utilisation du DLR). L'étude a utilisé un plan d'enquête descriptif, la population accessible de cette étude a été tirée de sept (07) lycées publics bilingues des sept arrondissements du Mfoundi où étaient ciblés les élèves du sous-système d'enseignement anglophone. Le chercheur a donc eu accès à 315 élèves issus des sept (07) lycées publics bilingues du département du Mfoundi. Le chercheur a également utilisé deux techniques d'échantillonnage principales, à savoir les techniques probabilistes et non probabilistes, car un questionnaire auto-administré a été utilisé pour recueillir les opinions des étudiants sur l'utilisation du DLR. La corrélation, la régression linéaire simple ainsi que la méthode statistiquement plus avancée de modélisation par équation structurelle (SEM) ont été utilisées pour analyser les données recueillies sur le terrain. L'analyse des données a prouvé qu'il existe une relation significative entre l'utilisation de l'apprentissage numérique sur l'engagement et la satisfaction des étudiants. L'étude a révélé que la plate-forme d'apprentissage numérique est un déterminant important de l'engagement et de la satisfaction des étudiants. En termes d'effet médiateur, il existe un fort effet médiateur entre la satisfaction des étudiants et l'utilisation de la plateforme d'apprentissage numérique et l'engagement des étudiants. Par conséquent, la satisfaction efficace des étudiants renforcera l'engagement efficace des étudiants dans l'utilisation de la plate-forme d'apprentissage numérique. Ainsi, l'étude conclut qu'une plateforme d'apprentissage numérique bien conçue conduira à un engagement efficace des étudiants grâce à la satisfaction.

CHAPTER ONE

INTRODUCTION

Today, we live in a knowledge society where many countries have invested in Digital Learning Education (DLE). Digital learning constitutes an essential foundation for learning and will improve learning outcomes (Chen & Jang, 2010; Giesbers et al., 2013), improve learners IT skills (Håkansson-Lindqvist, 2015; Skryabin et al., 2015) and programming skills (Williamson et al., 2018) which is critical in modern society and will lead to rebooting economy (European Commission, 2014). Before digital learning repository were implemented in schools, students attended lessons in learning environments that did not employ digital technologies. With the expansion of digital learning repository, online learning has become available to the masses (Downes & Bishop, 2012; Guðmundsdóttir et al., 2014). Today, digital expansion has affected education in ways yet unparalleled. The digitalization of education includes laptops, Internet access and learning management systems (LMS), which today are commonplace in most schools in the Western world (Balanskat, Bannister, Hertz, Sigillò, & Vuorikari, 2013; Duval, Sharples, & Sutherland, 2017; Lonka, 2015). Digital learning has been defined as the "thoughtful integration of classroom learning experiences to online learning experiences" (Garrison & Kanuka, 2004). Some researchers take a more systematic approach and address digital learning. Digital learning combines instruction with computer-mediated instruction (Graham, 2006). It includes the spatiotemporal oral flexibility of technology-mediated learning: "Taking the best from self-paced, instructor-led, online and classroom delivery to achieve flexible, cost-effective training that can reach the widest audience geographically and in terms of learning styles and levels" (Marsh, 2001).

Digital Learning repository (DLRs) constitute comprehensive bundles of IT capabilities such as machine learning, artificial intelligence, data mining, and gamification that enable Andriessen, Tseng, & Huang, 2011; Tiwana & Ramesh, 2001). The ongoing coronavirus disease of 2019 (COVID-19) pandemic has highlighted the importance of Digital Learning repository as most institutions have transitioned to online learning and talent development functions. Digital Learning repository have increased globally in the last few years (Furió, Juan, Seguí, & Vivó, 2015). Digital Learning platform offer functionalities such as self-adapting computer simulations, game-based learning, and Massive Open Online Courses (MOOCs)

(Chauhan, 2017; Cidral, Oliveira, De Felice, & Aparicio, 2018). Contemporary Digital Learning Platforms use these functionalities to deliver a collaborative, individualized, and participatory e-learning experience (de Koning-Veenstra, Steenbeek, van Dijk, & van Geert, 2014). The growth of the World Wide Web (WWW) and the Internet of things (IoT) has enabled Digital Learning repository service providers to offer learning experiences globally via smartphones, laptops, and tablets. The pandemic disease of 2019 (COVID-19) has also elevated the use of Digital Learning repository from a viable learning alternative to mainstream learning and training management systems.

Graham categorizes the quality of digital learning platforms as either enabling, enhancing or transforming, depending on the extent to which the technologies are allowed to alter the conditions for learning (Graham, 2006). Enabling learning is described as technologies enabling students to access information and convenience. Enhancing learning changes the conditions for learning by, for example, facilitating multiple simultaneous conversations. Finally, transforming learning would mean radical pedagogical transformation. We might imagine these as, for instance, personalization of education in terms of pace, place and time through flexible study hours/flexible choices of courses across schools, or reduced in-school hours through technology-mediated delivery, instruction and participation. According to Graham (2012), classrooms in which students utilize laptops and learning platforms then fall under the second level of Technology-Enhanced Learning (TEL). The levels of acceptance and expectations are likely to change with new innovative technologies, alongside the access, uptake and integration of digital technologies in everyday life. The line between enhancing and transforming is not static; rather, it is a subjective cultural interpretation (Bonk & Graham, 2012).

The learning platform is a way of structuring the instruction that fosters optimal organization of content and interaction with students, and most schools around the world use it, especially in the past few years due to the outbreak of COVID-19 (Almarashdeh , 2016; Gomez, 2016). Teaching must take advantage of virtual environments (Moreira, Henriques, Goulão & Barros, 2017; Ju- Yin & Yen-Chen, 2016; Marin, Sampedro, & Vega, 2017) and adapting the discourse to the uniqueness of the virtual environment's complexity. Learning platforms have been presented as virtual scenarios that promote educational innovation and professional development (Prendes & Gutierrez, 2013, Sáez, Dominguez, Ruiz & Belando, 2014), more focused on the model of educational personalization, with emphasis on cooperation. The learning platform in online education must be adapted to the knowledge and practices of virtual

environments, promoting usefulness (Moreno, Cavazotte & Alves, 2017), autonomous learning (Cho, 2011, Zhu, Au & Yates, 2016), and interaction with teachers throughout learning tasks and communication tools (Ma, Han, Yang & Cheng, 2015; Gharmallah, 2017). The teaching-learning process mediated by the digital learning platform includes substantial diversity of educational components to the communicative act: masterclass, knowledge presentation and questioning (Medina, Sánchez & Campos 2014).

Background of the Study

The background of this study will focus on Historical Background, Contextual Background, Conceptual Background and Theoretical Background

Historical Background

Wong (2020) describes a digital learning platform as an educational tool that occurs on the internet, whether synchronously or asynchronously. Scholars conceptualize digital learning as e-learning/online teaching/blended learning/remote learning/online education (Adarkwah, 2020; Aguilera-Hermida, 2020). Digital learning platforms are not a new instruction approach (De Freitas, Morgan, & Gibson, 2015). Paul & Jefferson (2019) reports that the earliest digital education program began in the mid-1800s at the University of London. In 1873, the "Society to Encourage Home Studies" was established in Boston, Massachusetts, as the first official correspondence school in the United States of America. The World Wide Web (WWW) was unveiled in 1991, and the University of Phoenix became one of the pioneers in online education (Kentnor, 2015).

Early online instruction mode started in 1994 and was followed up with content and learning management systems, including WebCT, Blackboard, and Moon line learning. However, De Freitas et al. (2015) report that these virtual learning platforms were not pedagogically driven tools but served as depositories for digital content. The earliest learning platform totally different from the traditional face-to-face modality of instruction was Fathom.com which was first initiated in 2000 and led by Columbia University. Yet, it faced technical issues such as broadband connectivity, and instructors lacked the motivation for pedagogical change. Hence, its establishment as a learning tool worldwide was hindered.

In Sub-Saharan Africa, the World Bank, in its quest to advance cyber education established the first online university in 1996 (Kotouaa, Ilkan, & Kilic, 2015). The university had its headquarters in Kenya but was established in Ethiopia together with six other African countries, including Kenya, Ghana, Zimbabwe, and Uganda. The University of Kenyatta operates this online university. The mode of delivery was through satellite broadcast in the form of videos, MPEG 4, and email conversations between lecturers and students. The principal objective of this online university was to enhance the quality of education in Africa (Kotouaa, Ilkan, & Kilic, 2015). The university targeted secondary school leavers and the working class who could not enter the university because of limited spaces. The only fully online universities in Sub-Saharan Africa are the African Virtual University (AVU), Kenyatta Digital School of Virtual Learning, and the University of Rwanda e-learning platform (Kotouaa, Ilkan, & Kilic, 2015). However, Sub-Saharan Africa faces insurmountable challenges ensuring the massification of online learning and cannot achieve participation rates like in Europe and North America (Trines, 2018).

Oyediran et al. (2020) stated that COVID-19 led to a drastic global change in the educational sector, leading to schools adopting different ways of teaching. (Muftahu, 2020). In Sub-Saharan Africa, the COVID-19 pandemic led to the closure of schools. Most educational institutions in Africa joined the league of developed countries by migrating to the online modality of instruction to ensure lifelong education (Adarkwah, 2020; Agormedah, Henaku, Ayite, & Ansah, 2020). Thus, COVID-19 stimulated the appetite of most African institutions to come up with educational innovations to counteract the disruption in education (Mukute, Francis, Burt, & Ben, 2020). Diverse delivery of instruction was adopted, including Web-Based Learning (WBL), e-learning platforms, CD-ROMS, television, radio, emails, and SMS services (Azu, Adegboye, & Quadri, 2020; Mulenga & Marbán, 2020; Tadesse & Muluye, 2020). According to Tadesse & Muluye (2020), only 11% of countries in Sub-Saharan Africa provided solely online learning mode of instruction, while 23% of countries provided a blend of broadcast and online learning. In some countries, instruction is delivered using social media applications like Facebook, Skype, WhatsApp, YouTube and Webchat (Sintema E. J., 2020; Tadesse & Muluye, 2020).

In the last two years, many African countries have embarked on new initiatives to integrate learning technology into education and training. As technologies become more accessible, most developing countries have moved further towards online and online education provisions to satisfy learners' desire for lifelong learning to achieve a fulfilled life (Quadri, 2020). Kanwar

(2013) perceives Africa as the most dynamic e-Learning market on the planet. Acknowledging the potential of online education, the Government of Cameroon recommends that "to lighten training based on physical presence, innovative approaches such as online learning or hybrid education (like the recently developed Virtual University in Yaounde) will be encouraged" (Cameroon's Education and Training Sector Strategy Paper, 2013).

Contextual Background

Cameroon began efforts to introduce a digital learning repository over four decades ago. It was only in 1995 that the idea of incorporating it into the broad education policy was discussed during the national forum on education in Cameroon (Peku, 1998). In response to the recommendations of the 1995 forum on education, a law was promulgated in 1998 to lay down guidelines for the provision of education in Cameroon, and online learning was prescribed as one mode of education delivery (Law No. 98/004, 14 April 1998, Section 23, Article 2). That same year Commonwealth of Learning financed a baseline study on the state of online learning in Cameroon as a response to a request made by the Ministry of National Education (Peku, 1998). The study reported that attempts were made to use online learning in Cameroon's educational system between 1967 and 1994 to address the problem of falling standards of education largely blamed on the lack of qualified teachers and access to education at all levels (Peku, 1998). The programme, which targeted both qualified and unqualified teachers, sought to upgrade them professionally. The study observed that the programme failed mainly because of poor funding and the non-availability of appropriate learning materials (Peku, 1998).

Similarly, in 2001, a law providing guidelines on higher education in Cameroon was enacted, and online learning was envisaged in one of the articles (Law No. 005, 16 April 2001, Article 11:4). The inclusion of a section in each of the laws recognizing online learning as an alternative form of learning was a major milestone. It means that any initiative aimed at developing online learning has a legal framework on which to take off. Online learning has its legal backing in the laws, providing guidelines for education in Cameroon. Its effective implementation requires a detailed procedure on how the entire process will function and how it fits into national development goals (Nyerere, 2012).

In 2008, the Commonwealth of Learning commissioned work with the focal points in the Ministries of Education, the National Agency for Information and Communication Technology,

and the universities to draft a policy specifying the conditions and structures for the effective implementation of online learning in Cameroon (Gravenir, & Mse, 2012). The drafting exercise was successfully carried out, and the final draft was forwarded to the Presidency of the Republic through the Prime Minister's office for consideration and signature. The enacted copy is still awaited, although some universities have kick-started online learning delivery (UNESCO Institute of Statistics, 2016).

From the literature review, it emerged that while the uptake of online learning has been slow in Cameroon, capacity-building initiatives have been ongoing. Commonwealth of Learning has been at the forefront of capacity-building initiatives in Cameroon. Commonwealth of Learning, in collaboration with the Research Institute for Open and Online Learning (RETRIDAL) of the National Open University of Nigeria, organized training workshops for university staff and Ministries of Education officials (UNESCO, 2016). The workshops organized at the University of Buea in 2005 and 2006 brought together 85 staff from the Faculty of Education-University of Buea; Advanced School of Translation and Interpretation (ASTI) Buea; and the Universities of Yaounde 1, Douala and Dschang (Alemnge, 2015, Gangopadhyay, 2010). The workshop programme focused on the aspects of digital learning platforms, such as course writing and logistics for online education, with emphasis on the online learning concepts and instructional design; principles and strategies of course writing; course delivery and monitoring; and supporting and assessing online learners. In 2007, the Commonwealth of Learning, in collaboration with Research Institute for Open Online Learning (RETRIDAL), organized a regional workshop at Printania Hotel, Yaounde. The workshop brought together 19 delegates from the Ministries of Education in Cameroon, Ghana, Nigeria and Sierra Leon. The training focused on an eLearning strategy and implementation model (Gangopadhyay, 2010).

The most efficient online education programme in the country was offered by the Faculty of Agronomic Sciences, University of Dschang (Gangopadhyay, 2010). The faculty offered diploma programmes through online learning. The management and organization of the programme were similar to that of any programme in most developing countries of Sub-Saharan Africa (Gangopadhyay, 2010). Apart from these formal programmes, other informal short-term programmes were meant to achieve specific national goals. The major recommendation of the baseline study was the creation of a National Technical Committee to draw up an action plan to roll out online learning in the country (Ng'ambi, 2013; Ng'ambi, Brown, Bozalek, Gachago, & Wood, 2016).

Conceptual Background

Digital learning repository

(Abu Shawar, 2009). Today, Learning Management Systems have become an integral component of most schools' educational systems, and interest is increasing in hybrid approaches that blend in class and online activities (Pishva et al., 2010). Digital learning platforms are not intended to replace the traditional classroom setting, but their main role is to supplement the traditional lecture with course content that can be accessed from the Internet (Landry et al., 2006). Digital learning that takes place partially or entirely over the Internet" (U.S. Department of Education, 2010). Online learning is appealing to many learners and is becoming more commonplace in elementary schools to high school and post-secondary education settings.

Digital learning platforms can also be called Learning Content Management Systems (LCMS). It can also be a virtual classroom tool or a Virtual Learning Environment (VLE) (Parker; Van Alstyne; Choudary, 2016). While each platform varies in function and features, all digital learning platforms can support all types of learning, i.e., online, classroom, and blended learning (Altbach; Knight, 2007). With the Internet and digital technology becoming an integral aspect of our lives, education has gone online, mandating specialized technology solutions to support online learning. Information Communication Technology (ICT) allows providers to offer academic programs through digital learning platforms, known by the term e-learning (Altbach; Knight, 2007). E-learning is a web-based learning ecosystem that integrates multiple stakeholders with technology and processes. The use of digital learning platforms has expanded rapidly worldwide as it offers people a flexible and personalized way to learn and enables low-cost on-demand learning (Literat, 2015).

Online learning / E-Learning

E-learning refers to the usage of information and communication technology to develop web-based, computer, digital, or online learning (McDonald et al., 2018). Singh and Thurman's (2019) reviewed the terms' online education' and 'online learning' and reviewed all publications that defined the word from 1988 to 2018. Moreover, they described 'online education' as education that uses the Internet for teaching and learning in an online setting. Teachers create synchronous or asynchronous instructional modules to boost learning and engagement, and the information is provided online.

Online learning is coined as "learning experiences in synchronous or asynchronous settings through various applications such as smartphones, laptops, etc., with internet access". Students can be at any place (independently) to study and interact with instructors and other students in such settings. Online learning is an instrument that could create the teaching and learning process more advanced, student-centred, and flexible (Singh and Thurman, 2019). It is also being treated as a valued instrument for learning, flexibility, cost efficiency, and the option of delivering outstanding education (Almahasees et al., 2021). Moreover, online learning has critical benefits such as self-learning, inexpensive, ease, and suppleness. Besides, online learning has become a slice of the modern world since it utilizes online platforms (Almahasees et al., 2021).

In the era of the knowledge-based economy, owing to the sustainable development of information and network as well as the popularization of computers, e-learning has changed the way learners communicate, interact, and behave and their cognition of learning (Almahasees et al., 2021). E-learning can keep working beyond the limitation of time, space, and location, which facilitates knowledge sharing between learners and teachers, thus gaining increasing numbers of applications in the field of education and having a profound impact on the development of education (Emran & Shaalan, 2014). This large-scale, open online teaching method has been developing rapidly all over the world, playing a major role in sharing educational resources and promoting educational equity (Tenório et al., 2016).

Student Engagement

Student engagement refers to the effort the learner makes to promote his or her psychological commitment to stay engaged in the learning process to acquire knowledge and build his or her critical thinking (Dixson, 2015). It is also associated with the learner's feeling of personal motivation in the course, which keeps the individual acting in order to interact with the course contents, tutors and peers, respectively. Student engagement is essential to keep learners motivated and help them achieve learning goals (Kehrwald, 2008; Shea et al., 2006). While Kuh (2003) relates student engagement as being the energy and time learners dedicate to their educational activities

Looking beyond cognitive skills learned or mastered, engagement focuses on individuals' dispositions or attitudes about classroom experiences and life-long learning (Mandernach, Donnelli-Sallee, & Dailey-Hebert, 2011). Student engagement has also been defined as

"students' willingness, need, desire, and compulsion to participate in and be successful in the learning process" (Bomia, Beluzo, Demeester, & Elander, 1997).

Student Satisfaction

Moore (2009) defines student satisfaction as being successful in the learning experience and being pleased with their experience. Sweeney and Ingram (2001) define it as the perception of enjoyment and accomplishment in the learning environment. Marsh and Roche (1997) developed a complex model for determining student satisfaction in terms of several factors: learning value, instructor enthusiasm, rapport, organization, interaction, coverage, and assessment. Bangert (2006) identified four factors related to student satisfaction in online learning: student and instructor interaction and communication, engaged learning, and cooperation among classmates. Ke and Kwak (2013) identified five elements of student satisfaction: learner relevance, active learning, authentic learning, learner autonomy, and technical competence. Kuo et al. (2013) determined that learner-instructor interaction and learner-content interaction combined with technology efficacy are valid indicators of students' satisfaction. However, Battalio (2007), using a criterion approach, argued that a positive course rating requires effective learner-instructor interaction.

Keengwe, Diteeyont and Lawson-Body (2012) argued that students' expectations influence the instructor's design of effective technology tools in online courses and are the key to understanding the satisfaction construct. Dziuban, Moskal, Brophy-Ellison and Shea (2007) found six key elements that contribute to students' satisfaction: an enriched learning environment, well-defined rules of engagement, instructor commitment, reduced ambiguity, an engaging environment, and reduced ambivalence about the value of the course. The authors concluded that satisfaction is mostly impacted by learning convenience and e-learning tools' effectiveness.

Theoretical framework

The theoretical framework for this study encompassed the Community of Inquiry (CoI) model for online learning environments developed by Garrison, Anderson & Archer (2000). The CoI framework provides a dynamic model for an institutional approach to move away from a passive lecture that fundamentally reshaped the educational experience based on thinking and learning collaboratively (Garrison, 2018). The evolution of technology and its use of it online

learning has transformed the education process. The Community of Inquiry (CoI) framework has been one of the most used and researched educational frameworks. The ARCS Model was created by Keller in the early 1980s and was developed to find "more effective ways of understanding the major influences on the motivation to learn and for systematic ways of identifying and solving problems with learning motivation" (Keller, 1987). Keller's Instructional Model of Motivation is also known as the ARCS Model, which is an acronym for the strategies used to ensure continued motivation: Attention, Relevance, Confidence and Satisfaction. Self-Determination Theory (SDT), developed by researchers . Deci and Ryan (1985), is a motivational theory that focuses on three basic psychological needs: competence, relatedness, and autonomy. Deci and Ryan stated that intrinsically motivated students, who maintain more autonomous behaviours, tend to engage more actively than those who are more extrinsically motivated by recognition of instructors or grade assessments (Deci & Ryan, 1985; Lee & Hannafin, 2016). and the Constructivist model of Vygotsky that promotes student-centred learning (Ahn & Class, 2011).

The interaction and interplay between the Community of Inquiry (CoI) model, the instructional theory of Keller's ARCS, the Self Determination theory and the Constructivist model of Vygotsky are evident from the literature review conducted, and these theories present a comprehensive, integrated framework within which the study is conducted. These theories support student engagement and student satisfaction in terms of enhancing student learning experiences in the digital learning platform (Kauffman, 2015). Furthermore, the theories are linked to the successful delivery of the learning content through creating and aligning the components of a social presence, cognitive presence, and teaching presence in online platforms. These three components are synonymous with Moore's (1989) interaction theory, which identifies three types of interactions occurring in the learning process: learner-content, learner-instructor, and learner-learner interactions. These interactions result in learners playing an active role in student engagement and self-regulation activities to achieve student satisfaction and academic success.

Statement Problem

Education institutions in Cameroon have recognized the importance of developing and maintaining effective infrastructural systems to encourage learner persistence in online learning (Milman, Posey, Pintz, Wright, & Zhou, 2015). The design of these systems is required to

satisfy the needs of learners while ensuring that students remain engaged in the learning process and apply self-regulation skills to succeed (Cho & Shen, 2013; Mello, 2016).

The shift to online learning in Cameroon has begun to widen access to their study programs using digital learning repository. Digital learning requires institutions to ensure student satisfaction through student engagement (Cho & Shen, 2013; Mello, 2016). The secondary education sector in Cameroon faces many challenges in implementing a digital learning repository as a tool for online learning. Some of these challenges include a lack of instant communication between the instructor and the students in the form of participation, collaboration and student evaluation. Technical issues where the students have no internet facilities, mobile androids and laptops. Also, there is a limited understanding of how students engage with the learning repository and the extent to which engagement with such a digital learning repository fosters student satisfaction.

These challenges are often linked to how institutions design their learning environments and engage students in their learning (Waldrop et al., 2019). Learning environments that support student engagement can influence the learning process (Macfarlane & Tomlinson, 2017; Waldrop et al., 2019) and lead to the development of student critical thinking skills (Waldrop et al., 2019). Student engagement is a multifaceted and complex phenomenon to understand. However, it is considered critical in supporting student learning and development (Kahu, 2013). With both the secondary and higher education system rapidly deploying various forms of digital technologies into their learning environments, understanding how students engage and the level of student satisfaction with these repositories is critical to the design of flexible and highly adaptive learning environments that can cater for diverse student learning preferences (Kahu & Nelson, 2018). Cox and Cox (2008) and Yuan and Kim (2014) posited that providing a collaborative learning environment is essential to online learning repositories because it fosters relationships and a sense of community among instructors and learners. Prior et al. (2016) asserted that this sense of community positively impacts student performance and satisfaction.

Implementing the digital learning repositories in Cameroon has greatly been important to all students during the pandemic (COVID 19). The constructs of student engagement (Fonolahi et al., 2014; Garrison & Vaughan, 2013; O'Connor, 2014; Stack, 2015) and student satisfaction (Kauffman, 2015; Saeler, 2015) have been studied in traditional environments. Given this, this study seeks to examine the impact of digital learning repositories on student engagement and satisfaction in secondary schools.

Purpose of the study

This study aims to examine the impact on the use of digital learning repository on student engagement and satisfaction in secondary schools.

Specific Objectives

The study has the following specific objectives:

- To assess the impact on the use of digital learning repository on student engagement.
- To investigate the effects on the use of digital learning repository on student satisfaction.
- To examine the extent to which the use of digital learning repository will ensure student satisfaction through student engagement.

Research Questions

- What is the impact on the use of digital learning repository on student engagement?
- What is the impact on the use of digital learning repository on student satisfaction?
- To what extent does the use digital learning repository mediating the relationship between satisfaction and student engagement?

Research Hypothesis

Ha1: the use of digital learning repository has a statistically significant effect on student engagement

Ho1: the use of digital learning repository has no statistically significant effect on student engagement

Ha2: the use of digital learning repository has a statistically significant effect on student satisfaction

Ho2: the use of digital learning repository has no statistically significant effect on student satisfaction

Ha3: the use of digital learning repository has a statistically significant mediating effect on the relationship between satisfaction and student engagement.

Ho3: the use of digital learning repository has no statistically significant mediating effect on the relationship between satisfaction and student engagement.

Scope and Delimitations

The scope of the study was limited to government high schools in Yaounde. The population comprised all students.

Significance

This study will be helpful to a wide range of stakeholders within the education sector. It will help the institutions and their administrators comprehend the difficulties faced across the entire region regarding student access to the digital learning platform. This study will also help the ministry of secondary education understand the drawbacks of the digital learning repository and a way to mitigate the challenges of adopting digital learning repository .

The results of this research study might provide a model that institutions can use to predict students' success based on their engagement and levels of satisfaction. The research would be particularly useful to the ministry of secondary education and administrators designing instructional approaches that foster the alignment of student engagement and student satisfaction in the use of digital learning repository .

Besides, the study will also help parents to anticipate various challenges that come with such abrupt changes in the education sector and remain as vigilant as possible. Additionally, the potential findings could lead to positive social change in the way that schools approach the process of learning and instruction for the benefit of students in online learning environments.

This study will provide readers with an important reference point that provides insights into how students engage with digital technologies and ways to design agile learning environments that cater to diverse student learning preferences. Finally, the study will contribute to the available body of literature on implementing the digital learning repository for educational purposes and factors to consider while implementing online learning initiatives.

CHAPTER TWO

LITERATURE REVIEW

This chapter review literature on digital learning plateform and its impact on students engagement and students satisfsction. This chapter presents the conceptual framework: digital learning platfroms,students enagegement , student satisfaction, student engagement and student staisfaction on the digital learnig platforms and this chapter also present review by objectives, the theoritcal fra meworok, and empirical review of studies relating to this reseach work.

Conceptual framework

Digital Learning Platform

Education institutions constantly seek more comprehensive access to their programs of study using online learning platforms (Fonolahi et al., 2014; Gallagher & LaBrie, 2012; Garrison & Vaughan, 2013; O'Connor, 2014; Stack, 2015). Students have also been increasing the demand for institutions to use multiple formats to deliver courses (Duesbery, Brandon, Liu, & Braun-Monegan, 2015). Accessing courses online or in a blended format of face-to-face and online delivery modes is an attractive and flexible option for students (Allen & Seaman, 2014). The shift to online learning requires that institutions review their pedagogical approaches and

strategies so that curricular designs accommodate learner diversity and learner needs in the online environment (Judge & Murray, 2017; Stocker, 2018; Sun & Chen, 2016). Cox and Cox (2008) and Yuan and Kim (2014) posited that providing a collaborative learning environment is essential to online learning platforms because it fosters relationships and a sense of community among instructors and learners. Prior et al. (2016) further asserted that this sense of community positively impacts student performance and satisfaction.

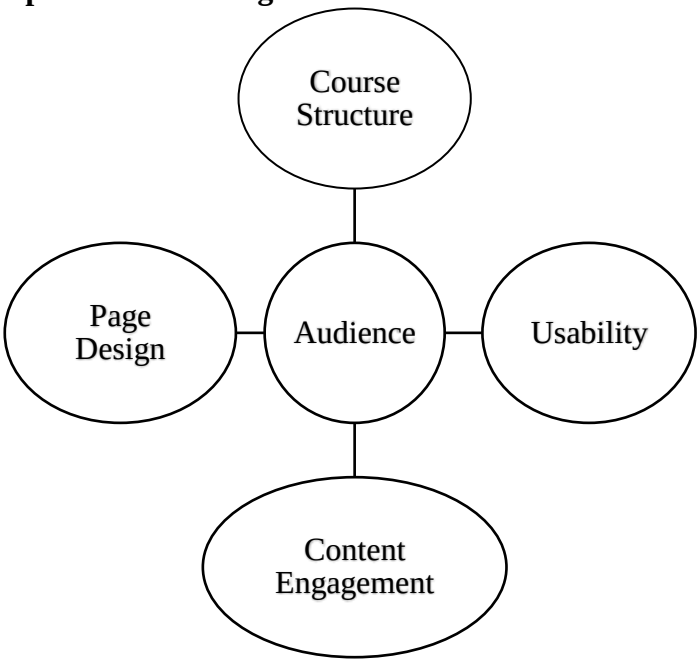
The transition to online learning platforms also depends on instructors' abilities to adjust their teaching and learning norms for instructional delivery and time management skills (Martins & Nunes, 2016). Students expect instructors to establish or promote a sense of community and maintain an online presence so they feel supported throughout the learning experience (Loh, Wong, Quazi, & Kingshott, 2016; Northcote, Gosselin, Reynaud, Kilgour, & Anderson, 2015). Student expectations were consistent with the main predictors for instructors' online teaching

self-efficacy, which included learner satisfaction through engagement, use of instructional strategies, and class management (Horvitz, Beach, Anderson, & Xia, 2015). Over the past several decades, references to online education and online learning have been somewhat interchangeable (McFarland et al., 2017). The National Center for Education Statistics (NCES) defined online education as "education that uses one or more technologies to deliver instruction to students who are separated from the instructor" and states that it may include technologies such as the Internet, cable satellite, wireless communication devices, audio conferencing, and DVDs and CD-ROMs (McFarland et al., 2017). Although NCES does not explicitly define online learning, it has become a subcategory of online education known for using the Internet and the World Wide Web (Harnett, St. George, & Dron, 2011).

Components of Digital Learning Platform

The learning platform is a way of structuring the instruction that fosters optimal organization of content and interaction with students, and it is used by most schools (Gomez, 2016; Almarashdeh, 2016). Teaching must take advantage of virtual environments (Moreira, Henriques, Goulão & Barros, 2017; Ju- Yin & Yen-Chen, 2016; Marin, Sampedro, & Vega, 2017) and adapting the discourse to the uniqueness of the virtual environment's complexity. Learning platforms have been presented as virtual scenarios that promote educational innovation and professional development (Prendes & Gutierrez, 2013, Sáez, Dominguez, Ruiz & Belando, 2014). Five digital Learning Components are essential for all successful online teaching and learning. Each digital learning component plays an important role in designing a digital learning platform (Selwyn, 2011).

Figure 1: Components of the Digita



Learning Platform

Audience: From concept to implementation, the student is a critical factor in the process of developing online learning (Allen et al. (2016). The whole thing intended and developed should be done with the student in mind. One of the first steps in system design is conducting a student needs analysis (Tavangarian and Röser, 2004). This analysis will help determine the basic structure of the other four digital learning components. In designing a digital learning platform, the following should be considered:

- Expectations
- Learning abilities (prerequisites)
- Available hardware/software
- Learning Environment
- Preferences

Course Structure: Course structure refers to how a course is intended for digital learning. The structure of a course plays a critical role in how the student learns the content (Dickson-Deane and Galyen, 2011). The following items are considered when structuring a course:

- Group content into logical modules

- Incorporate interactive concepts
- Use pictures/graphics to help explain ideas

Page Design: The page design of an online course is critical for the learning process. How a page is intended can greatly impact the student's learning experience (Dickson-Deane and Galyen, 2011). Page design consists of the following:

- Navigation must be intuitive
- Appearance must not hinder the learning process
- Balance between text and graphics is critical
- Consistency

Content Engagement: Content engagement refers to how the student interacts with the content of the course. Because studies have shown that the learning experience is greatly enhanced when exercises or activities are incorporated into the learning process, content engagement is critical (Tavangarian and Röser, 2004). The following are elements of digital learning platforms in terms of content engagement.

- Provide additional options/choices for the student.
- Incorporate quizzes, tests, and skill assessments.
- Create fun activities such as games or other educational methods of interactive learning.
- Keep activities focused on the course objective.

Usability: Alghamdi and Bayaga (2016), Usability reflects the Human-Computer-Interaction (HCI) since users adopt a particular technological product to accomplish their tasks quickly and effortlessly. In other words, usability factors make a system easy to learn and use through a usable user interface.

- Verify all links should work properly
- Ensure activities function as intended
- Inspect content to ensure that grammar and spelling are correct
- Ensure that graphics are visible
- Verify the course works appropriately in all applicable server environments
- Verify screen resolution works for the intended student
- Verify course objectives and expectations are met

Activities on Digital Learning Platforms

Synchronous and Asynchronous activities

Designing regular student activities is significant for student engagement. Digital Learning platforms allow instructors to coordinate their work, focus on learners and receive constant feedback from them. Activities carried out on digital learning platforms can be categorized as Synchronous and Asynchronous activities.

An asynchronous mode of learning/teaching has been the most prevalent form of online teaching so far because of its flexible modus operandi (Hrastinski, 2008). Asynchronous environments provide students with readily available material in audio/video lectures, handouts, articles and PowerPoint presentations. This material is accessible anytime, anywhere via a Learning Management System (LMS) or other channels. LMS is a set of tools that houses course content and provides a framework for communication between students and teachers, like a classroom. Other terms sometimes used instead of LMS are Course Management System (CMS) and Virtual Learning Environment (VLE). CMS is comparatively an older term, and its usage is less common today as it implies basic management of course content, while LMS indicates the system that supports the learning process. The term VLE also implies the support of the learning process, but it is more frequently used to describe systems that support a blended learning environment (Watson, Gemin, Ryan & Wicks, 2009).

Asynchronous Digital Learning is the most adopted method for online education (Parsad & Lewis, 2008) because learners are not time bound and can respond at their leisure. The opportunity for delayed response allows them to use their higher-order learning skills as they can keep thinking about a problem for an extended period and may develop divergent thinking. A constructed response replaces the freedom of expression. Therefore, asynchronous space leads to self-paced, independent, student-centred learning (Murphy, Rodríguez-Manzanares & Barbour, 2011). Hence, asynchronous digital learning can scaffold students' previous knowledge with new concepts (Lin, Hong & Lawrenz, 2012). Less reliance on memory and notes and more opportunities for discussions with peer groups help build critical thinking and deep learning (Huang & Hsiao, 2012). Shyness is reduced due to the distance mode, which alleviates the teacher's fear. As there is less pressure than in a real-time encounter, the affective filter remains low, and learners can respond more innovatively and creatively (Bailie, 2009).

Synchronous Digital Learning refers to learning/teaching that takes place simultaneously via an electronic mode. Synchronous voice or text chat rooms allow teacher-student and student-student interaction. Apart from chat, video conferencing facilitates face-to-face communication. Web conferences through surveys, polls and question-answer sessions can be more interactive than video conferencing. Synchronous mode instils a sense of community through collaborative learning (Asoodar, Atai, Vaezi & Marandi, 2014; Teng, Chen, Kinshuk & Leo, 2012). A synchronous virtual classroom allows instructors and students to interact and collaborate in real time. Using webcams and class discussion features, it resembles the traditional classroom, except that all participants access it remotely via the Internet. Lessons can be recorded and added to an e-library. Using the archived e-library, students can access and replay the teacher's lectures as often as necessary to master the material. Direct interaction with teachers and students in real-time is much like a traditional face-to-face classroom, rather better, as the distance is no longer a barrier, and by connectivity via the Internet, no time is wasted in travelling (Beaudin, 2016).

Synchronous sessions can result in high levels of motivation to stay engaged in online activities due to the teacher and class-fellows presence (Yamagata-Lynch, 2014). Instant feedback and answers can help students resolve any problems they encounter in learning. Facial expressions and tones of voice can aid them to have the human feel at a broader spectrum and lead to global interaction without much cost. Some of the challenges of synchronous education can be the need for students' availability at a given time and the necessary availability of a good bandwidth Internet. Participants can feel frustrated and thwarted due to technical problems. In addition, a carefully devised instructional design is required as pedagogy is more critical than technologically facilitated media. For example, Murphy et al. (2011) consider synchronous mode more teacher-oriented. Special online activities need to be created to broaden the scope of synchronous communication from a lecture or teacher-student discussion only.

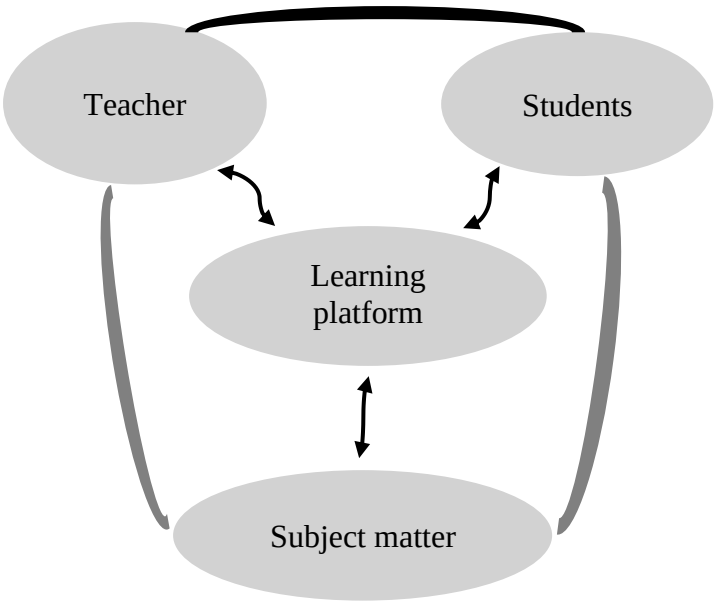
Table 1: Synchronous and Asynchronous activities

Synchronous Activities	Asynchronous Activities
• Video conferencing • Audio conferencing • Online chatting • White boarding • Application sharing • Instant messaging	• Self-paced Courses • Forums • Blogs • Messaging • Streaming Audio • Streaming Video • Sending E-mail

Communication Tools of Learning Platforms

The use of a learning platform encourages the interaction of all components of a traditional didactic scenario: teacher, students and subject matter.

Figure 2: Communication Tools of Learning Platforms



Source: Bates, (2015)

The interaction among the various components is essential to promote mediated learning (Bates, 2015). The learning platform opens a new stage, which exceeds the traditional space-time to motivate and make a set of instructional options available to students, colleagues and various groups.

The most crucial communication features of the platforms include forums, chat and web conferences.

- Forums. Virtual scenarios for comments and reflections between teachers and students in asynchronous mode.
- Chat—written speech involving a group of students and teachers in synchronous mode.
- Web conference—Synthesizes the keys of the oral discourse, supported transparencies, pictures, and video tutorials, expanded with questions and comments from teacher and students.

Online discussions carefully monitored by instructors promote co-constructed knowledge through activities such as sharing, negotiating, elaborating, and evaluating (Ioannou, Demetriou & Mama, 2014) and facilitate students' higher-order thinking (Kwon & Park, 2017). When teachers emphasise collaborative learning, students are more aware of their benefits (Gomez, Barbera & Fernández, 2016).

The interaction in online forums helps students to exchange different points of view on a subject (Duran, Cornejo, & Flores, 2017). One of the advantages of online forums following Arasaratnam & Northcote (2017) is having time for reasoned comments. Meanwhile, face-to-face sessions may not always be possible. Learning platforms seek to exploit the most valuable aspects of the training scenarios to become open spaces for all participants' intellectual and emotional enjoyment, taking advantage of the communication resources.

The digital learning platform in online education must be adapted to the knowledge and practices of virtual environments, promoting usefulness (Moreno, Cavazotte & Alves, 2017), autonomous learning (Cho, 2011, Zhu, Au & Yates, 2016), and interaction with teachers throughout learning tasks and communication tools (Ma, Han, Yang & Cheng, 2015; Gharmallah, 2017). The teaching-learning process mediated by the learning platform includes substantial diversity of educational components to the communicative act: masterclass, knowledge presentation and questioning. According to Holzweias, Joyner, Fuller, Henderson

& Young (2014), students' perceptions of learning platforms refer to their best learning experiences through activities that allow them to share knowledge and reflect, among others.

Medina, Sánchez & Campos (2014), Medina and Dominguez (2015), and Medina, Cacheiro & Medina- Medina (2015) have stressed the value of communicative competence of teachers and impact the development of educational processes, making progress in achieving harmonizing the instructive-creative design, to be worked on virtual environments. The educational use of learning platforms responds to the challenges of online higher education, customizing tasks and adapting the content presentation to virtual support, combining with traditional materials (Medina & Dominguez, 2015; Oproiu, 2015).

Types of Digital Learning Platforms

Digital learning platform allows students to access and absorb educational content in a strictly digital fashion, in groups or individual settings (Beer et al., 2010; Chen et al., 2010; Coates, 2007; Ituma, 2011; Horspool & Lange, 2012; Ko & Rossen, 2010; Palmer, 2012). Online learning can take place live at set times or entail pre-recorded lessons for students to complete on their own time.

Learning Destination Sites (LDS) platform

LDS offers more than 185,000 video-based lessons on various topics (Revere & Kovach, 2011). LDS allows you to access a variety of courses in one place. The following online learning platforms are also categorized as Learning Destination Sites:

- **Coursera**. Coursera offers virtual courses, certifications and degree content.
- **Codecademy**. Learners can choose from career paths and individual courses.
- **Khan Academy**. This learning platform specializes in online learning for kids. Khan Academy is free and boasts a wealth of courses in topics like math, reading, computers and social and emotional development.

Learning Management Systems (LMS) (platform)

LMS, also referred to as a Course Management System (CMS) or Virtual Learning Environment (VLE), these software programs generally contain numerous instructional functions that allow instructors to post lectures, initiate discussions, embed videos, and give quizzes all within one central platform (Beer et al., 2010; Ko & Rossen, 2010; Revere & Kovach, 2011).

Learning management systems give institutions the ability to deliver a large number of courses within the confines of a customized platform. With the LMS, institutions can integrate a wide range of teaching methods and course tools that allow them to engage with their students on individual levels (Coates, 2007). Regarding assessment, LMS instructors can run various student activity reports to determine their involvement in discussions, activities, and learning outcomes. Ituma (2011) determined that most online students accessed the Blackboard course daily. The following are the most common learning management systems used today:

- **Blackboard (traditional).** Blackboard is an LMS that serves all grade levels. Through Blackboard, instructors can build and share educational content. The provider has an associated app as well.
- **Canvas (traditional).** Canvas is one of Blackboard's primary competitors. All Ivy League schools have adopted Canvas as their main LMS. This up-and-coming platform is feature-heavy and efficient.
- **Moodle (open-source).** This robust learning management system is entirely free to use. It works best for those who have some experience with the administrative tasks involved in setting up an LMS.

Learning Management Ecosystems (LME) platform

A learning management ecosystem combines a Learning Digital System (LDS) and LMS. These comprehensive learning platforms offer a variety of courses, but they are internal to the institution (Revere & Kovach, 2011). This means you can't access an LME without being a part of the institution to which it belongs.

Web-based Applications (platform)

Even in a traditional classroom, instructors require students to use technology, such as the Internet and multimedia, to complete course assignments (Nelson Laird & Kuh, 2005). Today, the World Wide Web provides numerous web-based applications that can serve as platforms to offer online content. Instructors may use these applications without a learning management system and as additional resources to complement what is provided in the management system. The following are the most useful web-based applications:

- Gmail
- Hangouts
- Scholar

- Docs
- Task
- YouTube

YouTube has become a very popular website that allows individuals to upload their own videos to view, share, and comment on content (Sherer & Shea, 2011). Instructors may embed YouTube videos within their learning modules or share them as part of a class discussion (Sherer & Shea, 2011).

Other software companies allow instructors to use audio and video messages to communicate in real time with students (Revere & Kovach, 2011). such as

- Wimba
- Voice-Thread
- Pow-Wow-Now
- Skype

Classroom Management Platforms (CMP)

Classroom management platforms are time-saving tools that make learning run smoothly**.** These ingenious platforms help instructors time tasks, manage and improve students' behaviour and create a respectful and supportive environment (Bailie, 2009). Instructors can also use these platforms to communicate with parents and enhance educational experiences at school or home. The following are different types of classroom management platforms:

Google Classroom: Google Classroom requires the use of a Gmail account to access Classrooms. This platform is fantastic for easy communication, teamwork and sharing homework files. Institutions can even use Classroom to make a class website and store significant resources or information for students.

Buncee: Buncee is a fun and simple tool that helps students and teachers create course materials, presentations and stories. The platform has over 2,000 templates that allow users to build charts and visual art creations.

Edmodo: As a global LMS, Edmodo is a collaborative platform that connects teachers, students and parents. Teachers can:

- Support students
- Distribute quizzes

- Share assignments
- Create posts and messages

Digital Learning Platform Delivery Methods

Digital learning platforms have been used more frequently over the years because it's more accessible, cost-effective, and provides a more tailored learning experience. Intuitions deliver online learning through several methods:

Video-Based Learning (VBL)

Video-based learning involves learning from a video or series of videos. This format works best for those seeking flexibility in their learning. Students can typically view videos at any time from any location (Sherer & Shea, 2011). This format combines speaking, graphics and animation to provide a 360-degree learning experience. A great example of video-based learning is YouTube, where viewers can watch tutorials for just about anything, from knitting to coding.

One-on-One Learning

Online learning is not always asynchronous. With one-on-one learning, students can work with a teacher or tutor in real-time. This format provides more direct interaction with students' instructors, allowing learners to ask questions and work out problems face-to-face (Sherer & Shea, 2011).

Group Learning

Virtual classrooms, like those offered by most online colleges, are an excellent example of group learning (Pappas, 2015). Group learning classes often use other mediums, like pre-recorded videos and lectures, to enhance the learning experience. These classes typically meet at set times, during which an appointed instructor leads the class. Examples of virtual classrooms are:

- **Flip Grid:** Flip Grid is a conversation starter enabling students and teachers to share videos about a relevant subject.
- **Zoom:** Zoom provides a secure learning environment for kids and allows for safe interactions between students and teachers.

- **Slack:** Slack is an instant messaging tool that helps students communicate instantly. Teachers can set up channels geared toward separate topics, and Slack ensures data is secure, so only teachers and students access lessons.
- **Microsoft Teams:** Classrooms are a true team environment where teachers and students can swap thoughts and ideas. Microsoft Teams makes it easy for you and your students to work together as you exchange videos and homework assignments and engage in chat conversations.

Audio Learning

Audios are perfect for helping students learn on the go. Learners can listen to their lessons at any time and place. The audio delivery method is most suitable for trainers who give lessons on meditation, teach different languages, provide instructions on music, or use podcasts for their online courses (Hastie, Hung, Chen & Kinshuk, 2010). Moreover, audio can be extracted from video lessons, allowing learners to listen to the course rather than watch the visuals. This option is beneficial in conditions of low network connectivity.

Benefits of Digital Learning Platforms

Online learning requires top-notch time-management skills and plenty of self-discipline. Here are a few positive outcomes of online learning platforms (Eastin & LaRose, 2000)

Budget-Friendly Choices: An open-source learning destination sites allow anyone to dive into a subject that interests them free of charge.

Flexibility and Convenience: Online learning often allows learners to study at their convenience.

Options for Every Learning Style: Online learning platforms offer something for everyone. Group-based online learning, one-on-one online learning.

Factors That Affect Learning on Digital Learning Platforms

Learner Readiness toward Online Learning (OLRS): Students' readiness levels are vital in online education practices. Online learning readiness is one of the important factors that affect learning. Online learning readiness is directly proportional to satisfaction with online learning experiences (Gunawardena & Duphorne, 2000).

Computer and Internet Self-efficacy (CIS): We all know that we need proper infrastructure in the form of networks, nodes (computers and related devices) and related technology to conduct online courses. It would be realistic to assess individuals' ability to use such technology to derive its utility. The idea of self-efficacy is drawn from social cognitive theory, which suggests a theoretical framework for comprehending how self-efficacy beliefs regulate human functioning (Bandura, 1997). It basically understands individuals' computer/network self-efficacy. Compeau and Higgins (1995) found that computer self-efficacy positively influences computer-use outcomes, such as using software to analyse data. Similarly, Tsai and Tsai (2003) found that students with high Internet self-efficacy performed better in web-based tasks when compared to those students who had low Internet self-efficacy.

Online Communication Self-efficacy (OCS): Communication self-efficacy in online learning is an essential factor for overcoming the problems related to online communication (Hung et al., 2010). Online education essentially involves computer-mediated communication. To be successful, a student should engage actively in online discussions with fellow students, ask questions to teachers to understand the subject in-depth and work with other online students. Roper (2007) recommended that successful students use online discussions. It is essential to create chances for interactions and communications between students and their teachers in the online learning environment (McVay, 2000).

Self-Directed learning (SDL): One of the essential characteristics of online learning is its flexibility. Learners need not be tied up with a strict timeline in the process of learning the online content. Previously research has found that to be successful. Online learners should make self-decisions to suit their learning style and capability (Lin & Hsieh, 2001). Online learners should adopt suitable learning strategies to establish learning goals and evaluate learning outcomes. There exists a relationship between online learners taking their own decisions and their enthusiastic participation in online learning activities (Hung et al., 2010).

Motivation for Learning (ML): Motivation plays an integral part in student achievement (Eccles & Wigfield, 2002). The theoretical framework that explains the motivation process is goal-oriented behaviours (Maehr & Meyer, 1997). Academic motivation is defined as enthusiasm a student demonstrates during learning activities and the magnitude of attention a student puts into different learning activities (Cave, 2003). It is closely related to students' self-efficacy beliefs about themselves (Zimmerman, 2000). Motivationally oriented students are

expected to demonstrate significant effects on their learning performance (Hung et al., 2010). Saadé, He and Kira (2007) found that motivation has a vital role in the success or failure of online learning.

Learner control (LC): In an online learning environment, students completely control what to learn next and what to skip. He/she can comfortably streamline the learning activity based on comfort and convenience. One can decide how much to learn at a given time, and learners have control over their instruction. They can adopt an individualised approach by repeating or skipping sections. Learner control is the degree to which an online learner can decide his/her own learning process (Shyu & Brown, 1992). According to Merrill (1984), the learner should be given free-hand over the order of instructional material he/she makes use. Online learners who are better empowered to determine their own learning may exhibit better learning performance (Hung et al., 2010).

Sense of Isolation

Many students expressed a sense of isolation because there was a lack of direct communication with their instructor and classmates (Beffa-Negrini et al., 2002; Dixson, 2010; Gray & DiLoreto, 2016; Meyer, 2014; Wyatt, 2011). The sense of isolation may be related to a variety of reasons due to the diversity of the student population of online learning (Angelino, 2007; Beer et al., 2010; Gillett-Swan, 2017; Meyer, 2014; Park & Choi, 2009; Price & Baker, 2011; Wyatt, 2011).

Technology

Access to content in an online course is dependent on access to technology. This is undoubtedly a challenge for both online instructors and students. Furthermore, instructors are continually challenged to learn new technologies and apply new types of pedagogy within a virtual environment (Berge, 1998; Gillett-Swan, 2017; Roby et al., 2013). instructors often expressed the need for developmental assistance and technology support due to the ever-changing forms of technological tools (Roby et al., 2013). Gillett-Swan (2017) explained that incorporating technology creates additional work pressure and time commitment as the instructor seeks the best technology to meet students' needs. Students have also expressed concerns due to a lack of knowledge in using new technologies (Lim, 2004; Gillett-Swan, 2017; Rabe-Hemp et al., 2009). Chih-Yuan Sun and Rueda (2012) determined that students tend to be more successful in online courses when they are more confident in their technical abilities. Gillett-Swan (2017) suggested that hesitations in using technology can prevent students from completing assignments in a

specific time frame, especially when time limitations are placed on assessments and brief group work.

Acceptance

Institutional Concerns. Although online learning has experienced significant growth, overall acceptance of online courses has remained somewhat stagnant over the years (Allen et al., 2015). According to Allen et al. (2015), most instructors believe that online learners are more difficult to retain than students who attend face-to-face courses because online learners need more discipline.

Institutional Support of Online Learning

Academic leaders reported that an additional challenge of online instruction is due to the extra effort required to deliver an online course (Allen et al., 2015). instructors may be reluctant to teach online because of the other commitment of time and effort required to complete online course development and participate in a virtual environment (Allen et al., 2015; Gillett-Swan, 2017; Major, 2010). Various scholars have offered research to identify best practices for institutional support of online learning (Angelino et al., 2007; Angelino & Natvig, 2009; Meyer, 2014; Seok, 2007; Shea, 2005). In general, these best practices include the same services made available to traditional campus students, including faculty training, student support services, technology plans, and clear communication of the institutional calendar and processes (Angelino et al., 2007; Angelino & Natvig, 2009; Meyer, 2014; Seok, 2007; Shea, 2005). Lundberg and Sheridan (2015) confirmed in their study of online students that a supportive campus environment, which involves positive interactions with teachers and a sense of institutional support for success, significantly affects student learning.

Student Engagement on the use of Digital Learning Platforms

Student engagement is the input of physical and psychological energy that a student dedicates to educationally effective activities (Astin, 1984; Kuh, 2003). It is closely related to learning outcomes, such as learning satisfaction, academic achievement, and completion rates (Baron and Corbin, 2012; Gao et al., 2020) in all modes of education (Fisher et al., 2018). According to prior research (Fredricks et al., 2016; Maroco et al., 2016), student engagement is a multidimensional construct that includes three basic substructures: behavioural, emotional, and cognitive engagement. Specifically, behavioural engagement is related to students' behaviours,

such as attending classes and participating in learning activities following social and institutional rules (Sinval et al., 2021). Emotional engagement is the students' positive and negative responses to the learning process and class activities (Manwaring et al., 2017). Furthermore, cognitive engagement is defined as students learning efforts, such as learning strategies or approaches and academic self-regulation (Manwaring et al., 2017; Gao et al., 2020). In this vein, Janosz (2012) suggested that all three dimensions of students' engagement are interdependent as students need to engage both physically (behavioural) and psychologically (emotional and cognitive) to acquire new skills and knowledge in the learning process. If students fail to engage either way in the learning process, they will be inclined to experience a low level of learning satisfaction (Sun and Rueda, 2012; Gao et al., 2020). In contrast, students who are more engaged in learning activities are more likely to spend extra time on the learning process, participate more, and develop mechanisms to assist them in the learning process and achievement (Klem and Connell, 2004; Sinval et al., 2021), which eventually led to higher learning satisfaction. This is consistent with the findings of Kim and Kim (2021) and Cheng and Chau (2016) 's study that student engagement significantly positively affects students' satisfaction.

The definition of student engagement remains elusive, and the challenge to finalize and accurately describe the term is based on how scholars conceptualize the construct in the field (Azvedo, 2015; Dixson, 2015; Sinatra, Heddy, & Lombardi, 2015). The definition proposed by Kuh (2003) that engagement correlates to the amount of effort expended by the student in the learning environment was used in this study. This description of student engagement appears to be widely accepted as it was used to develop the National Survey of Student Engagement (NSSE) instrument, an instrument recognized as valid and reliable throughout the educational sector (Dixson, 2015). Since the implementation of the NSSE, other engagement measurement tools have emerged (Dixson, 2010, 2015; Handelsman et al., 2005; Ouimet & Smallwood, 2005; Roblyer & Wiencke, 2004). A study of student engagement in the traditional learning environment revealed that four basic elements aligned with Kuh's (2003) definition (Handelsman et al., 2005).

The engagement elements comprised skills (effort), emotional (connection to course material), participation/interaction (interactions with course content, peers, and instructors), and performance (achieving desired goals). While these engagement elements were fundamental in the development of the Online Student Engagement Scale (OSE; Dixson, 2010, 2015),

Schreiber and Yu (2016) applied the themes of the South African Survey of Student Engagement (SASSE) to the study of student engagement and academic achievement. These themes encompassed academic challenges, learning with peers, experience with staff, and the campus environment.

The dimensions of student engagement

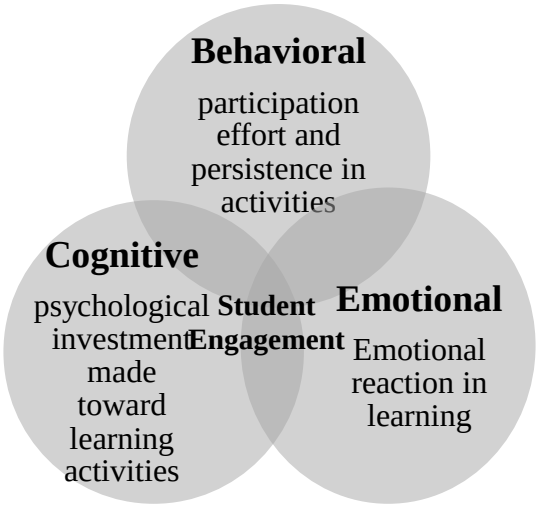
Student engagement is often conceptualized along three dimensions: behavioural, cognitive and emotional.

Behavioural engagement: the behavioural aspect of student engagement describes engagement along with effort and persistence in extracurricular, social and academic activities. It is mostly concerned with getting involved in-class activities, completing given assignments, and regular attendance. Fredricks et al. (2004) stress that student engagement's behavioural aspect consists of positive conduct (non-disruptive behaviours or following stated rules).

Cognitive engagement refers to the psychological investment made towards learning activities, where the student is invested in learning activities. This dimension is exhibited when students perceive the value of what they are learning, understand a topic and demonstrate a desire to learn and master skills. The cognitive type of engagement is linked to self-regulated learning, authentic intellectual capacity questions, focusing on tasks, and setting goals.

Emotional engagement: it refers to emotional reactions (positive/negative) demonstrated in learning, such as showing interest, boredom, or anxiety towards their learning settings and feeling like they belong in the school. The sense of belonging is considered vital to students' willingness to complete schoolwork (Baron & Corbin, 2012; Fredricks et al., 2016; Harris, 2008; Schmidt et al., 2018).

Figure 3: Dimensions of students' engagement



These dimensions are interrelated and contribute to a student's engagement. Although each of the three aspects of engagement can be considered distinct, there is considerable overlap. For example, Filsecker and Kerres (2014) indicated that the behavioural part of the engagement, which includes exerting effort and attention, could be regarded as cognitive engagement. There are other engagement dimensions identified in the literature. Harris (2008) discussed academic engagement, specific to learning tasks, to move away from the general behavioural engagement that covers non-academic activities. Linnenbrink-Garcia et al. (2011) added social-behavioural engagement as a construct related to students' effect and behaviour in collaborative group work (Fredricks et al., 2016). Reeve and Tseng (2011) propose the addition of agentic engagement to account for how students actively and constructively contribute to the learning environment. Agentic engagement factors in the student's ability to purposefully and proactively enhance the learning and teaching process. However, instead of a new dimension, it can be viewed as the union between the cognitive and behavioural dimensions.

Combining the three dimensions can provide a more in-depth description of students about their engagement (Fredricks et al., 2004). Therefore, it is important to measure all the dimensions when measuring student engagement because focusing on only one dimension can limit the understanding of student engagement. As behavioural, cognitive and emotional engagement interrelates in a volatile manner among individual students (Fredricks et al., 2004).

Critiques of behavioural engagement question whether participation in tasks can necessarily lead to desirable learning outcomes. For example, students in the class can focus on the

instructor, which would be noted as engagement; however, the student's attention could be elsewhere (Linnenbrink & Pintrich, 2003). In other words, a student can be behaviorally engaged but not cognitively. Harris (2008) asserted that cognitive engagement seems to be the most linked to learning and that a student's physical participation does not necessarily assure cognitive participation. This is echoed by Linnenbrink and Pintrich (2003), who suggested that teachers need to engage students cognitively, not just behaviorally. This entails that instructors must ensure that students deeply, critically and creatively think about the content being learned, reflect on what they know and do not know, and utilize different learning strategies to help their understanding of the content.

The emotional engagement has also been contested as to whether students "feel good" about school learning (Skinner & Belmont, 1993). For example, students being enthusiastic in class does not necessarily translate to better learning outcomes. Further, although research has claimed cognitive engagement to be the most important type of engagement, emotional and behavioural dimensions are seen as dimensions that may be required to enable cognitive engagement (Harris, 2008). For example, students need to be involved in the learning activity and, based on how they feel, then decide to engage cognitively. This further underlines the importance and relationship between these three dimensions of engagement.

Table 2: Type of Interactions and Engagement Factors of learners

Type of interactions	Engagement factors of learner
Learner-content	• Applies critical thinking skills. • Integrates own views with that of others. • Prepares study notes. • Applies learning to real-life situations.
Learner-instructor	• Interacts with instructor • Discusses academic performance and other matters • related to academic goal achievements • Obtains meaningful feedback on assignments Understands better difficult concepts and content after interaction
Learner-learner	• Collaborates as one-to-one or as a group • Interacts with peers on mastering course material • Respects peer differences • Values peer differences
Learner-online platform	• Uses learning space to participate in course activities

Learner-to-Learner Engagement: Learner-to-learner interaction is extremely valuable for online learning and leads to student engagement. To prevent online students from experiencing potential boredom and isolation in the learning environment, building activities that enhance

engagement is essential. These activities assist students in feeling connected and can create a dynamic sense of community. Revere and Kovach (2011) and Banna et al. (2015) found that traditional technologies for engaged learning, such as discussion boards, chat sessions, blogs, wikis, group tasks, or peer assessment, have served well in promoting student-to-student interaction in online courses. The authors highly recommend using web-based applications, such as Twitter feeds, Google applications, or audio and video technology like Wimba Collaboration Suite, to improve engagement in online courses. Shea, Fredericksen, Pickett, Pelz, and Swan (2001), in a survey of 3,800 students, found that when a more significant percentage of the course grade was based on discussions, students were more satisfied, and they thought they learned more. Learners thought that they had more interaction with their peers and instructor. Banna et al. (2015) suggest using videoconferencing or chatting in synchronous activities and discussion boards in asynchronous activities; they enhance student-to-student interaction. The utilization of social media in online courses provides an opportunity to improve engagement through social interaction (Everson, Gundlach, & Miller, 2013; Tess, 2013).

Learner-to-Instructor Engagement: Learner-to-instructor interaction leads to higher student engagement in online courses (Dixson, 2010; Gayton & McEwen, 2007). The use of multiple student-instructor communication channels may be highly related to student engagement. It is recommended that online instructors pay special attention to student-instructor interactions because they may affect learning outcomes (Dixson, 2010; Gayton & McEwen, 2007). The authors found rapport and collaboration between students and instructors in an interactive and cohesive environment, including group work and instructive feedback, are important for student engagement resulting in learning success. Students often contact instructors about assignments, course materials, and grades, but to be more effective, online instruction should include opportunities for students to interact with one another and instructors pertaining to what makes their learning meaningful. In addition, Gayton and McEwen (2007) stress that instructors' presence in online courses is required in terms of actively involving students in their courses; however, online instructors should be minimally active in discussions when online courses are purposefully designed so that the more students engage, the more meaningful learning outcomes will be. Dixson (2010) and King (2014) also agree that there must be cooperation and collaboration between students and instructors in online courses to increase student engagement.

Research has found that rapport and collaboration between students and instructors in an interactive environment are important. Dixson (2010) and King (2014) stress that consistent

interaction with students at the individual and group levels helps set academic expectations among students. King (2014) found that students rated thorough and timely instructor feedback on their work as the most valuable to improve their learning process. Instructor assessment of student work and participation using a stated grading policy, providing summative feedback, and posting grades within a specified time frame can be highly beneficial. Mini videos and screencasting are techniques to increase instructor visibility, which are believed to bring many pedagogical benefits. Revere and Kovach (2011) and Robinson and Hullinger (2008) suggest the use of new but well-established technologies, such as discussion boards, chat sessions, blogs, wikis, group tasks, Twitter, Skype, YouTube, and Ning networks, to foster student engagement through course design and technology integration. These technologies are also used for effective social-networking activities in active online learning to increase student engagement.

Learner-to-Content Engagement: Learner-to-content engagement is the process of intellectually interacting with the content, which can change a learner's understanding and perspectives (Moore, 1993). Abrami, Bernard, Bures, Borokhovski, and Tamim (2011) state that student-to-content interaction can occur while watching instructional videos, interacting with multimedia, and searching for information. Both synchronous and asynchronous delivery are effective options that help online students access to content for critical interaction (Banna et al., 2015). Online instructors are advised to invest sufficient time searching for scholarly reading and interactive instructional materials and designing well-thought-out assessments for the purpose of encouraging student-to-content engagement (Abrami et al., 2011; Banna et al., 2015). Real-world application of projects that enhances subject mastery and critical thinking skills is one strategy related to fostering learner-to-content engagement. It refers to the authenticity of the course content shown through real-world examples (Britt, 2015).

Revere and Kovach (2011) recommend making the content come alive using appropriate technology, which enhances student engagement. Online instructors should be critical in choosing material and content when they wish to engage students more in their courses. Online students should not merely be given a list of resources; instead, instructors should design authentic activities that provide opportunities to examine the tasks from different perspectives and encourage students to wisely use relevant information in the process. Dixson (2010) reports that students found a variety of activities that made them feel engaged, including course management system features, effective communication, and course facilitation strategies.

Indeed, student engagement is crucial for online pedagogy because well-designed online courses revolve around the learners (McCombs, 2015). Some studies argue that enhancing student engagement in online learning is difficult due to the overall insufficient mastery of technology and self-discipline (Oliver and Herrington, 2003). Nevertheless, Mount et al. (2009) suggest that interaction can best achieve student engagement among peers and instructors.

Factors of Student Engagement

Major (2015) identified several distinct factors that support the concept of engagement. Gray and DiLoreto (2016) referenced engagement factors to include attitude, personality, motivation, effort, and self-confidence. Various other researchers declared that engagement involves interaction, motivation, effort, involvement, active learning, and commitment of time (Beer, 2010; Coates, 2007; Dixson, 2010; Hoskins, 2012; Kuh, 2009; Pike & Kuh, 2005; O'Brien et al., 2008; Robinson & Hullinger, 2008; Umbach & Wawrzynksi, 2005). Furthermore, in an effort to enhance engagement within higher education institutions, the National Survey of Student Engagement was built upon five benchmarks of student engagement: level of academic challenge, active learning, student interactions, enriching educational experiences, and supportive campus environment (Carini et al., 2006; Kuh, 2003; Kuh, 2004; Kuh, 2009; Lundberg & Seridan, 2015; Pike & Kuh, 2005; Price & Baker, 2012; Robinson, 2008; Trowler, 2010). For the purpose of this study, various aspects of engagement are organized into four categories: student motivation, attention and related factors, involvement and active learning, and level of academic challenge and intellectual effort.

Student Motivation: Motivation has often been associated with engagement because motivation is known to somewhat direct behaviour, as it gives an activity its purpose and goal (Beer et al., 2010, p. 76; Lim, 2004; Reeve, 2012). Major (2015) considered motivation as the level of enthusiasm students have for learning and contends that both students and instructors should share the responsibility of motivation within an academic environment. A higher level of motivation should afford a higher level of enthusiasm for learning. Researchers have also implied that motivated learners are more persistent and actively engaged in learning (Gray & DiLoreto, 2016; Harnett et al., 2011).

Several studies have conducted surveys to determine the level of motivation as it relates to engagement in digital coursework (Chen & Jang, 2010; Chih-Yuan Sun & Rueda, 2005; Yoo

& Haung, 2013; Young & Bruce, 2011). Chen and Jang (2010) established that learner motivation is related to several aspects of learner success, such as persistence, retention, student success, and course satisfaction. While Chen and Jang (2010) were unable to confirm that motivation predicted learning outcomes, they provided supporting evidence that intrinsic motivation, extrinsic motivation, and motivation are reliable constructs in determining the relationship between contextual support, need satisfaction, and motivation among online learners. Scholars have proven the benefits of contextual support through interactions, such as online activities and discussion boards, as they provide an opportunity for greater communication, flexible learning, and enhanced confidence in completing coursework (Chen & Jang, 2010; Chih-Yuan Sun & Rueda, 2005; Harnett et al., 2011; Young & Bruce, 2011).

To understand how motivation is related to engagement, one should consider the basic types of motivation, known as intrinsic and extrinsic motivation, and how they relate to various types of engagement within virtual classrooms (Chen & Jang, 2010; Yoo & Huang, 2013). Shillingford and Karlin (2013) defined intrinsic motivation as "the doing of an activity for its inherent satisfaction rather than for some separate consequence" (p. 92). Schunk and Zimmerman (2012) explained that intrinsic motivation deals with one's personal interest and enjoyment of a task, while extrinsic motivation relates more to external rewards, such as wealth, recognition, and so on. Both are known to affect student motivation, but intrinsic motivation has proven to be more productive in supporting a student's need for autonomy and overall success in competence and performance (Chen & Jang, 2010; Schunk & Zimmerman, 2012).

Yoo and Huang (2013) discovered that intrinsic motivation is also affected by extrinsic motivation, such as rewards offered by employers, and suggested that the ability to relate content to real-life problems is important to adult digital learners. Other researchers have suggested that extrinsic motivation can evolve into intrinsic motivation when students are given the opportunity to participate in activities that allow them to practice specific skills of interest, receive constructive feedback, and avoid demeaning or unnecessary evaluations (Harnett et al., 2011; Shillingford & Karlin, 2013). As digital learners are typically non-traditional, they pursue their education while working full-time and maintaining family responsibilities. While they juggle so many responsibilities, it is helpful to understand what increases their motivation to pursue and successfully reach their individual goals, whether intrinsic or extrinsic, including their desire to be engaged in their academic coursework. Shillingford and Karlin (2013) reported results from a study to show how participants related the four motivational factors of

intrinsic, short-term extrinsic, long-term extrinsic, and willingness to learn new technology. The results of their study established that non-traditional students are more motivated by a desire to demonstrate competence and achieve goals through self-determination than to achieve external rewards such as career advancement (Shillingford & Karlin, 2013, p. 91)

Attention and Interest: Attention refers to one's ability to focus on one task (Major, 2015; Keller, 1987; Keller, 2010; Milman & Wessmiller, 2016). Keller (1987) included the importance of attention in an instructional design model known as the ARCS Model of Motivational Design. The main concept of this model was based on four dimensions of motivation: attention, relevance, confidence, and satisfaction. He identified attention as an element of motivation and a prerequisite for learning (Keller, 1987). Other researchers agreed and claimed that student attendance is a necessary factor of engagement as well (Kim & Frick, 2011; Major, 2015).

While attention may be easy to obtain, it is usually the most difficult aspect of engagement to sustain (Keller, 1987; Keller, 2010; Milman & Wessmiller, 2016; O'Brien et al., 2008). Students develop attention by hearing a dramatic statement relating to an introductory video, a lecture, a loud noise, or even a silent moment. O'Brien et al. (2008) explained that attention is based on individuals' judgments about the relevance of a task as it relates to their personal interests. If students can relate an assignment or activity on an individual level, then they are more likely to gain interest and maintain attention in completing that task (Lim, 2004; Keller, 1987; Keller, 2010; Milman & Wessmiller, 2016; O'Brien et al., 2008).

Hidi and Ainley (2012) stated that "interest plays a central role in focusing attention," a role that has been well documented in the literature for centuries (p. 82). When a student's interest triggers attention, the student is more likely to develop self-regulatory skills that allow them to maintain engagement throughout coursework (Hidi & Ainley, 2012). O'Brien et al. (2008) established that engagement is more likely to continue when participants can maintain their attention through positive emotions triggered by their interest in the activity. In a study conducted by Chih-Yuan and Rueda (2012), results indicated that students who were more interested in their coursework were also more engaged in the learning environment.

Self-regulation: Self-regulated behaviours have become increasingly important for digital learning as they must develop behaviours to engage in various course requirements without the

reinforcement of synchronous meetings (Kuo et al., 2014; Wang et al., 2013). Reeve, Ryan, Deci, and Jang (2012) defined self-regulation as a "process in which people organize and manage their capacities- that is, their thoughts, emotions, behaviours, and social-contextual surroundings- in the service of attaining some desired future state" (p. 223). Similarly, other researchers define it as an "active and constructive process that involves the student's active, goal-directed, self-control of behaviours, motivation, and cognition for academic tasks" in which the activities build personal and contextual attributes to reach optimal performance (Wang et al., 2013). Kuo et al. (2014) further explained that self-regulated learners are self-motivated, seek help from others, and are willing to take responsibility for their successes and failures (p. 37). Self-regulation is essential to online learners' success as they are required to monitor their time commitment as they complete coursework and other responsibilities at home and work.

Sansone, Fraughton, Zachary, Butner, and Heiner (2011) stated, "Successful digital students must learn and maintain motivation to learn", as they typically hold the sole responsibility of their engagement involving online content. Several quantitative studies have confirmed that self-regulated learning is a reliable predictor of course satisfaction and performance (Kuo et al., 2014; Sansone et al., 2011; Wang et al., 2013). Furthermore, one study indicated that by using proper learning strategies, students increase motivation and self-regulation levels, leading to higher course satisfaction and better performance (Wang et al., 2013).

While the convenience and flexibility of online education greatly affect a learner's motivation for online learning, students also appreciate a social presence that allows for interaction with faculty and peers (Kim & Frick, 2011). Sansone et al. (2011) suggested: "interventions to make students more motivated to learn the material may thus depend on whether and how goals-defined motivation enhances, detracts from, or has no effect on, the experience". The authors further recommend that online instructors develop a well-designed online environment that includes activities for reflection and collaboration with peers that promote self-regulated learning strategies and include interesting links and assignments that allows online students to apply concepts to their personal interests (Kim & Frick, 2011; Kuo et al., 2014; Sansone et al., 2011; Wang et al., 2013).

Involvement: In 1984, Alexander Astin proposed a theory of student involvement that described an involved student as one that devotes a considerable amount of energy to academics,

spends much time on campus, participates in various student organizations and activities, and often interacts with faculty and students. He further elaborated that "student involvement refers to the quantity and quality of the physical and psychological energy that students invest in the college experience" (Astin, 1999). He stated that such activities might include academic work, extracurricular activities, and interaction with faculty (Astin, 1999). In more recent work, authors have described involvement as how much time and energy are spent on the task at hand (Beer et al., 2010; Major, 2015).

Tinto (1997) referred to involvement as being the same as engagement and one of the most reliable predictors of student success within higher education. He held that students are more likely to succeed in college if they are more academically and socially engaged in educational activities (Tinto, 2012).

Active Learning: Kuh et al. (2005) expressed the importance of active and collaborative learning within the classroom, stating that students learn more when they are able to think about and apply what they are learning in various settings. Within an online classroom, students can participate in active learning with their instructors and peers through activities such as class discussions, presentations, group collaboration, or reflective writing (Beer et al., 2010; Kuh et al., 2005; Lundberg & Seridan, 2015; Price & Baker, 2012). Lundberg and Sheridan's (2015) study confirmed that interaction among students and direct communication with faculty contributed to students' involvement in the class and enhanced the overall learning experience.

While many researchers have conducted studies that support Alexander Astin's theory, most of the identified research involved traditional students who attended college campuses and failed to include non-traditional learners who commuted to campus or attended the evening and online classes (Price & Baker, 2012). In earlier definitions of involvement, scholars described the term as a physical participation in student organizations, attendance of campus events, and direct interaction with faculty and peers (Astin, 1984, Astin 1999, Price & Baker, 2012).

Various researchers have concluded that online learners are typically older and maintain at least part-time enrollments while pursuing their academic studies (Angelino, 2007; Beer et al., 2010; Fisher, 2010; Higher Education.com & Best Colleges.com, 2016; Park & Choi, 2009). Price and Baker (2012) questioned the usefulness of the NSSE as a measure of adult students' engagement as they discovered that adult learners scored significantly lower on the survey items

compared to traditional students. The authors suggest the results are related to adult learners' different motivations and desire to gain new skills and knowledge rather than create social relationships (Price & Baker, 2012).

Challenges of Student Engagement on the use of digital learning platform

Student engagement has been established as a key component of the learning process. Despite this recognition by researchers and scholars, Khan, Egbue, Palkie, and Madden (2017) reported that faculty faced challenges in fostering student engagement in online learning spaces. Most of these challenges are related to the transfer of traditional instructional methods to the online environment without modifying these methods for suitability in online settings. Khan et al. explored the mechanisms that could be employed in increasing the level of participation and engagement among learners and concluded that incorporating active learning strategies in designing and delivering instructional content was a critical requirement.

Other challenges of student engagement in the online learning environment are related to the mechanisms employed by students in their decision-making processes. Kahn, Everington, Kelm, Reid, and Watkins (2017) examined the need for students to engage in reflexive or involuntary reflective thought or activities when considering the actions to take about the demands of online learning. In the decision-making process, students first aligned the cause and effect of proposed actions to their social contexts prior to exercising the appropriate actions. The Kahn et al. research study demonstrated that the process of reflexivity could either encourage or discourage student engagement actions, where the latter could lead to frustration and, eventually, program withdrawal. By understanding this dynamic relationship between reflexivity and engagement, educational institutions can implement measures to promote active learning and engagement practices.

Student Satisfaction on the use of digital learning repository

Student satisfaction has been identified as an important factor in the journey of online students in higher education because it can impact students' engagement, motivation, learning, performance, success, and ultimately retention and graduation rates (Astin, 1993; Sahin & Shelley, 2008; Wickersham & McGee, 2008). In fact, student satisfaction was considered so important to the quality of online courses that the Sloan Consortium included it as one of the five pillars in its quality framework (Moore, 2005). In general, satisfaction is defined as the

fulfilment of a need, contentment or enjoyment (Merriam-Webster, n.d.). Astin (1993) defined student satisfaction as students' perception of value pertaining to their educational experience, which can encompass many elements and is therefore recognized as a multi-faceted concept (Wickersham & McGee, 2008). Building on existing literature, we define online learner satisfaction as "the fulfilment of a student's need and perceptions of contentment with the learner, instructor, course, program, and related organizational factors in the online learning environment."

The predictors of student satisfaction relate to academic achievement, performance, perceptions of the learning environment, success, persistence, and quality of the instructional design, content, and delivery (Artino, 2007, 2008; Bolliger & Martindale, 2004; Kuo et al., 2013, 2014; Puzziferro, 2008; Reinhart & Schneider, 2001; Thurmond, & Wambach, 2004; Yukselturk & Yildirim, 2008). These predictive dimensions of student satisfaction explored separately or combined, are viewed as the hallmark of the teaching and learning process (Yukselturk & Yildirim, 2008). For instance, a study of the relationship between the construct of student satisfaction and academic achievement in traditional versus online learning settings by Saeler (2015) showed that there was no statistical significance found between academic achievement and satisfaction in both learning environments. As with the construct for self-regulated practices, Moore's (1989) interaction model has been used as a framework to study the relationship between student satisfaction and interactions occurring at the (a) learner-learner, (b) learner-instructor, and (c) learner-content interfaces.

These studies have shown that there is a positive correlation between interaction and student satisfaction in both online and online learning (Ali & Ahmad, 2011; Bolliger & Martindale, 2004; Bray, Aoki, & Dlugosh, 2008; Dennen, Darabi, & Smith, 2007; Kuo et al., 2014; Lee, 2012; Thurmond & Wambach, 2004).

Dowell and Simmons (2012) found that many of the tools that facilitate student-to-student interaction were the least important, least satisfying and rated lowest in terms of meeting student expectations. This is consistent with previous research findings that show student-to-student interaction may be unimportant (May 1993) and leads to dissatisfaction (Bray, Aoki, and Dlugosh, 2008), but it is inconsistent with another, as suggested that peer interaction does lead to satisfaction (Eom., Wen, and Ashill., 2006; La Pointe and Gunawardena, 2004) and positive learning outcomes (Arbaugh and Rau, 2007). The tool the students found satisfying and important in terms of peer interaction was the forum – an open meeting space where messages

could be posted and discussed. Small et al. (2012) suggest that most students are satisfied with the virtual learning environment as a whole and, more importantly, with the tools they identified as important. This implies that while there is room for innovation, virtual learning environments can meet student expectations and satisfy their educational needs.

Zhang and Goel (2011) argued a positive attitude towards technology is an important variable leading to student satisfaction with a learning environment. In contemporary contexts, where interaction using online spaces is common, satisfaction is affected by more than just teaching styles. Eom., et al. (2006) argue that factors such as self-motivation, peer interaction, course structure, instructor feedback and facilitation all affect student satisfaction but may not necessarily lead to learning outcomes. Contrary, McGill and Hobbs (2008) suggest that fitting the task to the technology contributes to overall student satisfaction. In the following study, McGill and Klobas (2009) argue that teachers also need to consider their attitude towards online tools, the construction and value of social norms in the online environment, as well as how they use technology to facilitate the learning process. These considerations should improve teachers' use of online environments and can increase the satisfaction level that students experience. Small et al. (2012) summarized that satisfaction in education is driven by a combination of the student's capacity and goals, the teaching (quality and style) and a positive attitude towards technology that is being used to facilitate the education process.

Interaction between the student and the instructor, among students, and with the course, content and technology was the focus of Strachota's (2003) study of student satisfaction with online education. In her study, learner-content interaction ranked first as a determinant of student satisfaction, followed by learner-instructor and learner-technology interaction. Interaction between and among students was not found to be significantly correlated with satisfaction. Bollinger (2004) found three constructs to be important in measuring student satisfaction with online courses: interactivity, instructor variables and issues with technology. Palmer and Holt (2009) found that a student's comfort level with technology was critical to satisfaction with online courses. Secondary factors included clarity of expectations and the student's self-assessment of how well they were doing in the online environment. Drennan, Kennedy, and Pisarski (2005) also found positive perceptions of technology to be one of two key attributes of student satisfaction. The second was autonomous and innovative learning styles. Richardson and Swan (2003) focused on the relationship between social presence in online learning to satisfaction with the instructor. They found a positive correlation between students' perceptions

of social presence and their perceptions of learning and satisfaction. For Sahin (2007), the strongest predictor of student satisfaction was personal relevance (linkage of course content with personal experience), followed by instructor support, active learning and, lastly, authentic learning (real-life problem-solving).

Kuo, Walker, Belland, and Schroder (2013) highlighted that more studies had been conducted on learner-learner and learner-instructor interactions than on learner-content interactions. These studies revealed that the first two types of interactions were more suitably aligned with student satisfaction in online learning environments (Bolliger & Martindale, 2004; Jung, Choi, Lim, & Leem, 2002; Sher, 2009). Conversely, Kuo et al. (2013) found that the learner-instructor and learner-content interactions were better predictors of student satisfaction than the learner-learner interaction. While further studies using the interaction model showed that the learner-instructor interaction was the key predictor of student satisfaction (Battalio, 2007), the Kuo et al. study placed the learner-content interaction in the primary predictive position. Moreover, Kuo et al. inferred that the course design for online learning and ease of navigating the course material was critical to the interactive ability of learners and the content.

In reviewing the dimensions of student satisfaction, it was clear that these dimensions or outcomes of student satisfaction could be organized using the newly configured interaction model. The four-phase of interaction models are:

Table 3: Type of Interactions and Student Satisfaction Factors

Type of interactions	Student satisfaction factors
Learner-content	Quality of learning experiences Course activities aligned with expectations
Learner-instructor	Interactions with instructors
Learner-learner	Interactions with peers
Learner-online platform	Orientation program for online learning

Learning satisfaction represents learners' feelings and attitudes toward the learning process or the perceived level of fulfilment attached to one's desire to learn caused by the learning experiences (Topala and Tomozii, 2014). Previous research on online learning has shown that learners' satisfaction is a critical indicator of learning achievements and the success of online learning system implementation (Ke and Kwak, 2013). In the online context, satisfaction has

been found to be one of the most significant considerations influencing the continuity of online learning (Moore and Kearsley, 2011; Parahoo et al., 2016). To meet learners' real learning needs and create an effective learning environment, a growing body of literature has been conducted to examine various determinants of learners' online satisfaction (Shen et al., 2013; Hew et al., 2020; Jiang et al., 2021).

Factors Affecting Student Satisfaction on the use of Digital Learning repository

Baber (2020) identified several factors that prevent student's satisfaction with digital learning platforms:

- Administrative and technical issues
- Lack of academic and technical skills
- Lack of interaction
- Lack of motivation
- Lack of time and support for studies
- Problem with accessibility and affordably of internet usage.
- Online support service quality
- Perceived ease of use and usefulness of online platform,
- Computer self-efficacy
- Academic self-efficacy
- Online learning acceptance

Among the various factors that impact learners' online learning satisfaction and academic outcome, interaction in online learning can be seen as the key component, and its importance and effectiveness have also been emphasized by the theory of transactional online (Lee, 2010; Jan 2015; Jiang et al., 2021). Even though previous studies have confirmed the positive impact of interaction on online learning satisfaction, the mechanism behind this relationship has not been well addressed in the literature. Palmer and Holt (2009) stated that the ability and the confidence to learn from online courses and connect and engage with others were the main reasons explaining online learners' satisfaction. In this regard, this study argues that students' academic self-efficacy and engagement in online classes may explain the relationship between interaction and online learning satisfaction.

Student Satisfaction through engagement on the use of Digital Learning repository

The importance of student engagement in online learning has been stated by Martin & Bolliger (2018). Anderson (2003) has found that satisfaction can create student engagement; furthermore, satisfaction is also an essential topic related to student success in online learning. Student success becomes critical in the online environment since the online environment encourages students to depend mostly on their ability to learn. Verneil & Berge (2000) has shown that their activity mostly supports student success in online learning during the learning process. Blasco-Arcas et al. (2013) stated that two factors are directly associated with active learning: satisfaction and engagement. Wang & Baker (2015) stated that student engagement is a student effort to get involved in a specific course's learning processes. It has also become an important variable in conducting online learning effectively (Dixson, 2010). In an online environment, there are three types of interaction in engagement, as proposed by Bernard et al. (2009): interaction between students, student to instructor, and student to content. Lear et al. (2010) have proven that those types of interaction can help students be more active and engaged in their learning. Martin & Bolliger (2018) also confirm ed that engagement is critical to student learning and student satisfaction in their learning process. Therefore, student engagement can increase student satisfaction.

Studies related to student engagement, student satisfaction, and student success showed a positive correlation between each of the constructs and student success (Burrow & McIver, 2012; Korobova & Starobin, 2015; Webber et al., 2013). The studies were conducted in the traditional setting and used undergraduate student grades to measure academic success. Two of the studies examined data from the 2008 NSSE survey to assess the alignment of the engagement factors to student satisfaction and student success (Korobova & Starobin, 2015; Webber et al., 2013), while the correlation to student engagement in the third study was deduced based on improvements in student performance (Burrow & McIver, 2012). The NSSE benchmarks incorporated categories related to students' experiences with academic programs, relationships and interactions, and support. Findings from the Korobova and Starobin (2015) and Webber, Krylow, and Qin (2013) studies confirmed that interactions between faculty and students and staff and students were linked to the quality of the learning experience and desirable student outcomes. Additionally, the research showed that designing an appropriate assessment model can lead to overall academic success.

On in activity-based learning model encourages students to think critically and develop their practical skills when they learn actively and comprehensively by involving cognitive, affective and psychomotor domains. Student performances, satisfaction and engagement in online courses Research has demonstrated that activities that encourage online and social presence, enhance and build learner confidence and increase performance are critical factors in engagement (Anderson et al. 2014; Dixson 2015). Furthermore, Strang (2017) found that when students are encouraged to complete online activities such as self-assessment quizzes, this promotes their learning and engagement, resulting in higher grades. Tempelaar et al. (2017) postulated that factors such as cultural differences, learning styles, learning motivations and emotions might impact learner performances. Smith et al. (2012) deduced that students' pace of learning and engagement with learning materials are indicators of their performance and determinants of learning experience and satisfaction. Macfadyen and Dawson (2012) found that variables such as discussion forum posts and completed assignments can be used as practical predictors of learner performance and thus can be used to help in learners' retention and in improving their learning experiences

Theoretical Framework

Theories were used to explore the extent to which digital learning platforms will impact student engagement and student satisfaction and the relationship between the two constructs, student engagement and student satisfaction. These theoretical frameworks are the "community of inquiry" model for online learning environments developed by Garrison, Anderson & Archer (2000), The ARCS Model created by John M. Keller in the early 1980s and was developed to find "more effective ways of understanding the major influences on the motivation to learn, and for systematic ways of identifying and solving problems with learning motivation" (Keller, 1987), Self-Determination Theory (SDT), developed by researchers Edward L. Deci and Richard M. Ryan (1985), is a motivational theory that focuses upon three basic psychological needs: competence, relatedness, and autonomy and the constructivist model of Vygotsky that promotes student-centred learning (Ahn & Class, 2011). Each framework is presented separately below and shows the alignment between the theory and the digital learning platform and the two constructs of student engagement and student satisfaction.

Community of Inquiry (CoI) Model

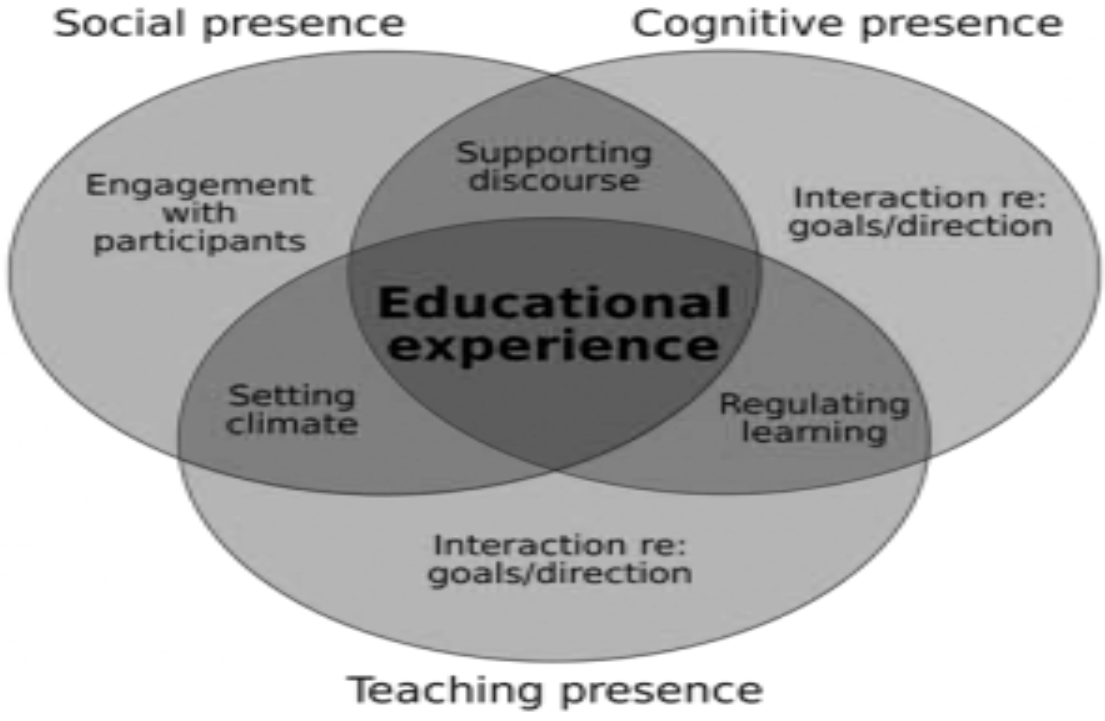
The community of inquiry has become one of the more popular models for online and blended courses that are designed to be highly interactive among students and faculty using discussion boards, blogs, wikis, and videoconferencing. The "community of inquiry" model for online learning environments developed by Garrison, Anderson & Archer (2000) is based on the concept of three distinct "presences": cognitive, social, and teaching. While recognizing the overlap and relationship among the three components, Anderson, Rourke, Garrison, and Archer (2001) advise further research on each component. Their model supports the design of online and blended courses as active learning environments or communities dependent on instructors and students sharing ideas, information, and opinions. Of particular note is that "presence" is a social phenomenon and manifests itself through interactions among students and instructors.

Community of Inquiry Framework Lipman (1991) has argued that education is inquiry. He suggests that "the community of inquiry is perhaps the most promising methodology for the encouragement of that fusion of critical and creative cognitive processing known as higher order thinking" (Lipman, 1991). Critical thinking is most often cited as the hallmark of higher education. Therefore, a community of inquiry could be the concept that best captures the ideal of a higher educational experience. Through student engagement in a community of inquiry, teachers can create the conditions for critical thinking, rational judgments, and understanding. Both a sense of community and commitment to the process of inquiry must be in place. The community of inquiry (CoI) model can be used as a framework to design, facilitate, and direct blended learning experiences in higher education. It has been the focus of extensive study and validation for over a decade (Garrison, 2017). The premise of the CoI framework is that higher education is both a collaborative and individually constructivist learning experience. A community of inquiry is where "students listen to one another with respect, build on one another's ideas, challenge one another to supply reasons for otherwise unsupported opinions, assist each other in drawing inferences from what has been said, and seek to identify one another's assumptions" (Lipman, 2003)

The three key elements or dimensions of the CoI framework are – social, cognitive, and teaching presence. It is at the convergence of these three mutually reinforcing elements that a collaborative constructivist educational experience is realized. Social presence creates an environment for trust, open communication, and group cohesion. Cognitive presence has been

defined “as the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry” (Garrison, Anderson, & Archer, 2001). It has been operationalized through the developmental phases of inquiry triggering event, exploration, integration, and resolution. The third and cohesive element, teaching presence, is associated with the design, facilitation, and direction of a community of inquiry. It is the unifying force that brings together the social and cognitive processes directed to personally meaningful and educationally worthwhile thinking” (Lipman, 1991). Critical thinking is most often cited as the hallmark of higher education. Therefore, a community of inquiry could be the concept that best captures the ideal of a higher educational experience. Through student engagement in a community of inquiry, teachers can create the conditions for critical thinking, rational judgments, and understanding. Both a sense of community and commitment to the process of inquiry must be in place. The community of inquiry (CoI) model can be used as a framework to design, facilitate, and direct blended learning experiences in higher education. It has been the focus of extensive outcomes.

Figure 4: Dimensions of the CoI framework



Social Presence

Of the three presences, social presence has evolved the most from the original conceptualization. Social presence is the ability of participants to identify with the community (e.g., course of

study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of protecting their individual personalities. It has been shown that text-based online communication, lacking in nonverbal communication cues (i.e., body language or physical presence), does not seriously restrict social presence (Rogers & Lea, 2005).

Rogers and Lea (2005) provide evidence that shared social identity with the group, not personal identity, is crucial for cohesive group behaviour. In fact, interpersonal bonds and conflicting personal goals could undermine the group's cohesion. For example, strong personal relationships may restrict critical discourse. For this reason, it is important, to begin with, group identity to build social presence and community in an educational context. If the intended result of social presence is to confer on the group a greater capacity to communicate and collaborate, then the group will work more productively to the extent that group members identify with the group, thus making the group more cohesive.

Cognitive Presence

Cognitive presence goes to the heart of the community of inquiry. It is defined by the inquiry process where learners are tasked with a problem or issue and construct meaning and confirm understanding through iteration between discourse and reflection (public and private worlds). The essence of cognitive presence is the practical inquiry cycle derived from the work of John Dewey. Cognitive presence is operationalized through the Practical Inquiry Model that reflects the phases of the educational process (Garrison & Anderson, 2003). The first phase is the recognition and definition of the problem or issue. The second phase is the exploration of the problem or issue through the gathering of relevant information and perspectives through individual searches and discourse. The third phase is making sense of the existing information to reach a resolution through reflection, sharing and critically analyzing the best ideas. The fourth phase is to test the best solution through the application, either vicariously or directly. Inevitably, the application phase is a catalyst to restart the inquiry process again to rethink, refine or construct a better solution.

Teaching Presence

The role of teaching presence is crucial in developing and sustaining a community of inquiry. The evidence is growing rapidly of the importance of teaching presence “as a significant determinant of student satisfaction, perceived learning, and sense of community” (Garrison &

Arbaugh, 2007). Like social and cognitive presence, teaching presence is multidimensional and developmental in nature. In many ways, the integrating force holds the social and cognitive elements together and ensures a functioning community of learners.

Teaching presence is hypothesized to have three responsibilities – design, facilitation and direct instruction (Anderson, Rourke, Garrison & Archer, 2001). The first aspect of teaching presence is designing the curriculum, tasks and timelines. Design sets the stage and the potential of the learning experience. Design is of particular concern in creating a community of inquiry and collaborative-constructivist learning experiences. Design and organisation are continuing challenges in such environments where learning is not predictable. Designing an online learning experience is challenging as it must concurrently consider social and cognitive presence concerns. Care must be taken to plan for the creation of a welcoming climate as well as activities that engage students in collaborative and reflective activities that have clear outcomes.

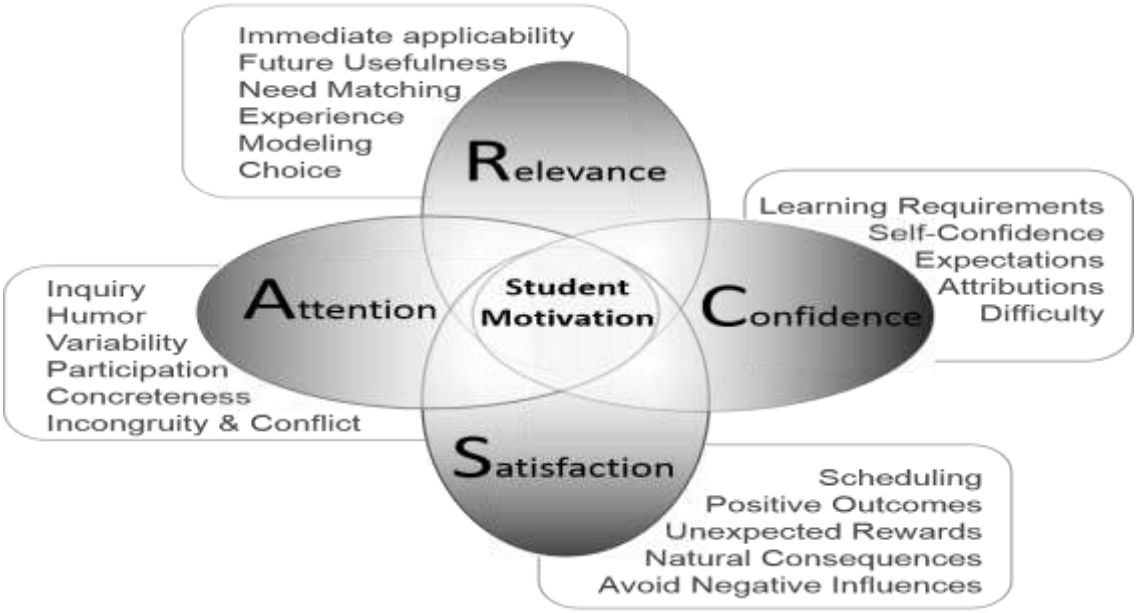
The second category of teaching presence is facilitating various learning activities. A common and potentially meaningful activity in online learning is the discussion forum. Here the primary responsibility of teaching presence is to monitor and manage discourse to ensure that it is productive and learners stay engaged. Too much or too little teaching presence in the form of facilitation can adversely affect keeping the discussion focused and realizing constructive outcomes. Collaborative learning activities such as project work will demand a different level of facilitation. While guidance must be readily available when the group needs it, care must be given to provide students with the necessary control and responsibility.

Keller's ARCS Model of Motivational (ARCS Instructional Design)

The ARCS Model was created by John M. Keller in the early 1980s and was developed to find "more effective ways of understanding the major influences on the motivation to learn and for systematic ways of identifying and solving problems with learning motivation" (Keller, 1987). Based upon theories of motivation and instructional design, it applied the expectancy-value theory that assumes that students are more likely to engage in an activity if it provides personal satisfaction and a positive probability for success (Keller, 1987). Keller was interested in the concept of motivational design because it could systematically produce replicable results over time in improving a learner's motivation to learn. Keller (2016) defines motivational design as a "process of arranging resources and procedures to bring about changes in motivation." According to Keller (1983), the ARCS Model of Motivational Design suggests that an

instructional designer can routinely improve a learner's motivation to learn by focusing on Attention, Relevance, Confidence, and Satisfaction (ARCS).

Figure 5: The ARCS model of motivational design



Attention: The first step in instructional design for motivation is to capture the learners' attention through either perceptual arousal or inquiry arousal. Using surprise, novel, engaging, and incongruous events at the start of a lesson will create perceptual arousal in learners and captivate their attention. Stimulating curiosity, wonder, and questioning by stating challenging problems and questions will create inquiry arousal in learners and capture their attention through intellectual or cognitive engagement. Key Question: is the content catching and keeping the learner's attention?

Methods to Activate Attention:

- Active Participation: encourage active participation by using games, roleplay, simulations, and other hands-on strategies to involve learners.
- Variability: use a variety of modalities (e.g. video, infographics, audio, short lectures, discussion groups) for presenting content.
- Humour: use cartoons and humorous anecdotes to maintain interest.
- Incongruity and Conflict: use debate and play the devil's advocate with comments that go against the learners' past experiences.

- Specific Examples: provide specific examples of the content through images, stories, and biographies.
- Inquiry: Ask questions and present problems or dilemmas for the learners to grapple with and discuss.

Relevance: Finding ways to connect the content to the learner's world ensures that the learning process is useful. Relevance helps connect the content to the real world. You can help establish relevance by using concrete language and examples that the learners will be familiar with. To establish relevance, you must consider how the content connects to the learner's goals, motives, and past experiences. Key Question: Why should the learner care about this content, and how does it connect to the learner's world?

Methods to Activate Relevance:

- Experience: show learners how new learning will use their existing skills and experience.
- Present Worth: help to show how the content will be immediately useful to them.
- Future Usefulness: help to show how the content will be useful to them in the future.
- Needs Matching: show how the content connects to the learner's needs.
- Modelling: show learners how to apply the learning and what to do. This helps them to walk the walk, so to speak. Other strategies include guest speakers, videos, and having learners function as tutors once they have the content.
- Choice: Build in choice so learners can use different ways of showing what they know. It allows them to play to their strengths.

Confidence: Learners have to feel they can succeed. If a learner perceives the content as too difficult, they may not even try to learn the content or may not try their hardest because they expect to fail. If the difficulty is too great, motivation will decrease. The content has to be organized in such a way that the learner feels they have the skill and ability to accomplish the task or understand the content. Key Question: Does the learner feel like they can succeed in learning this content?

Methods to Activate Confidence

- Provide Objectives & Prerequisites: objectives & prerequisites empower learners to estimate their likelihood of success. Objectives let learners see what is expected of them by

the end of the learning. Prerequisites empower learners to self-check if they have the prerequisite knowledge or skills. Learners can then take steps to address any deficiencies.

- Plan for Meaningful Success: scaffold and organize the learning so learners can experience success. The success should be substantial enough so it is meaningful and represents some accomplishments. There is a fine balance between too hard and too easy.
- Grow the Learners: scaffold and organize content so the learning increases in difficulty. This allows for growth in the learner.
- Feedback: provide feedback that supports the learner in attributing their effort to their success with learning the content.
- Learner Control: learners should have some degree of control over their learning path and assessment. They need to see that their success directly results from their choices and effort.

Satisfaction: Learning should be rewarding and satisfying for the learner. Satisfaction comes at the end of learning the content as the learner meets the goals and objectives as well as has their needs met by the learning. Satisfaction can also come from achievement and praise. Key Question: Does the learner feel good about their accomplishment in learning this content?

Methods to Activate Satisfaction

- Intrinsic Reinforcement: encourage the pleasure of learning for its own sake or to achieve personal goals. Learning should be useful and beneficial to the learner. Help them to see this benefit by applying the learning in a real-world setting.
- Extrinsic Rewards: give unexpected rewards and direct encouragement to learn.
- Equity: keep standards high, so learners know they are achieving. Do not over-reward simple tasks.

The ARCS Model of Motivational Design can be a beneficial tool in the development and assessing course activities because it provides a problem-solving, practical approach founded on theory and research (Keller, 2010). By building engaging activities and providing useful feedback, instructional designers and faculty members can greatly enhance the likeliness of student success. (Beffa-Negrini et al, 2002). However, as Keller (2010) noted, the model does have limitations. Not all instructors sense the responsibility of motivating their students. Faculty members who assume some responsibility for motivating their students to engage within their classroom best implement the model (Beffa-Negrini et al., 2002; Keller, 2010). Students ultimately choose whether to commit to completing assignments and tasks. Beffa-Negrini et al.

(2002) recommend the use of the ARCS Model with the understanding that assessment and adjustments should be made often as student cohorts and behaviours may often change as well. They suggest that instructors model respectful and clear online communication while also drawing attention to community building so that students will avoid isolation and have increased satisfaction with the learning experience (Beffa-Negrini et al., 2002).

Self-Determination Theory

Self-Determination Theory (SDT), developed by researchers Edward L. Deci and Richard M. Ryan (1985), is a motivational theory that focuses on three basic psychological needs: competence, relatedness, and autonomy. Deci and Ryan stated that intrinsically motivated students, who maintain more autonomous behaviours, tend to engage more actively than those who are more extrinsically motivated by recognition of instructors or grade assessments (Deci & Ryan, 1985; Lee & Hannafin, 2016). Shillingford and Karlin (2013) defined intrinsic motivation as "the doing of an activity for its inherent satisfaction rather than for some separate consequence. Schunk and Zimmerman (2012) explained that intrinsic motivation deals with one's personal interest and enjoyment of a task, while extrinsic motivation relates more to external rewards, such as wealth, recognition, and so on. Both are known to affect student motivation, but intrinsic motivation has proven to be more productive in supporting a student's need for autonomy and overall success in competence and performance (Chen & Jang, 2010; Schunk & Zimmerman, 2012).

Yoo and Huang (2013) conducted a quantitative study that supports the two levels of extrinsic motivation, in which adult learners need to apply what they learn in solving real-life problems. Another study found that students are intrinsically motivated when they can participate in activities that allow them to use specific skills and interests, receive constructive feedback, and avoid demeaning or unnecessary evaluations (Shillingford & Karlin, 2013). Because online learners are typically non-traditional and working students, it is important to understand what increases their motivation to pursue and successfully reach their individual goals. Shillingford and Karlin (2013) observed that participants displayed the four motivational factors of intrinsic, short-term extrinsic, long-term extrinsic, and willingness to learn new technology and applied findings to determine online learning programs' benefits. While few research studies have been conducted to determine how the self-determination framework directly relates to engagement, various scholars have used the framework to develop strategies for framework development

and practice within a classroom environment (BeffaNegrini, 2002; Cohen, Miller, Chen & Jang, 2010; Lee & Hannafin, 2016; Reeve, 2012; Sibold, 2016). Harnett, St. George, and Dron (2011) used this model to explore if learners were more engaged by intrinsic or extrinsic motivations. They learned that students were engaged by a variety of motivations, both intrinsic and extrinsic, and one was not more prevalent than the other (Harnett et al., 2011).

Constructivism

Constructivism emerged as a learning theory based on the contributions of philosophers Piaget on cognitive development through the construction of knowledge and Vygotsky on the social context of cognitive development (Brown, 2014; Guo, 2018; Johnson, 2017; Wang, 2014). The Vygotsky approach to the constructivist theory fosters student-centred learning in a collaborative learning environment (Ahn & Class, 2011; An & Reigeluth, 2011). Focusing on higher-order critical thinking skills, the constructivist model supports self-regulated learning, student engagement, and social and cognitive interaction skills. Creating a collaborative learning environment is a critical requirement for online learning platforms as it allows students to take an active part in the learning process.

Further, it is argued that the online learning environment is better aligned with the constructivist model than the traditional mode of learning as the online platform allows learners to create meaning from their interactions with the learning content (Guo, 2018; Johnson, 2017). A collaborative learning environment is also integral to applying the andragogical learning model (Ahn & Class, 2011; An & Reigeluth, 2011). Studies illustrating the use of the constructivist model confirmed that student competencies to direct their learning were strengthened through engagement, collaborative, and technological supportive activities to produce positive learning outcomes (Blayone, vanOostveen, Barber, DiGiuseppe, & Childs, 2017; Chitanana, 2012; Cortés & Barbera, 2013; Seo & Engelhard, 2014).

The interaction and interplay between the community of inquiry model, self-determination theory and Keller's ARCs model of motivational design model are evident from the literature review conducted, and the three theories present a comprehensive, integrated framework within which the study can be conducted. Furthermore, the theories are linked to the successful delivery of the learning content through creating and aligning the components of a social presence, cognitive presence, and teaching presence in the online environment. These three components are synonymous with Moore's (1989) interaction theory, which identifies three

types of interactions occurring in the learning process: learner-content, learner-instructor, and learner-learner interactions. These interactions result in learners playing an active role in student engagement and self-regulation activities to achieve student satisfaction and academic success.

Empirical studies

In various literature and previous research, engagement and satisfaction are closely associated with digital learning platforms (Beer, Clark & Jones, 2010; Chen & Jang, 2010; Diemann & Bastiaens, 2010; Dixson, 2010; Gray & DiLoreto, 2016; Huett, Young, Huett, Moller and Bray, 2008; Kim & Frick, 2011; Kuo, Walker, Schroder & Belland, 2014; Shillingford & Kerlin, 2013; Wang, Shannon & Ross, 2013; Yoo & Huang, 2013). Sampson et al. (2010) stated that students' satisfaction and outcomes are good indicators for assessing the quality and effectiveness of digital learning platforms. It is of concern for institutions to know whether its students, in general, are satisfied with their learning experience (Kember and Ginns 2012). Another essential element of a quality digital learning platform is learner engagement. Learner engagement refers to the effort the learner makes to promote his or her psychological commitment to stay engaged in the learning process, acquire knowledge, and build critical thinking (Dixson 2015). While there are different conceptualizations of student engagement (Zepke and Leach 2010), learning analytics advocates tend to emphasise the analysis of platform access logs, including clicks on learning resources, when it comes to student engagement in online learning (Rienties et al. 2018). The proposition is that being online through logins, active sessions, and clicks reflect actual engagement in an online course and results in better student performances. However, this model mainly works in classic online modules, and there is limited literature measuring students' engagement in activity-based hybrid learning environments where there is a mix of online and offline activities (Rajabalee et al., 2020).

Numerous studies have been conducted on student engagement in traditional and digital learning environments Kuh, 2003; Mello, 2016; Pellas & Kazanidis, 2015; Robinson & Hullinger, 2008; Schreiber & Yu, 2016). These studies linked student engagement to the key factors impacting the learning process, including instructional design and delivery, technology support, self-regulated or self-directed learning, student satisfaction, persistence, student performance, and student academic success. The role of the instructor in fostering student

engagement also has been explored and found to be an additional key factor, particularly considering the transition process to digital platforms (Cho & Cho, 2014; Ma, Han, Yang, & Cheng, 2015). More recently, there has been a focus on the relationship between engagement, the colaborative learning environment, a, Technology has been found to enhance the collaborative environment by creating active learning sites.

Prior studies have indicated the significant impact of student engagement on student satisfaction in different digital learning platforms (Blackmon & Major, 2012; Dixon, 2010; deNoyelles et al., 2014; Fisher, 2010; Gillett-Swan, 2017; Holley & Taylor, 2008; Huang & Hsiao, 2012; Lundberg & Seridan, 2015; Rabe-Hemp et al., 2009; Robinson, 2008; Roby et al., 2013; Wyatt, 2011). For example, Murillo-Zamorano et al. (2019) found that in the case of online learning, student satisfaction with flipped classrooms when students use technology means such as pre-recorded videos, to attend lectures out of class time and work collaboratively under the supervision and support of online course instructors (Findlay-Thompson & Mombourquette, 2014) was significantly and positively influenced by their engagement. Similarly, students' engagement in flipped classrooms heightened their performance and levels of satisfaction. Furthermore, Bolliger and Halupa (2018) revealed that in the context of online programs, student engagement had a significant positive association between student engagement and student outcomes, specifically with regard to their learning perception and satisfaction. The study of Gray and DiLoreto (2016) also confirmed this significant impact of student engagement on student learning in and satisfaction with online learning and also found that student engagement mediated the relationships between the presence of the course instructor and student satisfaction.

The use of digital learning platforms is in its infancy in most college and university curriculums (Dede & Richards, 2012). Several noted benefits, however, have been documented in higher student performance, student satisfaction, and dropout prevention (Centner, 2014; Czerkawski & Lyman, 2016; Dixson, 2015; Handelsman, Briggs, Sullivan, & Towler, 2005). However, there is generally limited formal use and implementation of such platforms, even though accessibility is widespread (Selwyn, 2007). Lee, Courtney, Balassi, Roca, Chiu, and Martinez (2010) surmise that computer literacy is a factor in platform use, finding that a higher degree of literacy is positively related to greater use and success. Oppenheimer (2003) finds an inverse relationship between classroom technology and the interaction between students and teachers. Does a student's lack of computer literacy skills adversely affect class performance in classes

using digital learning platforms? Marcal & Roberts (2000) considered Cengage's Aplia or MindTap and found that students already possess the necessary skills for these online learning tool applications, and a computer literacy prerequisite course for such classes is not warranted.

The effectiveness of well-trained students in the online learning arena facilitates underdeveloped areas of the world (Utsumi, Boston, Klemm, & Miller, 1997). This benefit extends to delivering training and similar application to stakeholders who support the institution (Latchem, Mitchell, & Atkinson, 1994; Walsh & Reese, 1995). This may or may not make the course more interesting to students, as research shows expected enjoyment is higher than actual enjoyment (Cleveland and Bailey, 1994), although attitudes play a role (Davis, Bagozzi, & Warshaw, 1989) and self-responsibility is a contributing factor (Wang & Stiles, 1976). Evidence exists that instructor attitudes are a causal factor in media effectiveness (Dillon and Gunawardena, 1995) which Webster and Hackley (1997) observed in technology-mediated online learning. Regardless, learning is best accomplished in an active, engaging environment where course design facilitates and encourages learning (Adelson, 1992; Hsi & Agogino, 1993). Interaction from multimedia exposure (Collis, 1995) or via online learning (Borbely, 1994; Latchem et al., 1994) should be considered in the design of an online learning environment (Ellis, 1992).

Concentration is a universal attribute required of online education students relative to face-to-face, classroom engagement (Kydd & Ferry, 1994). Fostering better concentration avoids distraction and establishes a foundation for positive learning outcomes (Gowan & Downs, 1994; Isaacs, Morris, Rodriquez, & Tang, 1995; Nahl, 1993; and Schwartz, 1995) in transforming from teacher based to learner-based curriculums (Tapscott, 1999). Evidence suggests that clear distinctions exist between online and traditional learning. Bennett, McCarty, and Carter (2011) found a significant grade difference between stronger and weaker students in online versus traditional classes, suggesting that online instruction perhaps requires more defined student skillsets, abilities, or motivation. Students are less likely to recall and retain information accessed via a computer as opposed to a print format (Jones, Pentecost, & Requena, 2005). These students become less focused in their approach to gathering and learning facts (Mangen, 2008), and exhibit less accuracy over a longer period required in accessing information (Dillon, 1992). Conversely, hernandez-Julian and Peters (2012) found seven percent higher completion rates of homework assignments submitted electronically than for students who otherwise submit via paper. The result is higher homework scores even though final exam performance

was unaffected. Thus, the realized benefit in this sample suggests higher completion rates produce higher accompanying points earned, as opposed to affecting the quality of learning from an observable medium.

Webster and Hackley (1997) explain that research in the area of student engagement has room for more exploration. Media technology vis-à-vis instructor presentation and delivery is an emerging area of interest. Individual interaction with the technology (Bruce, Peyton, & Batson, 1993; Jacques, Preece, & Carey, 1995) has formed a basis for such research that can be applied across a learning spectrum of individual instruction. Student perceptions of the usefulness of various forms of technology relate to teaching delivery (Moore & Benbasat, 1991; Boozer & Simon, 2019). A significant consideration when developing curricula is to engage students to maximize course outcomes, especially to the extent that students are encouraged to become autonomous learners. Findings by Boozer and Simon (2019) support results examined by Nguyen and Trimarchi (2009) that a perceived academic and economic value exists when MindTap or Aplia is a larger component of a course. (Cotterall, 1995; Leatherwood, 2006) found that a disproportionate trend exists in larger classes with less faculty availability. For those classes, more online and blended options are frequently offered, which creates more independence in a changing world requiring multifarious skills.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter is solely concerned with collecting data from the field and arriving at the results. The methodology is the detailed procedure used to answer the research questions. (Oso and Onen, 2005). This chapter consists of the following: Research design, Area of the study, sample and sampling techniques, validation of research instruments for data collection and the justification for their usage shall be explained in this chapter. The methodology used in this study falls within the limits of social science research methods as presented below:

Research Design

According to (Burns and Grove, 2003), a research design is a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings". (Amin 2005) also stated that a research design is a detailed plan and method for systematically and scientifically obtaining the data to be analysed. The function of the research design is to ensure that the evidence obtained enables the researcher to answer the research questions as conveniently as possible. This study was designed to explore the impact of Digital Learning repository on student engagement and satisfaction in some secondary schools in the Mfoundi division. The study used a descriptive survey design. According to (Gay 1976), descriptive research involves collecting data to answer questions concerning the status of the subject under study. Saunders, Lewis and Thornhill (2007) describe descriptive research as one for which the purpose is to accurately represent persons, events or situations. This design is used because the main aim is to describe the field's situation and generalize the findings to the target population.

Area of Study

This study was carried out in Mfoundi division in the Centre region of Cameroon. Mfoundi division has seven sub-divisions. This division harbours many secondary schools, which are both private and government secondary schools. The division covers a total surface area of about 297 square km as of 2005, with a total population of about 1881,876 (Central Bureau for population census in Cameroon, 2005). (BUCREP). Below is the map of the Mfoundi Division.

Figure 6: Map of Mfoundi Division

THE MAP OF MFOUNDI DIVISION

SOURCE: United Councils & Cities of Cameroon: Yaoundé VI, CVUC.CM

Population of Study

According to Amin (2005), a population is the totality of all the components relevant to certain research. When drawing conclusions from a sampling study, the researcher is interested in the entirety or aggregate of things or people who have one or more traits in common. Asiamah et al. believe that population members must share at least one common attribute. This characteristic qualifies participants as population members. Two thousand sixty-seven Lower Sixth Art students public secondary school students in Mfoundi make up the study population (source: MINESEC 2021).

Target Population

The researcher intends to generalize the findings to this population. The target population, often known as the parent population, may not always be reachable to the researcher (Amin, 2005). For Asiamah et al. (2017), the set of people or participants with particular traits of interest and relevance is referred to as the target population, and it is the portion of the general population that remains after it has been refined. The researcher must therefore identify and exclude members of the general population who might not be able to share experiences and ideas in sufficient clarity and depth from the target population. Therefore, the target population of this study comprises ten (10) secondary schools drawn from the seven subdivisions of Mfoundi. Students were chosen because the Digital Learning repository was designed to facilitate the learning of the student.

Accessible population

This is the population from which the sample is actually drawn (Amin,2005). Asiamah et al. (2017) corroborate this by postulating that after eliminating every member of the target population who might or might not engage in the study or who cannot be reached during that time, the accessible population is then reached. The last group of participants is the one from whom data is gathered by polling either the entire group or a sample taken from it. If a sample is to be taken from it, it serves as the sampling frame. People eligible to engage in the study but unable to participate or would not be available at the time of data collection are referred to as the accessible population. The accessible population of this study is drawn from seven (07) government bilingual high schools where students of Lower Sixth Arts in English sub-system of education were targeted. The researcher, therefore, had access to 315 students drawn from the seven (07) schools, as seen below.

Table 4: Distribution of accessible population per school

No	Name of school	Sub-division	Accessible population
1	Government bilingual high school Nkol-Eton	Yaounde 1	182
2	Government bilingual high school Emana	Yaounde 1	175
3	Government bilingual practising high school Yaounde	Yaounde 3	244
4	Government bilingual high school Ekounou	Yaounde 4	194
5	Government bilingual high school Yaounde	Yaounde 5	198
6	Government bilingual high school Mendong	Yaounde 6	276
7	Government bilingual high school Ekorezock	Yaounde 7	163
	Total		**1432**

Source: Division of personnel, the divisional delegation of secondary education 2022

Table 4 above shows the accessible population, which is 1432 in the targeted seven schools.

Sample of the study

The sample of this research work was drawn from the accessible population of 315 students of the English- system of education from the seven schools that the researcher had access to. Amin (2005) views a sample as a portion of the population whose results can be generalized to the entire population. The author further adds that a sample can also be considered as a representative of a population. Majid (2018) corroborates this by asserting that because the community of interest typically consists of too many people for any research endeavour to involve as participants, sampling is a crucial tool for research investigations. A good sample is one that statistically represents the target population and is sizable enough to provide an answer to the research issue. The sample size was determined using Research Advisor (2006), which constituted 310 Lower Sixth Art secondary school students drawn from seven schools representing the seven sub-divisions in Mfoundi.

Table 5: Distribution of sample per school

No	**Name of school**	**Sub-division**	**Accessible population**	**Sample**
1	Government bilingual high school Nkol-Eton	Yaounde 2	182	48
2	Government bilingual high school Emana	Yaounde 1	175	45
3	Government bilingual practising high school Yaounde	Yaounde 3	244	45
4	Government bilingual high school Ekounou	Yaounde 4	194	45
5	Government bilingual high school Yaounde	Yaounde 5	198	47
6	Government bilingual high school Mendong	Yaounde 6	276	45
7	Government bilingual high school Ekorezock	Yaounde 7	163	40
	Total		**1432**	**315**

Source: Krejcie & Morgan,1970

Sampling technique

Every research involves, to some degree or another, a sampling process. Sampling is one of the most important steps in research; it will lead to valid results when carefully done. Sampling is a process of selecting representative portions of a population which can permit the researcher to make utterances or generalizations concerning the said population. It can also be the process of selecting elements from a population so that the sampled elements selected represent the population. Sampling is involved when any choice is made about studying some people, objects, situations or events rather than others. A good sample should be representative of the population from which it was extracted. Regardless of the sampling approach, the researcher should be able to describe the characteristics and relate them to the population (Amin,2005).

Sampling techniques refer to the various strategies a researcher uses to draw out a sample from the parent population of the study (Amin, 2005). There are two main sampling strategies. There are probability and non-probability strategies. The sampling technique suitable for this study is probability sampling, in which all the elements of the population have some probability of being selected. Probability sampling will provide a base for the researcher to generalize about the population.

The type of probability sampling technique employed in this research is simple random sampling (SRS). Amin (2005) opined that a simple random sample is a sample obtained from the population in such a way that samples of the same size have equal chances of being selected. The researcher proceeded through this method by selecting the accessible population comprising seven government bilingual high schools in Mfou

ndi. This was done through the random number method, in which Amin (2005) says if there are numbers that identify the elements of the population, then the random number method will be appropriate. The researcher proceeded as follows;

The numbers 01,02,03…..10 were attributed to all the government bilingual high schools in Mfoundi division on folded pieces of paper in a basket. The researcher pleaded with two neighbours who randomly selected 3 and 4 schools each from the basket. These seven schools were selected to represent the seven schools used in the accessible population.

Through this technique, no school or student was left out, ensuring the representativeness of all government bilingual high schools in Mfoundi division.

Instrument for Data collection

An instrument is any tool that has been methodically built to collect data and should be accurate in gathering the specific data required for the study. The questionnaire is the tool utilized to gather data for this investigation. According to Amin's definition from 2005, a questionnaire is a professionally crafted tool used to gather data in line with the research questions and hypothesis requirements. He continues by saying that a questionnaire can be thought of as a self-report tool used to collect data on factors of interest in research. A questionnaire is a useful tool for gathering survey data, providing structured, frequently numerical data, being able to be administered without the presence of the researcher, and frequently being comparatively simple to analyze, as Cohen et al. (2007) reiterated. It is a tool for gathering data with specific questions that the respondent must answer and then return to the researcher. This study make use a questionnaire.

There are two different kinds of questionnaires: closed and open-ended. The type of study is the only factor influencing the questionnaire selection. This study will make use of Likert-style rating scales. These Likert-style rating scales are simple to code and take little time to complete. The data collection instrument (questionnaire) for students is made up of four (4) sections; the first (1) section contains the respondent's demographic data. Section two (2) on the use of Digital Learning Platforms, section three (3) on student engagement, and section four on student satisfaction. There are 33 items in all the other sections of the questionnaire, and respondents were requested to tick the box that corresponds to their point of view. The four options that were used and their corresponding weights were as follows;

Table 6: Questionnaire options and corresponding weights on the Likert scale

Option	Weight
Strongly Agree (SA)	4 Points
Agree (A)	3 Points
Disagree(D)	2 Points
Strongly Disagree (SD)	1 Point

Table 6 shows how the questionnaire was weighted with the various options, from 4 points for SA to 1 point for SD.

Administration of research instrument

This section of the work has to do with fieldwork proper. Questionnaire was taken to the different schools alongside the research authorization issued by the Dean of faculty. The researcher recruited two research assistants who helped in the administration of the instrument. Before going to each school, various school heads obtained permission, and the research authorization facilitated this aspect. Some of the questionnaire were filled on the spot and returned to the researcher or assistants. Some respondents returned their questionnaires home after one, two or three days. Generally, a good number of students did not hesitate to fill out the questionnaires.

Development of instruments

The process of developing the questionnaire started with a review of literature related to manpower management and its impact on quality assurance. Data exploitation enabled the researcher to accurately construct the questionnaire. Some items of the questionnaire were equally adapted from https://www.surveymonkey.com/r/HK7PWYT. The questionnaire is made up of 33 items designed for secondary school students. After developing the questionnaire, the researcher proceeded to conduct a pretest to test the validity and reliability of the instrument.

Validity of the instrument

One of the criteria a measuring instrument must meet is that of validity. According to Kasomo (2006), validity refers to the quality of a procedure or instrument to determine if the research is accurate, correct, true, meaningful and right. The validity, therefore, implies that we want to obtain what we are supposed to measure. This means that the test must measure the characteristics that it intends to measure. In this study, content validity is of interest to the researcher. Kasomo (2007) states that content validity refers to the degree to which the test measures what it is intended to measure. Kasamo (2006) observes that the content validity of an instrument is determined through expert judgment by carefully examining or inspecting the items that make the instrument. In order to ascertain content validity, the questionnaires were presented to the supervisor and other experts for scrutiny and advice. The content and impressions of the instrument were improved based on their advice and comments. The questionnaire items were then constructed in a way that they were better related to each question.

This ensured that all the research items were covered. A pilot study was used to ensure that the questionnaires were directed to respondents who were qualified to give information and that information obtained was representative of information elicited from the entire population.

Reliability of the instrument

According to Kasomo (2006), reliability refers to consistency in a research procedure or instrument. Reliability tells us the ability of a test to produce the same results at different intervals by the same persons. Hence, reliability implies an instrument or procedure's stability or dependability in obtaining information. Orochi (2008) states that "reliability of measurement concerns the degree to which a particular measuring procedure gives similar results over a number of repeated trials". In order to establish the reliability of the instrument, we did the piloting test. The questionnaire was first administered to students in schools that were not among the chosen sample. The results of the pretest were tested using the reliability coefficient of .843.

Administration of the Questionnaire

The questionnaire was taken to various schools by the researcher. The principal of each school was contacted to obtain permission to meet the students. All the students filled out the questionnaire on the spot. After filling, the questionnaires were returned to the researcher. The administration of the questionnaire went on smoothly because the majority of the students did not hesitate to fill out the questionnaire.

The return rate of the instrument

The return rate indicates the number of questionnaires that were received at the end of the research after the questionnaires were administered to respondents. The return rate for this study was calculated using simple percentage based on the formula below

$$R = \frac{\sum RQ}{\sum AQ} \times \%$$

Where;

R= Return rate

∑RQ= Sum of questionnaires returned

∑AQ= Sum of questionnaires administered

% = Percentage expressed as a hundred

The rate of return of questionnaires for this study was calculated as follows;

Total number of questionnaires administered = 315

Total number of questionnaires returned = 310

Therefore, return rate is = 310⁄315 * 100 = **98.4%**

Data analysis procedure

Data were analyzed quantitatively with the aid of SPSS (statistical package for social sciences). Quantitative analysis provides the analyst with tools to examine and analyze past, current and anticipated future events. Using quantitative data analysis allows the researcher to organize, summarize, and prepare the data for dissemination to others.

The data for this study were analyzed descriptively and inferentially using the SPSS version. Descriptive data were analyzed using simple frequency, percentages, mean and standard deviation. For inferential statistics, correlation, ANOVA and regression were used.

Ethical Issue

Ethical consideration is one element of encouraging respondents to answer research questions without any fear of favour. The researcher briefed the respondents on how the questionnaire was to be filled. The researcher obtained informed consent from the respondents before administering the questionnaire and equally assured them of total confidentiality and that it will only be used for educational research purposes. Students were advised to respond to the entire questionnaire.

Operational definition of variables

Elmes et al. (1995) state that "variables are what make an experiment run". In addition to this, effective selection and manipulation of variables make the difference between a good experiment and a poor one. There are two types of variables used in this work which include; the dependent and independent variables. This section shows the general and specific hypotheses, their respective dependent and independent variables, the modalities of the variables, the indicators of the modalities, the measuring scale and the statistical test for verifying the hypothesis.

The Independent Variables

It is also known as the predictor variable or explanatory variable. These are variables that are manipulated and used as explanatory factors in the study. The independent variable is the one that influences the dependent variable, and it is the presumed cause of the variation in the dependent variable(s), Amin (2005). It explains or accounts for the variation in the dependent variable. The independent variable for the study is the "Digital Learning Platform".

The Dependent Variable

This refers to the variable of primary interest in the study. According to Amin (2005), it is the variable whose effect is being studied. The researcher's goal is to understand and describe the dependent variable in this study, explain its variability or predict it. It is also known as the criterion variable. The dependent variable in this study is "Student Engagement and Satisfaction". This can be manifested as interaction, communication, engaged learning, cooperation, active learning, technology efficiency, participation and performance. Just name a few.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

This study aimed to examine the impact of digital learning repository on student engagement and satisfaction in secondary schools. This chapter seeks to answer the questions raised in the study and test the research hypotheses.

Data Screening

The data was screened for univariate outliers. Of the returned questionnaire, there were neither outliers nor missing values. Hence the analysis of the study will be based on a total of 310 questionnaire.

Demographic characteristics

Table 7: Gender Distribution of Respondents

	Frequency	Percent
Male	120	38.7
Female	190	61.3
Total	**310**	**100.0**

The table represents the gender distribution of respondents. In the context of this study, we use a population of 310 respondents. According to the table, 120 of the respondents are male while 190 of the respondents are female, making a percentage of 38.7 and 61.3, respectively. This variation is due to the fact that there are more females than males in the sample schools. This indicates that most of the students in secondary schools in Mfoundi-Division are females.

Figure 7: Gender Distribution of Respondents

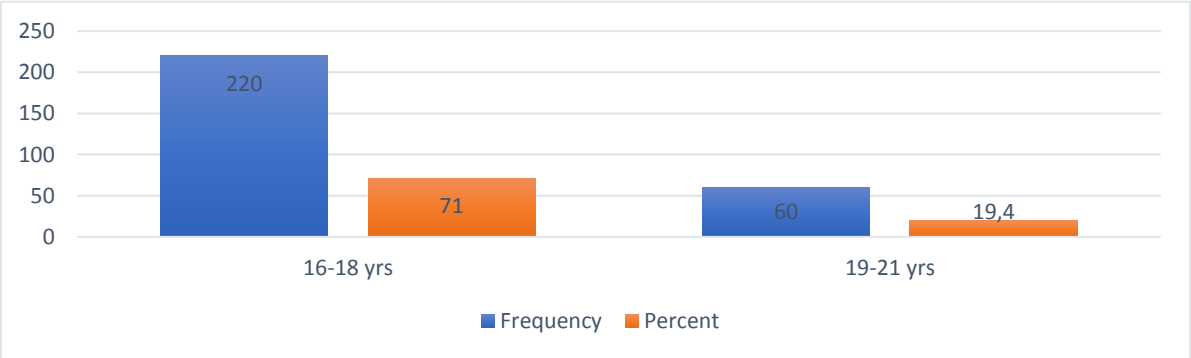


Table 8: Distribution of Respondents based on Age Group

	Frequency	Percent
16-18 yrs	220	71.0
19-21 yrs	60	19.4
22-24 yrs	20	6.5
25 and above	10	3.2
Total	**310**	**100.0**

The result shows that 71% of the students are of 16 to 18 years, 19.4% have ages between 19 to 21 years, 6.5% of 22 to 24 years of age and 3.2 % are of age 25 and above.

Figure 8: Distribution of Respondents based on Age Group

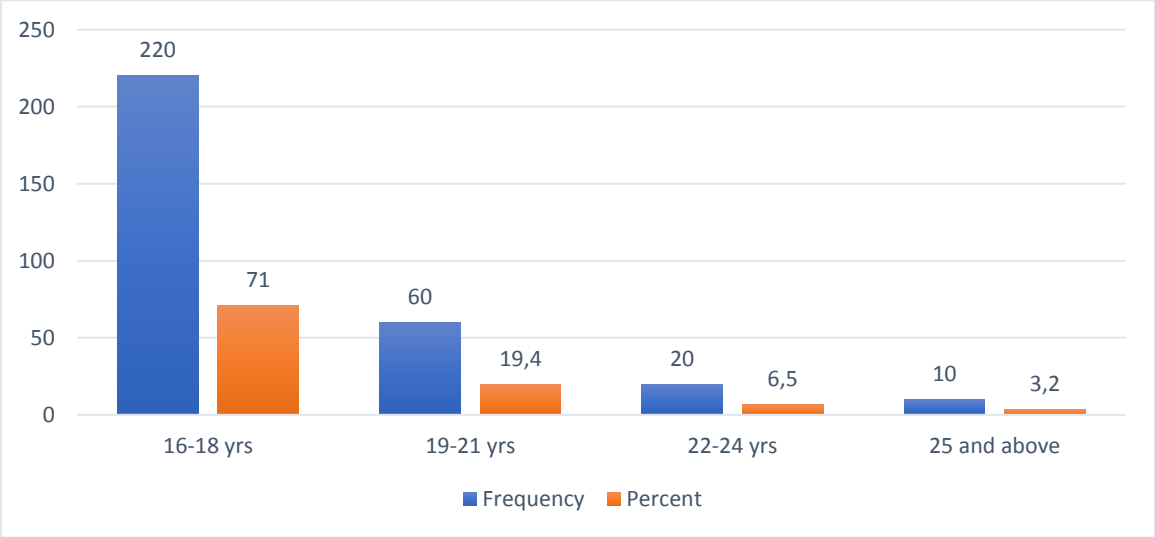


Table 9: Distribution of respondents based on schools

	Frequency	Percent
Government bilingual high school Emana	46	14.8
Government bilingual high school Nkol-Eton	44	14.2
Government bilingual practising high school Yaounde	44	14.2
Government bilingual high school Ekounou	44	14.2
Government bilingual high school Yaounde	47	15.2
Government bilingual high school Mendong	45	14.5
Government bilingual high school Ekorezock	40	12.9
Total	**310**	**100.0**

The above table represents the seven selected bilingual secondary schools in Mfoundi Division; the questionnaire was distributed in these schools. Government bilingual high school Emana with a frequency of 46, giving a percentage of 14.8; Government bilingual high school Nkol-Eton with

a frequency of 44, giving a percentage of 14.2; Government bilingual practising high school Yaounde and Government bilingual high school Ekounou both with a frequency of 44 giving a percentage of 14.2, Government bilingual high school Yaounde with a frequency of 47 giving a percentage of 15.2, Government bilingual high school Mendong with a frequency of 45 giving a percentage of 14.5, and Government bilingual high school Ekorezock with a frequency of 40 giving a percentage of 12.9.

Figure 9. Distribution of respondents based on schools

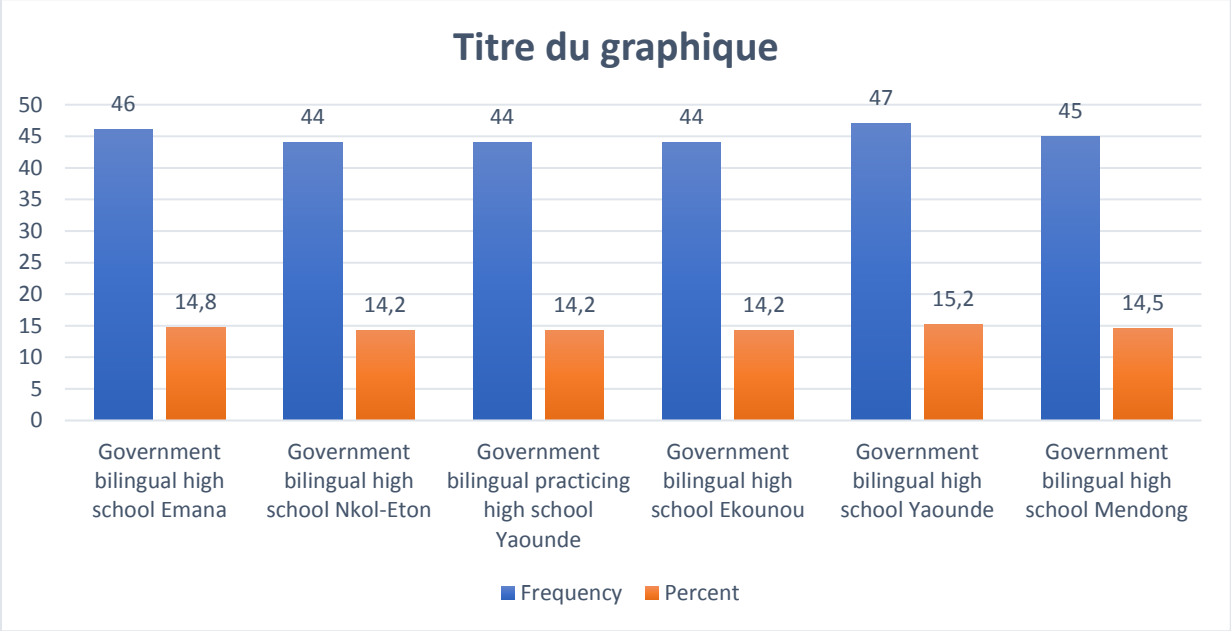


Table 10: Frequency table based on School Location

	Frequency	Percent
Yaounde 1	46	14.8
Yaounde 2	44	14.2
Yaounde 3	44	14.2
Yaounde 4	44	14.2
Yaounde 5	47	15.2
Yaounde 6	45	14.5
Yaounde 7	40	12.9
Total	**310**	**100.0**

According to the table above, the questionnaire was distributed in seven sub-divisions that make up Mfoundi Division. These subdivisions were Yaounde 1 with a frequency of 46, giving a percentage of 14.8, Yaounde 2 with a frequency of 44, giving a percentage of 14.2; Yaounde 3 and Yaounde 4 both with a frequency of 44, giving a percentage of 14.2, Yaounde 5 with a frequency of 47 giving a percentage of 15.2, Yaounde 6 with a frequency of 45 giving a

percentage of 14.5, and Yaounde 7 with a frequency of 40 giving a percentage of 12.9. This same result is represented in the figure below.

Figure 10: Distribution of respondents based on school's location

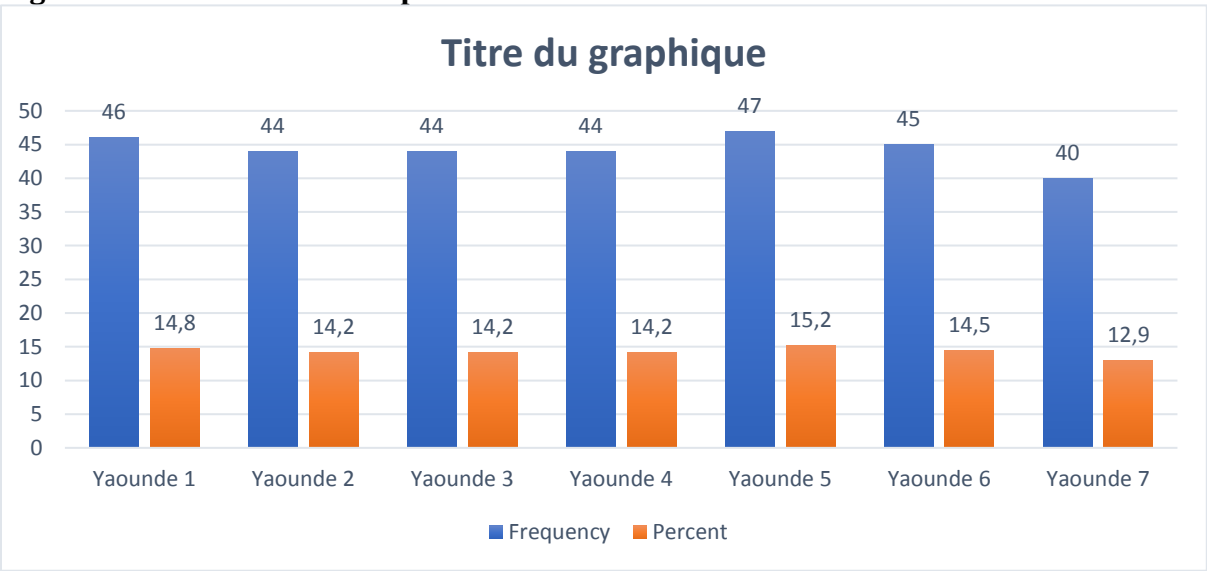


Table 11: Respondent's view on the role of digital learning repository

no	Item	SA		A		D		SD	
		f	%	F	%	F	%	f	%
1	The learning repository motivates student learning of subject	30	9.7	190	61.3	9.7	9.7	60	19.4
2	The learning repository encourages critical thinking	30	9.7	220	71.0	50	16.1	10	3.2
3	The content selected is relevant in an in-depth knowledge of the subject	40	12.9	150	48.4	70	22.6	50	16.1
4	The learning repository promotes a collaborative learning style	70	22.6	110	35.5	60	19.4	70	22.6
5	The learning repository allowed for interaction among students	70	22.6	140	45.5	60	19.4	40	12.9
6	The learning repository allowed for interaction between students and teachers	70	22.6	120	38.7	80	25.8	40	12.9
7	The learning repository increased my interactions with the teacher	30	9.7	60	19.4	150	48.4	70	22.6
8	The learning repository provided a reliable means of communication	40	12.9	130	41.9	90	29.6	50	16.1
9	The learning repository is a great place for the instructor to place handouts	50	16.1	90	29.0	140	45.2	30	9.7
10	The discussion section is available and easy to use.	30	9.7	140	45.2	80	25.8	60	19.4
11	The discussions helped me better understand the subject's content	60	19.4	120	38.7	100	32.3	20	9.7

Eleven items were designed to measure respondents' views on digital learning repository and student engagement. From the table above, 71% of the students generally agreed that the learning repository motivates student learning of the subject. 80.7%of students agreed that the

learning repository encourages critical thinking. 61.3% of the student agreed that the content selected is relevant in an in-depth knowledge of the subject. 58.1% generally agreed that the learning repository promotes a collaborative learning style. 68.1% generally agreed that the learning repository allowed for interaction among students. 61.3% of students agreed that the learning repository allowed students and teachers to interact. Only 29.1% of students affirmed that the learning repository increased student interactions with the teacher. 54.8% of students agreed that the learning repository provided reliable communication. 45.1%of students generally agreed that a learning repository is a great place for the instructor to put learning materials. 54.9% of students generally agreed that the discussion section is available and easy to use. 58.1% of the students generally agreed on the fact that the discussions helped students better understand the subject content.

Table 12: **Respondent's view on digital learning repository and student engagement**

NO	Item	SA		A		D		SD	
		f	%	F	%	f	%	f	%
1	The learning repository promotes independent learning.	70	22.6	130	41.9	80	25.8	30	30.97
2	The repository offers possibilities to comment basic content of the subject	60	19.4	160	51.6	80	25.8	10	3.2
3	The repository student forum offers a space for active learning	20	6.5	140	45.2	130	41.9	20	6.5
4	Teachers use the learning repository to respond to the need of the learners	70	22.6	110	35.5	60	19.4	70	22.6
5	I was satisfied with the content available on the learning repository	40	12.9	120	38.7	90	29.0	60	19.4
6	I was satisfied with the online lecture notes included on the learning respository	30	9.7	100	32.3	120	38.7	60	19.4
7	The lecture notes were easy to print.	00	00	100	32.3	150	48.4	60	19.4
8	The lecture notes were available on power points	30	9.7	130	41.9	90	29.0	60	19.4
9	I regularly visited the learning repository for a better understanding of a subject	30	9.7	170	54.8	40	12.9	70	22.6
10	The assignment section is available and easy to use	50	16.1	140	45.2	90	29.0	30	9.7
11	Teachers assess the assignment and give feedback	30	9.7	180	58.1	50	16.1	50	16.1

Eleven items were designed to measure respondents' views on digital learning repository and student engagement. It shows that 64.5% of students agree that the learning repository promotes independent learning. 71% agreed that the repository offers possibilities to comment on the basic content of the subject. 51.7% agreed with the notion that the repository student forum offers a space for active learning. 58.1% think that Teachers use the learning repository to

respond to the need of the learners. 51.6% agreed that they were satisfied with the content available on the learning repository . 42% of the students agreed that they were satisfied with the online lecture notes on the learning repository . 32.3% of the student agreed that lecture notes were easy to print. 51.6% of students generally agreed to the fact that lecture notes were available on power points. 64.5% of the student agreed with the notion that students regularly visited the learning repository for a better understanding of a subject. 61.3% of students generally agreed that the assignment section is available and easy to use. Finally, 67.8% of students agreed that Teachers assess assignments and give feedback to students using the learning repository .

Table 13: Respondent's view on Digital learning repository and student satisfaction.

No	Item	SA		A		D		SD	
		f	%	F	%	f	%	f	%
1	I have successfully incorporated the learning repository into my learning	40	12.9	120	38.7	90	29.0	60	19.4
2	The learning repository is a complement to the classroom material.	50	16.1	160	51.6	40	12.9	60	19.4
3	The self-assessment activities in the learning repository promote the acquisition of knowledge of the subject	50	16.1	170	54.8	40	12.9	50	16.1
4	The learning repository favour the creation of a scheme of work for collaboration among students	70	22.6	90	29.0	100	32.3	50	16.1
5	The learning repository fosters a climate of didactic interaction	40	12.9	110	35.5	90	29.0	70	22.6
6	The learning repository enables the creation of learning communities among students	60	19.4	90	29.0	90	29.0	70	22.6
7	Through the learning repository , strong links with other students are encouraged	90	29.0	130	41.9	50	16.1	40	12.9
8	I believe that the learning repository enhances learning	40	12.9	140	45.2	90	29.0	40	12.9
9	I believe that the learning repository will play an important role in secondary education in the future	50	16.1	150	48.4	40	12.9	70	22.6
10	I was satisfied with the overall experience of using the digital learning	40	12.9	120	38.7	100	32.3	50	16.1
11	I was satisfied with the learning repository in regard to the quality of my learning	40	12.9	120	38.7	100	32.3	50	16.1

Eleven items were designed in the questionnaire to respond to the question of student satisfaction with the digital learning reposiotory . The above table shows that 51.8% of the students agreed on the notion that they successfully incorporated the learning repository into their learning. 67.7 % agreed that the learning repository is a complement to the classroom material. 70.9 % of the students also agreed that self-assessment activities in the learning platform would promote the acquisition of knowledge of the subject 51.6% of students

generally agreed that the learning repository favours the creation of a scheme of work for collaboration among students. 48.4 % think the learning repository fosters the climate of didactic interaction. 48.4 also agreed that the learning repository enables the creation of learning communities among students. 70.9% of the students generally agreed that strong links with other students through the learning repository are encouraged. 58.1 of the students agreed that the learning repository enhances learning. 64.5 of the students agreed on the notion that the learning repository will play an important role in secondary education in the future. 51.6% agreed that they were satisfied with the overall experience using digital learning. Finally, 51.6 generally agreed that they were satisfied with the learning repository in regard to the quality of learning.

Table 14: Correlations among variables

	DLP	**SS**	**SE**
Digital Learning Repository (DLR)		.800**	.759**
Student Satisfaction (SS)			.875**
Student Engagement (SE)			
Mean	2.595	2.595	2.595
SD	.5298	.5298	.5298
N	310	310	310

To be more precise and fully test the assumption of the linearity and strengths of relationships between the separate IV and the DVs, the researchers have conducted a correlation analysis whose main results are displayed in Table above. Outcomes show that student engagement and satisfaction are significantly correlated with digital learning repository. Concerning the strength of the relationship among variables under study, students' satisfaction is significantly correlated with digital learning repository (Pearson's r (309) = .800, $p < .01$); engagement is significantly correlated with digital learning repository (Pearson's r (309) = .759, $p < .01$); students' satisfaction is significantly correlated with student's engagement (Pearson's r (309) = .875, $p < .01$). Hence, from the correlation analysis, it can be concluded that all three measured variables are significantly correlated. Moreover, due to the confirmed linearity of relationships between the separate IV and the DVs, the precondition to run regression analyses to actually test the previously developed hypotheses is met (Saunders et al., 2016).

Regression Analysis

Since the digital learning repository is the intersection of the contributing constructs, in order to identify which independent variable was the largest predictor of student engagement and

satisfaction, when all the other variables were considered, a standard simple regression was performed. Student engagement and satisfaction were the dependent variables, and the digital learning repository were the independent variable.

The various assumptions underlying simple regression were examined. The correlations between the independent variables and the dependent variables were above 0.2 and thus were acceptable for the regression analysis (Tabachnick & Fidell, 2007). Moreover, there were not very high correlations ($r > 0.9$) (Field, 2009) between the dependent variables. For further evaluation to check multicollinearity, which indicates a perfect linear relationship between two or more of the dependent variables, the tolerance and variance inflation factor (VIF) values were examined. All the tolerance values were above 0.1, and the VIF values were less than 10. Thus, the data set did not indicate multicollinearity (Field, 2009; Tabachnick & Fidell, 2007).

The Mahalanobis distance was used to check for outliers. Mahalanobis distance "is the distance of a case from the centroid of the remaining cases where the centroid is the point created at the intersection of the means of all the variables" (Tabachnick & Fidell, 2007). It reveals cases that lie at a distance from the other cases, and such cases are considered outliers. Mahalanobis distance is evaluated using chi-square distribution. "Mahalanobis distance is distributed as a chi-square (X^2) variable, with degrees of freedom equal to the number of independent variables" (Tabachnick & Fidell, 2007). In order to detect which cases are multivariate outliers, the critical X^2 value of the number of degrees of freedom of the independent variables is compared with the Mahalanobis distance of the cases (Tabachnick & Fidell, 2007). Any case whose Mahalanobis distance value is greater than the critical X^2 is considered an outlier. Tabachnick and Fidell (2007) have produced a table of critical X^2 values with which researchers can compare their Mahalanobis distance values. The data cases of the study were compared with this critical X^2 value. No case with critical values higher than what was prescribed by Tabachnick and Fidell (2007) was detected.

The normality of the data set was checked with the Normal Probability Plot and the Scatterplot of the Standardised Residuals. The Normality Probability Plot produced a fairly straight diagonal plot, indicating that the points did not deviate from normality. Again, the scatterplot produced a rectangular-shaped distribution of the residuals, with most points concentrated around zero (0). This indicated that the data was fairly normally distributed. SPSS produces unusual cases in a table called Case-wise Diagnostics for standard multiple regression. Pallant

(2005) alerted that the Casewise Diagnostics table has information on cases that have values above 3.0 or below -3.0 as their standardised residuals and that in normally distributed data, such cases should not be more than 1% of the total cases. In order to check if such cases have an effect on the results, one should have a look at the Cook's distance value. If the Cook's distance is more than 1, then there is cause for concern (Field, 2009; Pallant, 2005; Tabachnick & Fidell, 2007). Though Casewise Diagnostics produced a case with a standardized residual above 3 (in this case, it was 5.655), the Cook's distance produced a maximum value of 0.59. Thus, though the standardized residual is above 3, the maximum Cook's distance value was less than 1; therefore, this case can be included in the regression.

The standard regression with independent predictors (digital learning repository) to predict student engagement and satisfaction was used to verify each research hypothesis. The adjusted R^2 was reported because Tabachnick and Fidell (2007) recommended that the R square tends to overestimate its true value in the population when the sample size is small and that the adjusted R square corrects the value of R square and thus produces a better predictor of the true population value.

Test of Hypotheses

H_{O1}: The use of digital learning repositoriries has no statistically significant effect on student satisfaction

Regression was carried out to ascertain the extent to which digital learning repositories predict student satisfaction.

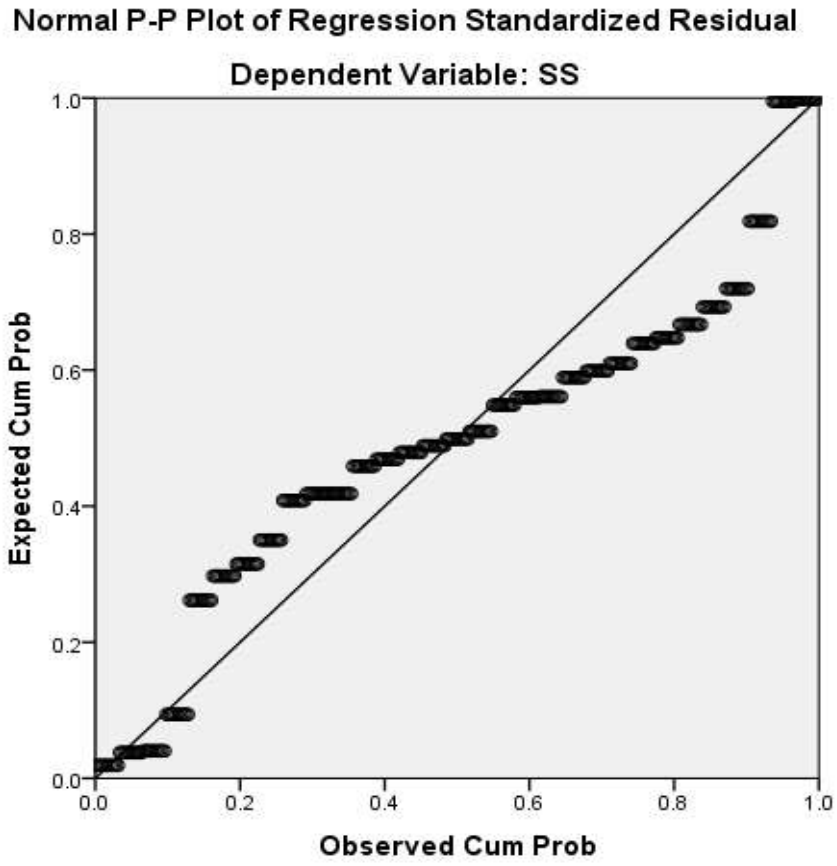
Table 15: **Model Summary on the impact of digital learning repository on student satisfaction**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.800[a]	.640	.639	.35867

a. Predictors: (Constant), RLP

The normal P-P plot showed that there was a strong positive linear relationship between the digital learning repository and student satisfaction scores, which was confirmed with a Pearson's correlation coefficient of r = .800. The regression model predicted 64 % of the variance. The model was a good fit for the data (F (1, 308= 547.703, p < .001).

Figure 11: Normal P-P on the impact digital learning respository student satisfaction



The next table is the F test. The linear regression F test has the null hypothesis that the digital learning repository does not significantly influence student satisfaction at p=.05. In other words, R^2= 0, with F (1, 308) = 547.703, p= .000, the test is highly significant. Thus, we can assume that there is a statistically significant impact of the digital learning repository and student satisfaction.

Table 16: ANOVA[a] of the impact of digital learning repository on student satisfaction

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	70.460	1	70.460	547.703	.000[b]
	Residual	39.623	308	.129		
	Total	110.083	309			

a. Dependent Variable: SS
b. Predictors: (Constant), RLP

The regression results showed a significant relationship between digital learning repository on students' satisfaction (t = 23.403 p < 0.000). The slope digital learning repository of students was .800, so student satisfaction by a factor of .800.

Table 17: Coefficients[a] on the impact of digital learning repository on student satisfaction

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	.206	.102		2.024	.044
	RLP	.901	.039	.800	23.403	.000

a. Dependent Variable: SS

H_{O2}: The use of digital learning repository has no statistically significant effect on student engagement

Here, regression was also carried out to ascertain the extent to which digital learning repository scores student engagement scores.

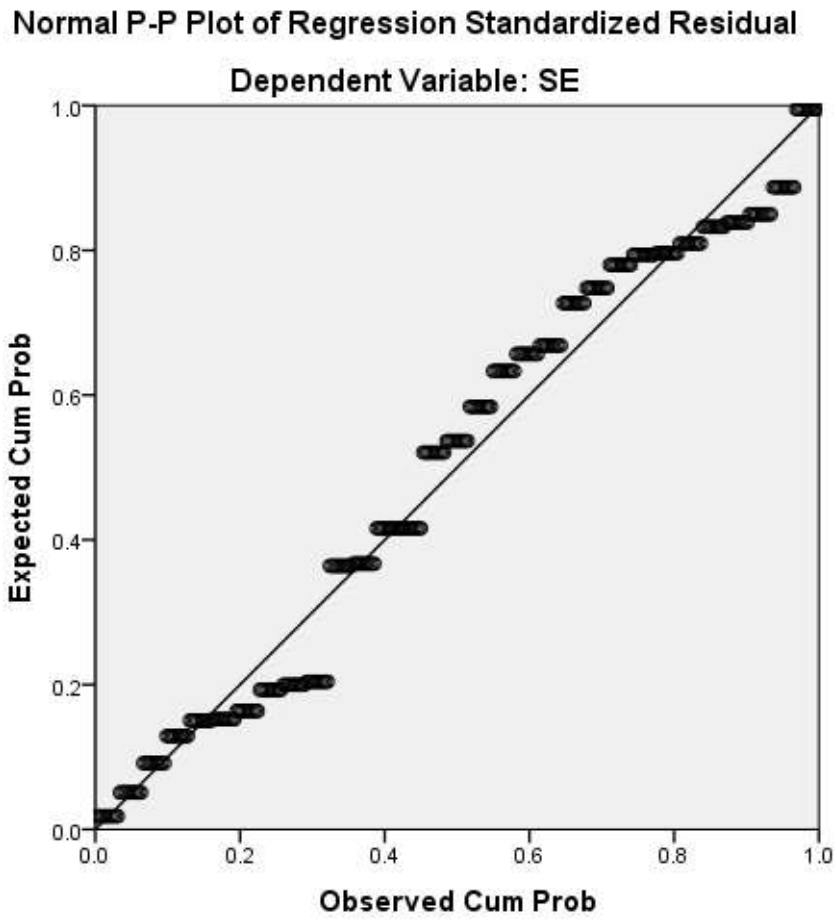
Table 18: Model Summary of the impact of digital learning repository on student engagement.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.759[a]	.577	.575	.47378

a. Predictors: (Constant), RLP
b. dependent variable SE

The normal P-P plot showed a strong positive linear relationship between digital learning repository and students' engagement scores, which was confirmed with a Pearson's correlation coefficient of r =.759. The regression model predicted 57.7 % of student engagement variance. The model was a good fit for the data (F (1, 308) = 419.499 p < .0000.

Figure 12: normal P-P plot of the digital learning repository's impact on student engagement.



To test the previously established hypotheses with the help of simple linear regression analyses, Saunders et al. (2016) state that the collected data has to meet the precondition that is concerned with the linearity of the relationship between the separate IV and the DVs. Therefore, in the first instance, the researchers have produced scatterplots of the relationships between the different IVs, namely student engagement and student satisfaction on digital learning repository such as DVs. Looking at the various scatterplots, it can be detected that the relationship between the different IVs and the DVs in all cases is linear.

Table 19: ANOVA[a] of digital learning repository impact on student engagement.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	94.164	1	94.164	419.499	.000[b]
	Residual	69.136	308	.224		
	Total	163.300	309			

a. Dependent Variable: SE
b. Predictors: (Constant), RLP

ANOVA results show that the linear regression F test has the null hypothesis that the use of digital learning repositories does not have a statistically significant influence on student engagement p=.05. In other words, R^2= 0, with F (1, 308) = 419.499, p= .000, the test is highly significant. Thus, we can assume that digital learning repository significantly impact student engagement.

Table 20: **Coefficients[a] of the impact of digital learning repository on student's engagement.**

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	-.135	.135		-1.002	.317
	RLP	1.042	.051	.759	20.482	.000

a. Dependent Variable: SE

The regression results showed a significant relationship between digital learning repository on student engagement scores (t = 20.482, p= 0.000). The slope coefficient for the digital learning repository was .759, and student engagement increased by a factor of .759.

Ho3: The use of digital learning repository has no statistically significant mediate effect on the relationship between satisfaction and student engagement.

Mediation model

Estimate of regression weight: when RLP goes up by 1, SS goes up by 0.901. The regression weight estimate, .901, has a standard error of about .038, and the Critical ratio for regression weight dividing the regression weight estimate by the estimate of its standard error gives *z* = .901/.038 = 23.441. In other words, the regression weight estimate is 23.441standard errors above zero.

Level of significance for regression weight: The probability of getting a critical ratio as large as 23.441 in absolute value is less than 0.001. In other words, the regression weight for RLP in the prediction of **SS** is significantly different from zero at the 0.001 level (two-tailed). These statements are approximately correct for large samples under suitable assumptions.

Estimate of standardized regression weight: When RLR goes up by 1 standard deviation, **SS** goes up by 0.8 standard deviations.

Estimate of regression weight: When **SS** goes up by 1, **SE** goes up by 0.904. The regression weight estimate, .904, has a standard error of about .055. The critical ratio for regression weight. Dividing the regression weight estimate by the estimate of its standard error gives *z* = .904/.055 = 16.499. In other words, the regression weight estimate is 16.499 standard errors above zero.

Level of significance for regression weight: The probability of getting a critical ratio as large as 16.499 in absolute value is less than 0.001. In other words, the regression weight for **SS** in the prediction of **SE** is significantly different from zero at the 0.001 level (two-tailed). These statements are approximately correct for large samples under suitable assumptions.

Estimate of standardized regression weight: When **SS** goes up by 1 standard deviation, **SE** goes up by 0.742 standard deviations. Estimate of regression weight, when **RLR** goes up by 1, **SE** goes up by 0.227. Standard error of regression weight, the regression weight estimate, .227, has a standard error of about .062. The critical ratio for regression weight dividing the regression weight estimate by the estimate of its standard error gives *z* = .227/.062 = 3.680. In other words, the regression weight estimate is 3.68 standard errors above zero.

Level of significance for regression weight: The probability of getting a critical ratio as large as 3.68 in absolute value is less than 0.001. In other words, the regression weight for **RLR** in the prediction of **SE** is significantly different from zero at the 0.001 level (two-tailed). Estimate of standardized regression weight, when RLP goes up by 1 standard deviation, SE goes up by 0.166 standard deviations. These statements are approximately correct for large samples under suitable assumptions.

Test for mediation

Table 21: **Mediation table**

	Direct Effects			**Indirect Effects**			**Total Effects**	
	DLR	**SS**		**DLR**	**SS**		**DLR**	**SS**
SS	.901	.000	**SS**	.000	.000	**SS**	.901	.000
SE	.227	.904	**SE**	.815	.000	**SE**	1.042	.904

Direct Effect – Estimate: The direct (unmediated) effect of **DLR** on **SE** is .227. That is, due to the direct (unmediated) effect of **DLR** on **SE**, when **DLR** goes up by 1, **SE** goes up by 0.227. This is in addition to any indirect (mediated) effect that **DLR** may have on **SE**.

Indirect Effect – Estimate: The indirect (mediated) effect of **DLR** on **SE** is .815. That is, due to the indirect (mediated) effect of **DLR** on **SE**, when **DLR** goes up by 1, **SE** goes up by 0.815. This is in addition to any direct (unmediated) effect that **DLR** may have on **SE**. For further discussion of direct, indirect and total effects, see Kline (1998, p. 52).

Total Effect – Estimate: The total (direct and indirect) effect of **DLR** on **SE** is 1.042. That is, due to both direct (unmediated) and indirect (mediated) effects of **DLR** on **SE**, when **RLR** goes up by 1, **SE** goes up by 1.042. For further discussion of direct, indirect and total effects.

Summary

The analysis of the collected data revealed that all three hypotheses used in this study are statistically significant, hence:

Ha1: the use of digital learning repositories has a statistically significant effect on student engagement

Ha2: the use of digital learning repositories has a statistically significant effect on student satisfaction

Ha3: the use of digital learning repositories has a statistically significant mediating effect on the relationship between student satisfaction and student engagement.

CHAPTER FIVE

DISCUSSION, SUMMARY OF FINDINGS, CONCLUSION, RECOMMENDATIONS AND LIMITATIONS

This study's main objective is to examine the impact of digital learning repository on student engagement and satisfaction in secondary schools.

Discussions of Findings

The discussion will logically follow the sequence of the research hypothesis and will be based on the relevant research data as presented in chapter four as well as the views of some authors and theories.

The use of digital learning repository and student engagement

The first hypothesis in this study states that digital learning has an effect on student engagement. We used the correlation coefficient as a statistical tool to test this hypothesis. The level of significance is P<.000 and thus is less than 0.05, which is the alpha and the standard error margin. The correlation coefficient of .800 indicates that the link is positive and moderate. Since the probability value is <0.05, we concluded that the digital learning repository has an effect on student engagement in a significant manner. This means that an increase in the use of digital learning repository will increase student engagement in the form of interaction. Hence, we reject the null or statistical hypothesis and retain the alternative hypothesis that digital learning repository have a significant effect on students' engagement.

Kuh et al. (2005) expressed the importance of active and collaborative learning within the classroom, stating that students learn more when they are able to think about and apply what they are learning in various settings. Within an online classroom, students can participate in active learning with their instructors and peers through activities such as class discussions, presentations, group collaboration, or reflective writing (Beer et al., 2010; Kuh et al., 2005; Lundberg & Seridan, 2015; Price & Baker, 2012). Lundberg and Sheridan's (2015) study confirmed that interaction among students and direct communication with instructors contributed to students' involvement in the class and enhanced the overall learning experience. Dixson (2010) and King (2014) stress that consistent interaction with students at the individual and group levels help set academic expectations among students. King (2014) also asserts that instructor feedback on students' assignments makes learning more interactive and improves student learning process. Instructor assessment of student work and participation using a stated

grading policy, providing summative feedback, and posting grades within a specified time frame can be highly beneficial. Revere and Kovach (2011) and Robinson and Hullinger (2008) assert that the use of new but well-established technologies, such as discussion boards, chat sessions, blogs, wikis, and group tasks, , fosters student engagement through course design and technology integration. These technologies are also used for effective social-networking activities in active online learning to increase student engagement. A collaborative learning environment is also integral to applying the andragogical learning model (Ahn & Class, 2011; An & Reigeluth, 2011). Studies illustrating the use of the constructivist model confirmed that student competencies to direct their learning were strengthened through engagement, collaborative, and technological supportive activities to produce positive learning outcomes (Blayone, vanOostveen, Barber, DiGiuseppe, & Childs, 2017; Chitanana, 2012; Cortés & Barbera, 2013; Seo & Engelhard, 2014).

The ARCS Model of Motivational Design can be a beneficial tool in the development and assessing course activities because it provides a problem-solving, practical approach founded on theory and research (Keller, 2010). By building engaging activities and providing useful feedback, instructional designers and faculty members can greatly enhance the likeliness of student success. (Beffa-Negrini et al, 2002). Indeed, student engagement is crucial for online pedagogy because well-designed online courses revolve around the learners (McCombs, 2015). Some studies argue that enhancing student engagement in online learning is difficult due to the overall insufficient mastery of technology and self-discipline (Oliver and Herrington, 2003). Nevertheless, Mount et al. (2009) suggest that interaction can best achieve student engagement among peers and instructors.

The use of digital learning repository and student satisfaction

The second hypothesis in this study states that there is a relationship between the use of digital learning repository and student satisfaction. We used the correlation coefficient as a statistical tool to test this hypothesis. The level of significance is .000 and thus is less than 0.05, which is the alpha and standard error margin. The correlation coefficient of .800 indicates that the link is positive and moderate. Since the probability value <0.05, we conclude that there is a significant relationship between the digital learning platform and student satisfaction. This means that the more the use of digital learning repositories, the more satisfaction student will get. Hence, we reject the null hypothesis and retain the alternative hypothesis, which states that

there is a significant relationship between the use of digital learning repositories and student satisfaction.

The predictors of student satisfaction relate to academic achievement, performance, perceptions of the learning environment, success, persistence, and quality of the instructional design, content, and delivery (Artino, 2007, 2008; Bolliger & Martindale, 2004; Kuo et al., 2013, 2014; Puzziferro, 2008; Reinhart & Schneider, 2001; Thurmond, & Wambach, 2004; Yukselturk & Yildirim, 2008). These predictive dimensions of student satisfaction explored separately or combined, are viewed as the hallmark of the teaching and learning process (Yukselturk & Yildirim, 2008). For instance, a study of the relationship between the construct of student satisfaction and academic achievement in traditional versus online learning settings Saeler (2015) showed that there was no statistical significance found between academic achievement and satisfaction in both learning environments. As with the construct for self-regulated practices, Moore's (1989) interaction model has been used as a framework to study the relationship between student satisfaction and interactions occurring at the learner-learner, learner-instructor, and learner-content interfaces. These studies have shown that there is a positive correlation between interaction and student satisfaction in online learning (Ali & Ahmad, 2011; Bolliger & Martindale, 2004; Bray, Aoki, & Dlugosh, 2008; Dennen, Darabi, & Smith, 2007; Kuo et al., 2014; Lee, 2012; Thurmond & Wambach, 2004).

According to Keller (1983), the ARCS Model of Motivational Design learning should be rewarding and satisfying for the learner. Satisfaction comes at the end of learning, the content as the learner meets the goals and objectives as well as has their needs met by the learning. Satisfaction can also come from achievement and praise. Keller state that Intrinsic Reinforcement encourages the pleasure of learning for its own sake or to achieve personal goals. Learning should be useful and beneficial to the learner. Also, extrinsic Rewards give unexpected rewards and direct encouragement to learn. Furthermore, equity: keep standards high, so learners know they are achieving.

The use of digital learning repository and student satisfaction through engagement.

The third hypothesis in this study states that the use of digital learning repository has a mediating effect on the relationship between satisfaction and student engagement. We used Structural Equation Modelling (SEM) as a statistical tool to test this hypothesis. The analysis shows that the use of digital learning repository has a statistically significant mediating effect

on the relationship between student satisfaction and student engagement. Hence, we reject the null statistical hypothesis and retain the alternative hypothesis, which states that there is a mediating effect between digital learning repository and student's satisfaction and engagement. This means that the more the satisfaction in the use of digital learning repository the more the level of engagement.

In a various literature and previous research, there is a mediating effect between learning repository and student engagement and satisfaction (Beer, Clark & Jones, 2010; Chen & Jang, 2010; Diemann & Bastiaens, 2010; Dixson, 2010; Gray & DiLoreto, 2016; Huett, Young, Huett, Moller and Bray, 2008; Kim & Frick, 2011; Kuo, Walker, Schroder & Belland, 2014; Shillingford & Kerlin, 2013; Wang, Shannon & Ross, 2013; Yoo & Huang, 2013). Sampson et al. (2010) stated that students' satisfaction and outcomes are good indicators for assessing the quality and effectiveness of digital learning repository. It is of concern for institutions to know whether its students, in general, are satisfied with their learning experience (Kember and Ginns 2012).

Numerous studies have been conducted on student engagement in the traditional and digital learning environments Kuh, 2003; Mello, 2016; Pellas & Kazanidis, 2015; Robinson & Hullinger, 2008; Schreiber & Yu, 2016). These studies linked student engagement to the key factors impacting the learning process inclusive of instructional design and delivery, technology support, self-regulated or self-directed learning, student satisfaction, persistence, student performance, and student academic success. The role of the instructor in fostering student engagement also has been explored and found to be an additional key factor, particularly considering the transition process to digital repository (Cho & Cho, 2014; Ma, Han, Yang, & Cheng, 2015). More recently, there has been a focus on the relationship between engagement and the collaborative learning environment and associated tools due to the rapid advances in technology and digital resources (Donaldson et al., 2017; Hew, 2016). Technology has been found to enhance the collaborative environment through the creation of active learning sites.

Prior studies have indicated the significant impact of student engagement on student satisfaction in different digital learning repository (Blackmon & Major, 2012; Dixon, 2010; deNoyelles et al., 2014; Fisher, 2010; Gillett-Swan, 2017; Holley & Taylor, 2008; Huang & Hsiao, 2012; Lundberg & Seridan, 2015; Rabe-Hemp et al., 2009; Robinson, 2008; Roby et al., 2013; Wyatt, 2011). For example, Murillo-Zamorano et al. (2019) found that in the case of online learning,

student satisfaction with flipped classrooms when students use technology means such as pre-recorded videos, to attend lectures out of class time and work collaboratively under the supervision and support of online course instructors (Findlay-Thompson & Mombourquette, 2014) was significantly and positively influenced by their engagement. Similarly, students' engagement in flipped classrooms heightened their performance and levels of satisfaction. Furthermore, Bolliger and Halupa (2018) revealed that in the context of online programs, student engagement had a significant positive association between student engagement and student outcomes, specifically with regard to their learning perception and satisfaction. The study of Gray and DiLoreto (2016) also confirmed this significant impact of student engagement on student learning in and satisfaction with online learning and also found that student engagement mediated the relationships between the presence of the course instructor and student satisfaction.

The use of digital learning repository is in its infancy in most college and university curriculums (Dede & Richards, 2012). Several noted benefits, however, have been documented higher student performance, student satisfaction, and dropout prevention (Centner, 2014; Czerkawski & Lyman, 2016; Dixson, 2015; Handelsman, Briggs, Sullivan, & Towler, 2005). However, there is generally limited formal use and implementation of such platforms even though accessibility is widespread (Selwyn, 2007). Lee, Courtney, Balassi, Roca, Chiu, and Martinez (2010) surmise that computer literacy is a factor in repository use, finding that a higher degree of literacy is positively related to greater use and success. Oppenheimer (2003) finds an inverse relationship between classroom technology and interaction between students and teacher.

The importance of student engagement in online learning was stated by Martin & Bolliger (2018). Anderson (2003) found that satisfaction can create student engagement, and furthermore, satisfaction is also found as an essential topic related to student success in online learning. Student success become critical in online environment since online environment encourage students to depend mostly on their ability to learn. Verneil & Berge (2000) has shown that student success in online learning mostly supported by their activity during learning process. Blasco-Arcas et al. (2013) stated that there are two factors that are directly associated to active learning, those are satisfaction and engagement. Wang & Baker (2015) stated that student engagement is student effort to get involve in learning processes of a specific course. It has also become one of the important variables in conducting online learning effectively (Dixson, 2010). In an online environment, there are three types of interaction in engagement as

proposed by Bernard et al. (2009), those are interaction between students, interaction of student to instructor, and interaction of student to content. Lear et al. (2010) who has proven that those types of interaction can help students to be more active and more engaged in their learning. Martin & Bolliger (2018) also confirmed that engagement is critical to student learning and student satisfaction in their learning process, therefore student engagement can increase student satisfaction and student satisfaction will also increase student's engagement in the use of digital learning repository .

Conclusion

The main objective of this study was to examine of digital learning repository and its impact on student's engagement and satisfaction in some selected secondary schools in Yaounde. The correlation, simple linear regression as well as the statistically more advanced method of simple Structural Equation Modelling (SEM) was used to analyse data on the impact of digital learning repository on student's engagement and satisfaction and also the mediating effect of satisfaction on the use of digital learning repository and student engagement was tested. Data analysis proved that a significant relationship exists between use of digital learning on student's engagement and satisfaction. The study found that digital learning repository is a strong determinant of student's engagement and satisfaction. In terms of mediating effect there is a strong mediating effect between student's satisfaction and the use of digital learning repository and student's engagement. Hence effective students' satisfaction and effective students' engagement will depend on the effectiveness of digital learning platform: content, learning interaction models, learning media, communication strategies, and learning assessments, who teaches, who is learning, and how the learning interactions are carried out and the support of learning technology.

Recommendations

This literature study shows that digital education is an effective method in terms of learning outcomes. The effectiveness of digital learning repository has more to do with who teaches, who is learning, and how the learning interactions are carried out and the support of learning technology. digital learning repository will be effective if it is well prepared, in terms of content, learning interaction models, learning media, communication strategies, and learning assessments. Even when properly designed, online learning requires more self-discipline and initiative on the part of students. Ways to improve on the digital learning repository are:

Establish instructor presence regularly. One of the most important ways to create an engaging online learning environment for students is to ensure that instructor are actively present in it. The educational literature refers to this as establishing “teacher presence”, and it is critical to students’ learning and their perception of the quality of the online learning experience. While providing online lectures and other material for students is an excellent start, there are many other ways to make sure students feel a connection with teacher: Prepare a short weekly video announcement: Let students know the week’s aim/s, objectives, how the week connects to previous learning and subject outcomes, and any provide any advice around assessment progress.

Generate student interaction through online discussion One of the most common ways to provoke student engagement with online subject is through online discussion. While it is technically very easy to set up discussion boards in the LMS, it is more difficult to make online discussions among students and teaching staff work. In part this is because they are asynchronous, which means that the conversation can become disjointed.

Create student engagement and interaction through polling. Excellent teachers are not just passionate about their discipline and seek to convey this to students, they are also interested in where their students “are” in relation to the material they are covering. Most teachers elicit or gauge how students are coping with the material they are presenting in a subject without really noticing it (they ask questions, they observe students faces in a class, etc). But this can be tricky in an online environment. However, there are tools – generically called quiz or polling tools – that can helps teaching staff to gauge how students are going with the material being covered in the subject and they can use this to provoke engagement.

Provide regular advice to students, particularly about assessment: It is a truism to say that students’ engagement in study is often driven by assessment. In online learning environments it is particularly important to provide students with advice about how the assessment for the subject is organized. It is also useful to create no-stakes or low-stakes tasks early in the teaching period for students to check their understanding of a topic or practice a skill. This provides students with important early feedback on how they are going in the subject, it can also indicate areas were teaching staff might need to provide additional support or resources.

Limitations of the Study

- It was time consuming for example during the administration of questionnaire; it was not easy to collect the questionnaire. Some of the respondents were reluctant in providing the needed information as a result of the fact that they were not certain of the use to which their responses were to be put in spite of the researchers' explanations of purpose to which their responses were going to be made. This might have resulted to some of the respondents faking their responses.
- We had financial difficulties at the level of transportation from one place to the other in the city of Yaounde in search of concrete information. Printing, cyber and phone calls were another heavy cost to bear.
- However, despite the above limitations, this study was deemed successful because the purpose, for which it is designed, has been achieved.

Suggestions for Further Research

1) The study should be replicated in other divisions and region using other designs.
2) For the results of the study to be more generalized, a large sample should be used in replicating the study

Reference

Abuhassna, H., Megat, A., Yahaya, N., Azlina, M., & Al-rahmi, W. M. (2020). Examining Students' satisfaction and learning autonomy through web-based courses. *International Journal of Advanced Trends in Computer Science and Engineering*, 1(9), 356–370.

ACER. (2019). Australasian survey of student engagement.

Adams, S., Cummins, M., Davis, A., Freeman, A., Hall, C., & Ananthanarayanan, V. (2017). *NMC Horizon Report: 2017 Higher Education Edition*. Austin, Texas: The New Media Consortium.

Akaslan, D., & Law, E. L.-C. (2011). *Measuring student E-learning readiness*: A case about the subject of Electricity in Higher Education Institutions in Turkey. In H. Leung, E. Popescu, Y. Cao, R. W. H. Lau, & W. Nejdl (Eds.), ICWL 2011. LNCS, vol. 7048, (pp. 209–218). Heidelberg: Springer.

Akdemir, O., & Koszalka, T. A. (2008). Investigating the relationships among instructional strategies and learning styles in online environments. *Computers & Education,50*(4), 1451-1461.

Akyol Z and Garrison DR (2011) Understanding cognitive presence in an online and blended com- munity of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology* 42(2): 233–250.

Alexander, S., & Golja, T. (2007). Using students' experiences to derive quality in an e-learning system: An institution's perspective. *Educational Technology & Society*, 10(2), 17 33.

Ali, A., & Ahmad, I. (2011). Key factors for determining students' satisfaction in distance learning courses: A study of Allama Iqbal Open University. *Contemporary Educational Technology, 2*(2), 118–134.

Allen IE and Seaman J (2013) Changing course: Ten years of tracking *online education in the United States*. In: Sloan Consortium, Newburyport, MA, USA.

Allen M, Bourhis J, Burrell N, et al. (2002) Comparing student satisfaction with distance education to traditional classrooms in higher education: A metaanalysis. *American Journal of Distance Education* 16(2): 83–97.

Allen, I. E., & Seaman, J. (2014). *Grade change: Tracking online education in the United States*. Newburyport, MA: The Sloan Consortium.

Allen, I. E., & Seaman, J. (2015). *Grade level: Tracking online education in the United States*.

Allen, I. E., & Seaman, J. (2019). *Changing course: Ten years of tracking online education in the United States.* Sloan Consortium.

Allen, I. E., Seaman, J., Poulin, R., & Straut, T. T. (2016). Online report card: *Tracking online education in the United States.* Babson survey research group and the online learning consortium (OLC), Pearson, and WCET state authorization Network.

Ally, M. (2012). *Student attention, engagement and participation in a twitter-friendly classroom.* Paper presented at the 23rd Australasian Conference on Information Systems, ACIS 2012, Geelong, VIC.

Almarashdeh, I. (2016). Sharing instructors experience of learning management system: A technology perspective of user satisfaction in distance learning course. *Computers in Human Behavior*, 63, 249-255

Al-Rahmi, W. M., Alias, N., Othman, M. S., Alzahrani, A. I., Alfarraj, O., Saged, A. A., & Rahman, N. S. A. (2018). Use of e-learning by university students in Malaysian higher educational institutions: *A case in Universiti Teknologi Malaysia*. IEEE Access, 6, 14268–14276.

Al-Rahmi, W. M., Othman, M. S., & Yusuf, L. M. (2015a). The effectiveness of using e-learning in Malaysian higher education: *A case study Universiti Teknologi Malaysia. Mediterranean Journal of Social Sciences,* 6(5), 625–625.

Al-rahmi, W. M., Othman, M. S., & Yusuf, L. M. (2015c). Using social media for research: *The role of interactivity, collaborative learning, and engagement on the performance of students in Malaysian post-secondary institutes*. Mediterranean Journal of Social Sciences, 6(5), 536.

Al-Rahmi, W. M., Othman, M. S., & Yusuf, L. M. (2015d). *Exploring the factors that affect student satisfaction through using e- learning in Malaysian higher education institutions*. Mediterranean Journal of Social Sciences, 6(4), 299.

Al-Rahmi, W. M., Othman, M. S., & Yusuf, L. M. (2015e*). Effect of engagement and collaborative learning on satisfaction through the use of social media on Malaysian higher education.* Res. J. Appl. Sci., Eng. Technol, 9(12), 1132–1142.

Alrashidi, O., Phan, H. P., & Ngu, B. H. (2016). Academic engagement: An overview of its definitions, dimensions, and major conceptualizations. *International Education Studies*, *9*(12), 41.

Alshuaibi, M. S. I., Alshuaibi, A. S. I., Shamsudin, F. M., & Arshad, D. A. (2018). Use of social media, student engagement, and academic performance of business students in Malaysia. *International Journal of Educational Management, 32*(4), 625–640.

Altınay, Z. (2017). Evaluating peer learning and assessment in online collaborative learning environments. *Behaviour & Information Technology, 36*(3), 312-320.

Anderson A, Huttenlocher D, Kleinberg J, et al. (2014) *Engaging with massive online courses.* In: Proceedings of the 23rd international conference on World wide web, pp. 687–698. New York: ACM.

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing environment. *Journal of Asynchronous Learning Networks, 5*(2).

Arbaugh, J. B. (2001). How instructor immediacy behaviors affect student satisfaction and learning in web-based courses.*Business Communication Quarterly,64*(4), 42-54.

Arbaugh, J.B. (2007). An empirical verification of the community of inquiry framework. *Journal of Asynchronous Learning Network, 11*(1), 73-85.

Artino, A. R. (2008). Motivational beliefs and perceptions of instructional quality: Predicting satisfaction with online training. *Journal of Computer Assisted Learning, 24,* 260–270.

Avcı, Ü., & Ergün, E. (2019). Online students' LMS activities and their effect on engagement, information literacy and academic performance. *Interactive Learning Environments,* 1–14.

Baleghi, S., Ayub, A. F. M., Mahmud, R., & Daud, S. M. (2017). The influence of system interactivity and technical support on learning management system utilization. *Knowledge Management & E- Learning, 9(*1), 50-68.

Bangert, A. W. (2006). Identifying factors underlying the quality of online teaching effectiveness: An exploratory study. *Journal of Computing in Higher Education, 17*(2), 79-99.

Bangert, A. W. (2006, spring). Identifying factors underlying the quality of online teaching effectiveness: An exploratory study. *Journal of Computing in Higher Education, 17*(2), 79–99.

Bangert, A. W. (2008). The development and validation of the student evaluation of online teaching effectiveness. *Computers in the Schools, 25*(1), 35-47.

Banque Mondiale (2013). *Rapport d'Etat d'un Système Educatif National.*
Carty, W. 1999. New Markets for Meeting Old Needs: US Distance Education and Developing Countries. London: EDUCASE.

Baragash, R. S., & Al-Samarraie, H. (2018). Blended learning: Investigating the influence of engagement in multiple learning delivery modes on students' performance. *Telematics and Informatics, 35*(7), 2082–2098.

Barnacle, R., & Dall'Alba, G. (2017). Committed to learn: Student engagement and care in higher education. *Higher Educa- tion Research & Development, 36*(7), 1326–1338.

Barnard, L., Lan, W. Y., To, Y. M, Paton, V. O., & Lai, S. L. (2009). Measuring self-regulation in online and blended learning environments. *The Internet and Higher Education*, 12(1), 1–6.

Baron, P., & Corbin, L. (2012). Student engagement: Rhetoric and reality. *Higher Education Research & Development, 31*(6), 759–772.

Barua, P. D., Zhou, X., Gururajan, R., & Chan, K. C. (2018). *Determination of factors influencing student engagement using a learning management system in a tertiary setting.* Paper presented at the IEEE/WIC/ACM International Conference on Web Intelligence (WI).

Battalio, J. (2007). Interaction online: A reevaluation. *Quarterly Review of Distance Education, 8*(4), 339- 352.

Beer, C., Clark, K., & Jones, D. (2010). *Indicators of engagement.* Paper presented at the Curriculum, technology transformation for an unknown future. Proceedings ascilite Sydney.

Bervell, B., & Umar, I. N. (2017). A decade of LMS acceptance and adoption research in Sub-Sahara African higher educa- tion: A systematic review of models, methodologies, milestones and main challenges. *Eurasia Journal of Mathemat- ics, Science and Technology Education, 13*(11), 7269–7286.

Bledsoe, T. (2013). A multimedia-rich platform to enhance student engagement and learning in an online environment. *Online Learning Journal, 17*(4).

Boekaerts, M. (2016). Engagement as an inherent aspect of the learning process. *Learning & Instruction, 43*, 76–83.

Boekaerts, M. (2016). Engagement as an inherent aspect of the learning process. *Learning & Instruction, 43*, 76–83.

Bolliger, D. U. (2004). Key factors for determining student satisfaction in online courses. *International Journal on E-Learning, 3*(1), 61-67.

Bolliger, D. U., & Inan, F. A. (2012). Development and validation of the online student connectedness survey (OSCS). *The International Review of Research in Open and Distributed Learning*, 13(3), 41–65.

Bolliger, D. U., & Martindale, T. (2004). Key factors for determining student satisfaction in online courses. *International Journal on E-Learning, 3*(1), 61–67.

Bomia, L., Beluzo, L., Demeester, D., Elander, K., Johnson, M., & Sheldon, B. (1997). *The impact of teaching strategies on intrinsic motivation*.

Bordelon, K. (2013). *Perceptions of achievement and satisfaction as related to interactions in online courses* (PhD dissertation). Northcentral University.

Bosch TE (2009) *Using online social networking for teaching and learning*: Facebook use at the University of Cape Town. Communication 35(2): 185–200.

Bouhnik, D., & Carmi, G. (2013). Thinking styles in virtual learning courses, (p. 141e145). Toronto: *Proceedings of the 2013 international conference on information society* (i-society).

Bray, E., Aoki, K., & Dlugosh, L. (2008). Predictors of learning satisfaction in Japanese online distance learners. *International Review of Research in Open & Distance Learning, 9*(3), 1–24.

Briggs, A. (2015, Feb.). Ten ways to overcome barriers to student engagement online. *Online Learning Consortium*.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies and academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education, 27*, 1–13.

Brown, L. (2014). Constructivist learning environments and defining the online learning community. *Journal on School Educational Technology*, *9*(4), 1–6.

Burch, G. F., Heller, N. A., Burch, J. J., Freed, R., & Steed, S. A. (2015). Student engagement: developing a conceptual framework and survey instrument. *Journal of Education for Business*, *90*(4), 224–229.

Byrne, B. M. (2010). Structural equation modeling with AMOS: *Basic concepts, applications, and programming*, (2nd ed.,). New York: Routledge.

Cabero-Almenara, J., Arancibia, M., & del Prete, A. (2019). *Technical and didactic*

Carini, R. M., Kuh, G. D., & Klein, S. P. (2006). Student engagement and student learning: Testing the linkages. *Research in Higher Education*, *47*(1), 1–32.

Centner, T. J. (2014). Structuring a distance education program to attain student engagement. *North American Colleges and Teachers of Agriculture Journal*, *58*(3), 230–235.

Chan CKY, Tam VW and Li CYV (2011) *A comparison of MCQ assessment delivery*

Chen, K. C., & Jang, S. J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior*, *26*(4), 741–752.

Chen, P.-S. D., Lambert, A. D., & Guidry, K. R. (2010). Engaging online learners: The impact of Web-based learning technology on college student engagement. *Computers &* Education, 4 (54), 1222–1232.

Cheung, R., & Vogel, D. (2013). Predicting user acceptance of collaborative technologies. *Computers & Education*, *63*, 160–175.

Cho, M., & Cho, Y. (2017). Self-regulation in three types of online interaction: A scale development. *Distance Education*, *38*(1), 70–83,

Cho, M., & Shen, D. (2013). Self-regulation in online learning. *Distance Education*, *34*(3), 290–301.

Cho, Y.S. (2011). *Diversification of learning platforms.* Moscow: ITE-UNESCO.

Commonwealth of Learning (2000*). An Introduction to Open and Distance Learning.* Vancouver, BC, Canada: COL.

Cox, B., & Cox, B. (2008). Developing interpersonal and group dynamics through asynchronous threaded discussions: *The use of discussion board in collaborative learning*. *Education*, *128*(4), 553–565.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *3*(3), 319–340.

Democratizing digital learning: theorizing the fully online learning community model. *International Journal of Educational Technology in Higher Education*, *14*(1), 1–16.

Dennen, V. P., Darabi, A. A., & Smith, L. J. (2007). Instructor–learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Education*, *28*(1), 65–79.

DiLoreto, M., & Gray, J. (2015, October). *Student satisfaction and perceived learning in online courses: The development of the SLS-OLE*. Paper presented at the Annual Meeting of the Online Learning Consortium, Orlando, FL.

Dixson MD (2010) Creating effective student engagement in online courses: What do students find engaging? *Journal of the Scholarship of Teaching and Learning* 10(2): 1–13.

Dixson, M. D. (2015). Measuring student engagement in the online course: The online student engagement scale (OSE). *Online Learning*, *19*(4), 143–157.

Donaldson, L., Matthews, A., Walsh, A., Brugha, R., Manda-Taylor, L., Mwapasa, V., & Byrne, E. (2017). Collaborative tools to enhance engagement in a blended learning Master's

programme. *AISHE-J: The All Ireland Journal of Teaching & Learning in Higher Education, 9*(1), 2921–29220.

Dziuban, C., Moskal, P., Brophy-Ellison, J., & Shea, P. (2007). Student satisfaction with asynchronous learning. *Journal of Asynchronous Learning Networks, 11*(1), 87-95.

Dziuban, C., Moskal, P., Kramer, L., & Thompson, J. (2013). Student satisfaction with online learning in the presence of ambivalence: Looking for the will-o'-the-wisp. *Internet and Higher Education, 17,* 1-8.

Ebbert, D., & Dutke, S. (2020). Patterns in students' usage of lecture recordings: A cluster analysis of self-report data. *Research in Learning Technology*.

Eccles, J., & Wang, M.-T. (2012). So, what is student engagement anyway? In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 133–145). New York: Springer.

engagement in online learning programs: Evidence from the virtual world of Second Life. *Computers in Human Behavior*, *35*, 157–170.

Eom, S.B., Ashill, N., & Wen, H.J. (2006). The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation. *Decision Sciences Journal of Innovative Education, 4*(2), 215-235.

Exploring the Use of Digital Technologies from the Perspective of Diverse Learners in Online Learning Environments Duderstadt, J., Atkins, D., & Houweling, D. (2002). *Higher education in the digital age:*

Exploring the Use of Digital Technologies from the Perspective of Diverse Learners in Online Learning Environments Lee, C. D. & Smagorinsky, P. (2000). *Vygotskian perspectives on literacy research: Constructing meaning through collaborative inquiry*. Cambridge University Press.

Fredricks, J. A., Filsecker, M., & Lawson, M. A. (2016). Student engagement, context, and adjustment: Addressing defini- tional, measurement, and methodological issues. *Learning and Instruction, 43*, 1–4.

Gharmallah, M. (2017). The Effect of Using Online Discussion Forums on Students' Learning. *TOJET: The Turkish Online Journal of Educational Technology*, *16*(1), 164-176.

Gomez, P.; Barbera, E. & Fernández, F. (2016). Measuring teachers and learners' perceptions of the quality of their online learning experience. *Distance Education, 37*(2), 146-163.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In B. Miller (Ed.), *The handbook of blended learning* (1st ed., pp. 3– 21). Preiffer.

Gray, J., & DiLoreto, M. (2015, August). *Student satisfaction and perceived learning in online learning environments: The mediating effect of student engagement*. Paper presented at the Annual Meeting of the National Council of Professors of Educational Leadership, Washington, D.C.

Greene, B. A. (2015). Measuring cognitive engagement with self-report scales: Reflections from over 20 years of research. *Educational Psychologist,* 50(1), 14– 30.

Groccia, J. E. (2018). What is student engagement? *New Directions for Teaching and Learning*, *2018*(154), 11–20.

Halverson, L. R. (2016). *Conceptualizing blended learning engagement*. [Doctoral Dissertation. Brigham Young University, USA.

Halverson, L. R., & Graham, C. R. (2019). Learner engagement in blended learning environments*: A conceptual framework. Online Learning*, 23(2), 145-178

Handelsman MM, Briggs WL, Sullivan N, et al. (2005) A measure of college student course engagement. *The Journal of Educational Research* 98(3): 184–192.

Harper, S. R., & Quaye, S. J. (2008). *Student engagement in higher education: Theoretical perspectives and practical approaches for diverse populations*. Taylor & Francis Group.

Harris, L. R. (2008). A phenomenographic investigation of teacher conceptions of student engagement in learning. *The Australian Educational Researcher, 35*(1), 57–79.

Havard, B., Du. J., & Xu, J. (2008). Online collaborative learning and communication media, *Journal of Interactive Learning Research, 19*(1), 37–50. *Online Learning, 20,*

Heitner, K. L., & Jennings, M. (2016). *Culturally responsive teaching knowledge and practices of online faculty*. 4, 54–78.

Helal, S., Li, J., Liu, L., Ebrahimie, E., Dawson, S., Murray, D. J., & Long, Q. (2018). Predicting academic performance by considering student heterogeneity. *Knowledge-Based Systems*, *161*, 134–146.

Henderson, M., Selwyn, N. & Aston, R. (2017). What works and why? Student perceptions of 'useful' digital technology in university teaching and learning. *Studies in Higher Education, 42*(8), 1567- 1579.

Henrie, C. R., Bodily, R., Larsen, R., & Graham, C. R. (2018). Exploring the potential of LMS log data as a proxy measure of student engagement. *Journal of Computing in Higher Education*, 30(2), 344–362.

Henrie, C. R., Bodily, R., Larsen, R., & Graham, C. R. (2018). Exploring the potential of LMS log data as a proxy meas- ure of student engagement. *Journal of Computing in Higher Education, 30*(2), 344–362.

Henrie, C. R., Halverson, L. R., & Graham, C. R. (2015). Measuring student engagement in technology-mediated learning: A review. *Computers & Education, 90,* 36–53.

Hew, K. F. (2016). Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS. *British Journal of Educational* 1824–28.

Hillman, C. A., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *American Journal of Distance Education, 8*(2), 30–42.

Holmes N (2018) Engaging with assessment: Increasing student engagement through continuous assessment. *Active Learning in Higher Education* 19(1): 23–34.

Holzweias, P.C., Joyner, S.A., Fuller, M.B., Henderson, S. & Young, R. (2014). Online graduate student's perceptions of best learning experiences. *Distance Education, 35(*3), 311-

Huei YC (2014) Student engagement and learning using an integrated student-lecturer engagement design framework. In: 2014 *International conference on teaching, assessment and learning* (TALE), pp. 79–85. Piscataway: IEEE.

Ice, P., Curtis, R., Phillips, P., Wells, J. (2007). Using asynchronous audio feedback to enhance teaching presence and students' sense of community. *Journal of Asynchronous Learning Networks, 11*(2), 3-25.

Jaggars, S. S., & Xu, Di (2016). How do online course design features influence student performance? *Computers and Education,* 95, 270-284.

Johnson, C. (2017). Teaching music online: Changing pedagogical approach when moving to the online environment. *London Review of Education, 15*(3), 439–456.

Johnson, D. M., Edgar, L. D., Shoulders, C. W., Graham, D. L., & Rucker, K. J. (2016). *Relationship between engagement and satisfaction among seniors at a mid-south land grant*

Jones, S. J. (2012). Technology review: *The possibilities of learning analytics to improve learner-centered decision-making.*

Jung, I., Choi, S., Lim, C., & Leem, J. (2002). Effects of different types of interaction on learning achievement, satisfaction and participation in web-based instruction. *Innovations in Education & Teaching International, 39*(2), 153–162.

Ju-Yin, T, & Yen-Chen, Y. (2016). College Students' Perspectives of E-Learning System Use in High Education. *Asian Journal of Education and Training, 2*(2), 53-62.

Kahn, P., Everington, L., Kelm, K., Reid, I., & Watkins, F. (2017). Understanding student engagement in online learning environments: The role of reflexivity. *Educational Technology Research & Development*, *65*(1), 203–218.

Kahu, E. R. (2013). Framing student engagement in higher education. *Studies in Higher Education, 38*(5), 758–773.

Kahu, E. R., & Nelson, K. (2018). Student engagement in the educational interface: Understanding the mechanisms of student success. *Higher Education Research & Development, 37*(1), 58–71.

Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology*, *23*, 1–13.

Kebble, P.G. (2017). Assessing Online Asynchronous Communication Strategies Designed to Enhance Large Student Cohort Engagement and Foster a Community of Learning. *Journal of Education and Training Studies, 5*(8); 92-100.

Keller, J. M. (1984). The use of the ARCS model of motivation in teacher training. Aspects of Educational Technology Volume XVII: Staff Development and Career Updating. K. S. A. J. Trott. London, Kogan Page.
Keller, J. M. (1987). "Strategies for stimulating the motivation to learn." Performance & Instruction 26(8): 1 - 7.
Keller, J. M. (1987). "The systematic process of motivational design." Performance & Instruction 26(9): 1 - 8.
Keller, J. M. (2008). "An integrative theory of motivation, volition, and performance." Technology, Instruction, Cognition, and Learning 6(2): 79-104.
Keller, J. M. (2010). Motivational design for learning and performance: The ARCS model approach. New York, Springer.

Khan, A., Egbue, O., Palkie, B., & Madden, J. (2017). Active learning: Engaging students to maximize learning in an online course. *Electronic Journal of E-Learning, 15*(2), 107-115.

Kirmizi, O. (2014). A Study on the Predictors of Success and Satisfaction in an Online Higher Education Program in Turkey. *International Journal of Education*, 6, 4.

Korobova, N., & Starobin, S. S. (2015). A comparative study of student engagement, environments. *Distance Education, 2* (1), 89–106.

Kuh, G. D. (2003, March/April). What we're learning about student engagement from NSSE: *Benchmarks for effective educational practices*. *Change*, *35*(2), 24–32.

Kuh, G. D. (2016). Making learning meaningful: Engaging students in ways that matter to them. *New Directions for Teach- ing and Learning*, *2016*(145), 49–56.

Kuh, G. D., Kinzie, J., Cruce, T., Shoup, R., & Gonyea, R. M. (2007). *Connecting the Dots: Multi-Faceted Analyses of the Relationships between Student Engagement Results from the NSSE, and the Institutional Practices and Conditions That Foster Student Success* (Revised Final Report prepared for Lumina Foundation for Education).

Kuo, Y. C., Walker, A. E., Schroder, K. E. E., & Belland, B. R. (2014). Interaction, internet self-efficacy, and self-regulated learning as predictors of student satisfaction in online education courses. *The Internet and Higher Education*, *20*, 35–50.

Kuo, Y., Walker, A. E., Belland, B. R., & Schroder, K. E. (2013). A predictive study of student satisfaction in online education programs. *International Review of Research in Open & Distance Learning*, *14*(1), 16–39.

Kuo, Y., Walker, A. E., Belland, B. R., & Schroder, K. E. E. (2014). A predictive study of student satisfaction in online education programs. *The International Review of Research in Open and Distance Learning*, *14*(1), 16-39.

Kurucay, M. & Inan, F.A. (2017). Examining the effects of learner-learner interactions on satisfaction and learning in an online undergraduate course. *Computers & Education*, 115, 20-37.

Lee, B. C., Yoon, J. O., & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: Theories and results. *Computers & Education*, 53, 1320–1329.

Lee, J. (2012). Patterns of interaction and participation in a large online course: Strategies for fostering sustainable discussion. *Educational Technology & Society*, *15*(1), 260–272.

Lester, P. M., & King, C. M. (2009). Analog vs. digital instruction and learning: Teaching within first and second life environments. *Journal of Computer-Mediated Communication*, 14, 457–483.

Lewis, N. (2004). *Military student participation in distance learning*. Doctorate dissertation. Johnson & Wales University. USA.

Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the class- room. *Reading & Writing Quarterly*, *19*(2), 119–137

Linnenbrink-Garcia, L., Rogat, T. K., & Koskey, K. L. K. (2011). Affect and engagement during small group instruction. *Con- temporary Educational Psychology*, *36*(1), 13–24.

Little-Wiles, J. M., & Naimi, L. L. (2011). *A study of traditional undergraduate student engagement in blackboard learning management system.* Paper presented at the ASEE Annual Conference and Exposition, Conference Proceedings.

Little-Wiles, J. M., Hundley, S. P., & Koehler, A. (2010). *Work in progress—Maximizing student engagement in a learning management system.* Paper presented at the 40th Annual Frontiers in Education Conference: Celebrating Forty Years of Innovation, FIE 2010, Arlington, VA.

Liu, D., Froissard, C., Richards, D., & Atif, A. (2015). *Validating the effectiveness of the moodle engagement analytics plugin to predict student academic performance.* Paper presented at the 2015 Americas Conference on Information Systems, Puerto Rico.

Loh, C., Wong, D. H., Quazi, A., & Kingshott, R. P. (2016). Re-examining students' perception of e-learning: An Australian perspective. *International Journal of Educational Management, 30*(1), 129–139.

Lyashenko, M.S. & Frolova, N.H. (2014). LMS projects: *A platform for intergenerational e-learning collaboration. Education and Information Technologie*s, 19, 495-513.

Ma, J., Cheng, J., & Han, X. (2018). Initial development process of a student engagement scale in blended learning environment. *Proceedings – 6th International Conference of Educational Innovation Through Technology*, EITT 2017, 2018-March, 234–237.

Ma, J., Han, X., Yang, J., & Cheng, J. (2015). Examining the necessary condition for engagement in an online learning environment based on learning analytics approach: The role of the instructor. *The Internet and Higher Education*, 24, 26-34.

Macfarlane, B., & Tomlinson, M. (2017). Critiques of student engagement. *Higher Education Policy, 30*(1), 5–21.

Maguire, R., Egan, A., Hyland, P., & Maguire, P. (2017). Engaging students emotionally: The role of emotional intelligence in predicting cognitive and affective engagement in higher education. *Higher Education Research & Development, 36*(2), 343–357.

Mahle, M. (2011). *Effects of interaction on student achievement and motivation in distance*

Martin, F., Ahlgrim, L. & Budhrani, K. (2017) Systematic Review of Two Decades (1995 to 2014) of Research on Synchronous Online Learning. American. *Journal of Distance Education, 31*(1), 3-19.

Mello, L. V. (2016). Fostering postgraduate student engagement: Online resources supporting self-directed learning in a diverse cohort. *Research in Learning Technology, 24*, 1–16.

Messias, I., Morgado, L., & Barbas, M. (2015). *Students' engagement in distance learning: Creating a scenario with LMS and Social Network aggregation.* Paper presented at the 17th International Symposium on Computers in Education, SIIE 2015.

Moore, M. G. (1989). Three types of interactions [Editorial]. *The American Journal of Distance Education, 3*(2), 1–7.

Moore, M. G. (1991). Editorial: Distance education theory. *The American Journal of Distance Education, 5*(3), 1-6.

Moreira, J.A., Henriques, S., Goulão, M.F. & Barros, D. (2017). Digital Learning in Higher Education: A Training Course for Teaching Online - Universidade Aberta, Portugal. *Open Praxis, 9*(2), 253– 263.

Moreno, V., Cavazotte, F., Alves, I. (2017). Explaining university students' effective use of e-learning platforms. *British Journal of Educational Technology*, *48*(4), 995–1009.

Muirhead, B. (2004). Encouraging interaction in online classes. *International Journal of Instructional Technology and Distance Learning, 1*(6), 45-50.

Nagy, J. T. (2018). Evaluation of online video usage and learning satisfaction: An extension of the technology acceptance model. *International Review of Research in Open & Distance Learning*, *19*(1), 160–184.

Nawrot I and Doucet A (2014) *Building engagement for MOOC students*: Introducing support for time management on online learning platforms. In: Proceedings of the 23rd international conference on World Wide Web, pp. 1077–1082. New York: ACM.

Nicol, D. (2009). Assessment for learner self-regulation: Enhancing achievement in the first year using learning technologies. *Assessment & Evaluation in Higher Education*, *34*(3), 335–352.

Northey, G., Bucic, T., Chylinski, M., & Govind, R. (2015). Increasing student engagement using asynchronous learning. *Journal of Marketing Education, 37*(3), 171–180.

Nortvig, A. M., Petersen, A. K., & Balle, S. H. (2018). *A literature review of the factors influencing e-Learning and blended learning in relation to learning outcome, student satisfaction and engagement, 16*(1), 46–55.

Online Merriam, S. B. (2009). *Qualitative Research: A Guide to Design and Implementation*. Jossey- importance of engagement strategies in the online learning environment. 1, 205–222. Bass.

Oproiu, G.C. (2015). A Study about Using E-learning Platform (Moodle) in Univeristy Teaching Process. *Procedia-Social and Behavioral Sciences*, 180, 426-432.

Paulsen, J., & McCormick, A. C. (2020). Reassessing disparities in online learner student engagement in higher education. *Educational Researcher, 49*(1), 20–29.

Pecku, N.K. (1998). *Survey of Current Status of Distance Education in Cameroon*.

Pekrun, R., & Linnenbrink-Garcia, L. (2012). Academic emotions and student engagement. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement.* (pp. 259–282). Springer, US.

Pellas, N., & Kazanidis, I. (2014). Engaging students in blended and online collaborative courses at university level through Second Life: Comparative perspectives and instructional affordances. *New Review of Hypermedia and Multimedia*, *20*(2), 123–144.

Pellas, N., & Kazanidis, I. (2015). On the value of second life for students' engagement in blended and online courses: A comparative study from the higher education in Greece. *Education and Information Technologies*, *20*(3), 445–466.

Pera, A. (2013). The relationship between faculty practices and student engagement and learning. *Analysis and Metaphysics, 12,* 160–165.

Pérez-Navio, E., Rodriguez, J. & Carmona, M. (2015). El uso de mini-videos en la práctica docente universitaria [The use of mini-videos in university teaching practice]. *Edmetic, 4*(2), 51-70.

Petersen, J. (2015). *Honoring diversity in an online classroom: Approaches used by instructors engaging through an LSM* [Doctoral dissertation, University of Nebraska-Lincoln].

Rashid, T., & Asghar, H. M. (2016). Technology use, self-directed learning, student engagement and academic performance: Examining the interrelations. *Computers in Human*

Reeve, J. (2012). A Self-determination Theory perspective on student engagement. In S. Christenson, A. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 149–172). Boston, MA:

Reeve, J., & Tseng, C.-M. (2011). Agency as a fourth aspect of students' engagement during learning activities. *Contemporary Educational Psychology, 36*(4), 257–267.

Reinhart, J., & Schneider, P. (2001). Student satisfaction, self-efficacy, and the perception of the two-way audio/video distance learning environment: A preliminary examination. *Quarterly Review of Distance Education, 2*(4), 357– 365.

Rennie F and Morrison T (2013) E-Learning and Social Networking Handbook*: Resources for Higher Education*. New York: Routledge Press.

Republic of Cameroon (2013*). Cameroon Education and Training Sector Strategy Paper. Published by the Ministry of Economy, Planning and Regional Development*.

Rienties, B. & Toetenel, L. (2016). The impact of learning design on student behavior, satisfaction and performance: *A cross-institutional comparison across 151 modules. Computers in Human Behavior,* 60, 333-341.

Robertson JS, Grant MM and Jackson L (2005) Is online instruction perceived as effective as campus instruction by graduate students in education? *The Internet and Higher Education* 8(1): 73–86.

Robinson CC and Hullinger H (2008) New benchmarks in higher education: Student engagement in online learning. *Journal of Education for Business* 84(2): 101–109.

Robinson, C. C., & Hullinger, H. (2008). New benchmarks in higher education: Student engagement in online learning. *Journal of Education for Business, 84*(2), 101e108.

Robinson, C. C., & Hullinger, H. (2008). New benchmarks in higher education: Student engagement in online learning [Electronic version]. *Journal of Education for Business, 84*(2), 101–109.

Roblyer MD and Wiencke WR (2004) Exploring the interaction equation: Validating a rubric to assess and encourage interaction in distance courses. *Journal of Asynchronous Learning* Networks 8(4): 24–37.

Roblyer, M. D., & Doering, A. H. (2010). *Integrating educational technology into teaching* (5th ed.). Allyn and Bacon.

Roblyer, M. D., & Wiencke, W. R. (2004). Exploring the interaction equation: Validating a rubric to assess and encourage interaction in distance courses. *Journal of Asynchronous Learning Networks*, *8*(4), 25–37.

Rogers, E. M. (2003*). Diffusion of innovations*, (5th ed.,). New York: Free Press.

Rotar, O. (2017). Rethinking the support system for adult students in online learning environment. *Journal of Educational and Instructional Studies in the World*, *7*(4), 12–19.

Rovai, A. P. (2004). A constructivist approach to online college learning. *Internet and Higher Education*, *7*(2), 79–93.

Rovai, A. P., Ponton, M. K., Wighting, M. J., & Baker, J. D. (2007). A comparative analysis of student motivation in traditional classroom and E-learning courses. International. *Journal on E-Learning*, *6*(3), 413–432.

Saeler, A. (2015). *The relationship of student satisfaction and academic achievement in online versus traditional education* (Doctoral dissertation). ProQuest Dissertations & Theses Full Text database. (UMI No. 3714866)

Salmon, G. (2011). E-moderating*: The key to teaching and learning online*, (3rd ed.,). London: Routledge.

Santally M and Senteni A (2004) A cognitive approach to evaluating web-based distance learning environments. *Instructional Technology and Distance Learning* 1(3): 45–53.

Saunders, F. C., & Gale, A. W. (2012). Digital or didactic: Using learning technology to confront the challenge of large cohort teaching. *British Journal of Educational Technology, 43*(6), 847–858

Selander, S. (2008). Designs of learning and the formation and transformation of knowledge in an era of globalization. *Studies in Philosophy and Education*, *27*(4), 267–281.

Selwyn, N. (2016). Digital downsides: exploring university students' negative engagements with digital technology. *Teaching in Higher Education, 21*(8), 1006-1021.

Shaw, C., Larson, R. & Sibdari, S. (2014). An asynchronous, personalized learning platform-Guided Learning Pathways (GLP). *Creative Education, 5*, 1189-1204.

Shea P, Li CS and Pickett A (2006) A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *The Internet and Higher Education* 9(3): 175–190.

Shea, P., Fredericksen, E., Pickett, A., & Pelz, W. (2003). Student satisfaction and reported learning in the SUNY Learning Network. In: T. Duffy and J. Kirkley, *Learner Centered Theory and Practice in Distance Education*. Mahwah, NJ: Lawrence Erlbaum.

Shea, P., Li, C. S., & Pickett, A. (2006). A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *The Internet and Higher Education, 9*(3), 175-190.

Sher, A. (2009). Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in web-based online learning environment. *Journal of Interactive Online Learning, 8*(2), 102–120.

Shi, Y., Frederiksen, C. H., & Muis, K. R. (2013). A cross-cultural study of self-regulated learning in a computer-supported collaborative learning environment. *Learning and instruction 23, 52-59.*

Siemens G (2012) MOOCs are really a platform [Blog post]. elearnspace. Available at: http://www. personal.psu.edu/atb3/blogs/snippets/2012/07/george-siemens—moocs-are-really-a-platform.

Suzuki, K. and J. M. Keller (1996). Creation and cultural validation of an ARCS motivational design matrix. *Annual meeting of the Japanese Association for Educational Technology, Kanazawa, Japan.*

Swan K and Shih LF (2005) On the nature and development of social presence in online course discussions. *Journal of Asynchronous Learning Networks* 9(3): 115–136.

Swan, K. (2001). Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education*, *22*(2), 306-331.

Swart, A. J. (2015). Student usage of a learning management system at an open distance learning institute: A case study in electrical engineering. *International Journal of Electrical Engineering Education*, *52*(2), 142–154.

Swart, A. J. (2017). *Using reflective self-assessments in a learning management system to promote student engagement and academic success.* Paper presented at the 8th IEEE Global Engineering Education Conference, EDUCON 2017.

Tabak, F., & Nguyen, N. T. (2013). Technology acceptance and performance in online learning environments: Impact of self-regulation. *Journal of Online Learning and Teaching*, *9*(1), 116–130.

Taylor, S., & Todd, P. A. (1995). Assessing IT usage: *The role of prior experience*. MIS Quarterly, 19(2), 561–570.

Thurmond, V. A., & Wambach, K. (2004). Understanding interactions in distance education: A review of the literature. *International Journal of Instructional Technology and Distance Learning*, *1*(1), 9–33.

Thurmond, V., & Wambach, K. (2004). Understanding interactions in distance education: A review of the literature. *International Journal of Instructional Technology & Distance Learning*, *1*, 9–33.

Trekles, A. M. (2013). *Learning at the speed of light: Deep learning and accelerated online graduate courses* (published doctoral dissertation). Retrieved from Capella University:

Trowler, V. (2010). Student engagement literature review. (*The Higher Education Academy*).

Trowler, V. (2010). Student engagement literature review. *The Higher Education Academy*, *11*(1), 1–15.

Tu, C., & McIsaac, M. (2002). The relationship of social presence and interaction in online classes. *The American Journal of Distance Learning, 16*(3), 131-150.

Venugopal, G., & Jain, R. (2015). *Influence of learning management system on student engagement.* Paper presented at the 2015 IEEE 3rd International Conference on MOOCs, Innovation and Technology in Education (MITE).

Visser, L. (1998). *The Development of Motivational Communication in Distance Education* Support, Educational Technology Department, The University of Twente, The Netherlands.

Wallace, R. (2003). Online learning in higher education: A review of research on interactions among teachers and students. *Education, Communication & Information, 3*(2), 241–280.

Wandler, J. B., & Imbriale, W. J. (2017). Promoting undergraduate student self- regulation in online learning environments. *Online Learning, 21*(2), 1–16.

Wang, C., Shannon, D. M., & Ross, M. E. (2013). Students' characteristics, self- regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, *34*(3), 302–323.

Wang, F. H. (2017). An exploration of online behaviour engagement and achievement in flipped classroom supported by learning management system. *Computers & Education, 114*, 79–91.

Wang, M-T., & Hofkens, T. L. (2019). *Beyond classroom academics*: A school-wide and multi-contextual perspective on student engagement in school.

Wang, Y. D. (2014). Applying constructivist instructional strategies to e-learning: a case study of a web development course. *International Journal on E-Learning*, *13*(3), 375–406.

Whitmer, J. (2015). *How blackboard analytics improves learner Engagement*.

Williams, D., & Whiting, A. (2016). Exploring the relationship between student engagement, Twitter, and a learning management system: A study of undergraduate marketing students. *International Journal of Teaching & Learning in Higher Education, 28*(3), 302–313

Wyatt, L. G. (2011). Nontraditional student engagement: Increasing adult student success and retention. *The Journal of Continuing Higher Education, 59*(1), 10–20

Xiao, J. (2017). Learner-content interaction in distance education: The weakest link in interaction research. *Distance Education, 38(*1), 123-135.

Xu, D., & Jaggars, S. S. (2011). The effectiveness of distance education across Virginia's

Young S (2006) Student views of effective online teaching in higher education. *American Journal of Distance Educatio*n 20(2): 65–77.

Yu, Z. (2015). Indicators of satisfaction in clickers aided EFL class. *Frontiers in Psychology*, 6, 587.

Yuan, J., & Kim, C. (2014). Guidelines for facilitating the development of learning communities in online courses. *Journal of Computer Assisted Learning, 30*, 220– 232.

Yukselturk, E., & Yildirim, Z. (2008). Investigation of interaction, online support, course structure and flexibility as the contributing factors to students' satisfaction in an online certificate program. *Journal of Educational Technology & Society, 11*(4), 51–65.

Zacharis, N. Z. (2015). A multivariate approach to predicting student outcomes in web-enabled blended learning courses. *Internet and Higher Education, 27*, 44–53.

Zagalsky, A., Feliciano, J., Storey, M.A., Zhao, Y. & Wang, W. (2015). *The Emergence of GitHub as a Collaborative Platform for Education. Motivation and Dynamics of the Open Classroom*. *CSCW 2015*, March 14-18, 2015. Vancouver, BC, Canada.

Zanjani, N., Edwards, S. L., Nykvist, S., & Geva, S. (2016). LMS Acceptance: The Instructor Role. *The Asia-Pacific Education Researcher, 25*(4), 519-526.

Zhoc, K. C., Webster, B. J., King, R. B., Li, J. C., & Chung, T. S. (2019). Higher education student engagement scale (HESES): Development and psychometric evidence. *Research in Higher Education, 60*(2), 219–244

Zhou, L., & Zhang, D. (2008). Web 2.0 impact on student learning process. In K. McFerrin et al. (Eds.), *Proceedings of society for information technology and teacher education international conference* (pp. 2880–2882). AACE.

Zhu, C. (2012). Student satisfaction, performance, and knowledge construction in online collaborative learning. *Educational Technology & Society*, 15(1), 127–136.

Zimmerman, B.J. (1990). Self-Regulated Learning and Academic Achievement: An Overview. *Educational Psychologist*, 25(1), 3-17.

APPENDIX

QUESTIONNAIRE

Dear Students:

I am a final year master student of the University of Yaoundé 1, Department of Curriculum and Evaluation of the faculty of Education. I am conducting research on " Digital Learning repositories impact on student's engagement and satisfaction in some selected secondary schools in the Mfoundi Division".

The purpose of the questionnaire is to get information from students on the above research topic. In order to carry out this research, your corporation in filling out the research questionnaire is needed. You are therefore required to be honest in your response as the research is purely for academic purposes, and all information supplied shall be treated confidentially, your name is not required anywhere on this questionnaire. Thanks for your anticipated co-operation.

Yours Sincerely

JINGA ADELINE BESANGA

(Researcher)

SECTION A: Personal Data (Information)

Read the following statements thoroughly and indicate the answer that best corresponds to your opinion by ticking in the appropriate column provided or by filing the blanks

Sex: male, female

Name of school: _____

Age: 16 - 18 19 – 21 22 - 24 25 and above

Name of School:_____

Sub divisions of School Location: _____

(INSTRUCTIONS)

Below are some statements designed to get a response on digital learning repository as an indicator of student's engagement and satisfaction in some secondary schools in Mfoundi Division. To what extent do you agree with following statement.

Strongly agree ……. (SA)

Agree …… (A)

Disagree ……. (D)

Strongly Disagree ……... (SD)

Tick the appropriate opinion.

SECTION B. Role of Digital Learning Repository

SN	Statement	SA	A	D	SD
1.	The leaning repository motivate student learning of the subjects				
2.	The learning repository encourage critical thinking				
3.	The content selected are relevant in an in-depth knowledge of the subject				
4.	The learning repository promote a collaborative learning style				
5.	The learning repository allowed for interaction among students				
6.	The learning repository allowed for interaction between students and teachers				
7.	The learning repository increased my interactions with the teacher				
8.	The learning repository provided a reliable means of communication				
9.	The learning repository is a great place for the instructor to place handouts				
10.	The discussion section is available and easy to use.				
11.	The discussions helped me better understand subject content.				

SECTION C. Digital Learning Repository and Students Satisfaction.

SN	Statement	SA	A	D	SD
1.	The learning repository promote independent learning				
2.	The repository offers possibilities to comment basic content of the subject				
3.	The repository student forum offers a space for active leaning l				
4.	Teachers use the learning repository to respond to the need of the learners				
5.	I was satisfied with the content available on the learning repository.				
6.	I was satisfied with the online lecture notes included on the learning repository.				
7.	The lecture notes were easy to print.				
8.	The lecture notes were available in PowerPoint.				
9.	I regularly visited the learning repository for a better understanding of a subject				
10.	The assignment section is available and easy to use				
11.	Teachers assess the assignment and gives feed back				

SECTION D. Digital Learning Repository and Students Engagement.

SN	Statement	SA	A	D	SD
1.	I have successfully incorporated the learning repository in my learning				
2.	The learning repository is a complement of the classroom material				
3.	The self-assessment activities in the learning repository promote the acquisition of the knowledge of the subject				
4.	The learning repository favour the creation of a scheme of work for collaboration within students				

5.	The learning repository fosters the climate of didactic interaction between teachers and students				
6.	The learning repository enable the creation of learning communities among students				
7.	Through the learning repositories strong link with other students are encourage				
8.	I believe that the learning repository enhance learning.				
9.	I believe that the learning repository will play an important role in secondary education in the future.				
10.	I was satisfied with the overall experience using the digital learning repository				
11.	I was satisfied with the learning repository in regards to the quantity of my learning experience				