Universidade do Minho
Instituto de Educação

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March, 2023

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Appreciation

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DECLARAÇÃO DE INTEGRIDADE

Declaro ter atuado com integridade na elaboração do presente trabalho académico e confirmo que não recorri à prática de plágio nem a qualquer forma de utilização indevida ou falsificação de informações ou resultados em nenhuma das etapas conducente à sua elaboração.

Mais declaro que conheço e que respeitei o Código de Conduta Ética da Universidade do Minho.

Scenario-Based Approach and Social Media to Support Secondary School Students' Learning

Abstract

This research aim towards understanding the most effective procedures for implementing scenario-based learning (SBL) approach and social media to support meaningful learning at the secondary education level. It is observed that research and development on SBL are concentrated more on corporate entities, and in higher education. Therefore, to evaluate the relevancy of SBL in secondary education, supporting theories from the literature that were explored to establish the conceptual framework for this research are scenario planning theories and approaches, situated learning theories, cognitivism, constructivism and, behaviourism, amongst others. To accomplish the research aim, four objectives were outlined, and the influence of SBL approach and social media on those objectives was assessed. The objectives are social and interactive educational media; learners' motivation; learners' engagement; and learners' cognitive experience. These objectives formed parts of the components studied to elaborate learning as a process. Being a qualitative research, primary data were collected from 80 participants (secondary school students) from two Nigerian secondary schools that were selected through non-random sampling. The data collection tools comprise two scenario-based e-learning courses that were crafted and developed for this research, and questionnaires that inquired about the participants' experiences with the scenario-based e-learning courses. The results were presented using a descriptive statistical method, while basic statistical tools such as measures of variability, and weighted average were used for the analyses of the results. The main conclusions, among several others, are the recognition of students' emotions as a significant factor in achieving meaningful learning, the proper understanding of the factors that make up emotions in learning, and the operationalization of these elements in SBL courses. More research is needed specifically in the field of evaluation. It is also concluded that formative assessment can be modelled as a plausible tool to efficiently implement SBL as a new paradigm in secondary education.

Keywords: Cognitive functions; Empiricism; Learning as a continuous process; Scenario planning; Technology-enhanced learning.

Abordagem baseada em cenários e redes sociais para apoiar a aprendizagem dos alunos do ensino secundário

Resumo

Esta investigação visa a compreensão dos procedimentos mais eficazes de implementação da abordagem de aprendizagem baseada em cenários (SBL) e das redes sociais para apoiar uma aprendizagem significativa a nível do ensino secundário. Observa-se que a investigação e desenvolvimento da SBL se concentra mais em entidades empresariais e no ensino superior. Para avaliar a relevância da SBL no ensino secundário foram exploradas, na literatura da especialidade, para estabelecer o quadro conceptual para esta investigação, teorias e abordagens de planeamento de cenários, de aprendizagem situada, de desenvolvimento cognitivo e comportamentalismo. Para atingir a finalidade da investigação, foram delineados quatro objetivos específicos, tendo sido avaliada a influência da abordagem SBL e do recurso a redes sociais. Os objetivos específicos referem-se aos meios educativos sociais e interativos; a motivação dos alunos; o envolvimento dos alunos; e a experiência cognitiva dos alunos; estes fatores foram analisados como componentes relevantes no processo de aprendizagem. Sendo a investigação qualitativa, foram recolhidos dados de 80 participantes (estudantes do ensino secundário) de duas escolas secundárias nigerianas selecionadas através de amostragem não aleatória. Os instrumentos de recolha de dados compreendem dois cursos de e-learning baseados em cenários elaborados e desenvolvidos para esta investigação e questionários que inquiriram sobre as experiências dos participantes com os cursos de e-learning baseados em cenários. Os resultados foram apresentados utilizando um método estatístico descritivo, através de ferramentas estatísticas básicas tais como medidas de variabilidade e média ponderada. As conclusões principais, entre várias outras, são o reconhecimento das emoções dos alunos como um fator significativo na obtenção de aprendizagem significativa, a compreensão adequada dos fatores que compõem as emoções na aprendizagem e a operacionalização desses elementos em cursos SBL. Mais investigação se revela necessária especificamente no domínio da avaliação. Conclui-se ainda que a avaliação formativa pode ser modelada como uma ferramenta plausível para implementar eficientemente o SBL como um novo paradigma no ensino secundário.

Palavras-chave: Aprendizagem como processo contínuo; Aprendizagem tecnológica reforçada; Empirismo; Funções cognitivas; Planeamento de cenários

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List of acronyms

AICC: Aviation Industry Computer-based Training Committee

AST: Adaptive Structural Theory

B.C.: Before Christ

BBS: Bulletin Board System

CAI: Computer Assisted Instruction

CAL: Computer Assisted Learning

CBI: Computer Based Instruction

C-MAP: Concept Map

GUI: Graphical User Interface

HTML5: Hypertext Markup Language revision 5

IRC: Internet Relay Chat

LMS: Learning Management System

MS PowerPoint: Microsoft PowerPoint

OS: Operating System

SBL: Scenario-Based Learning

SCORM: Shareable Content Object Reference Model

SME: Subject Matter Expert

TAIDA: Tracking, Analysing, Imaging, Deciding, and Acting

TCP/IP: Transmission Control Protocol/ Internet Protocol

TEL: Technology-Enhanced Learning

VOIP: Voice Over the Internet Protocol

xAPI: Experience Application Programming Interface

ZPD: Zone of Proximal Development

INTRODUCTION

Learning is an integral part of education and perhaps the most referred concept when issues about human development vie for the attention of people and society. The domain of knowledge acquisition and its efficient usage, which have been the continuous quest by humans from the existence has to make learning the concept of a debate, equivocal, and reappraisal amongst the elites in education, psychology, and in academia at large.

Educational activity or pedagogy entails the functionalities and the resources (both human and capital) that foster the imbibing, acquisition and development of knowledge and skills needed for humans to live, adjust, and adapt to the variables in their environment (Vygotsky, 1986) (Bandura, 1971). Therefore it is important to reflect on the concept of learning as a process that involves the engagement of the cognitive functions of selecting relevant pieces from the presented information or situation, mentally organizing them, and integrating them with relevant prior knowledge activated from long-term memory (Fiorella & Mayer, 2015).

Learning is an inevitable activity that humans experience throughout their lifetime and, this way, they form conscious and unconscious learning. Most of the learning activity in every human's life happens unconsciously, that is, much of the knowledge is acquired without the awareness or existence of a metacognitive state (Dienes, 2011). Be it conscious or unconscious learning, it is evident that constant acquisition and the know-how application of relevant and meaningful knowledge is a pivot to individual and societal development (Papert, 1980b). Integrating technology in education can be seen as a tool and catalyst for change which has saddled learning activity through phases of development, reforms, and it has addressed some fundamental issues that are affecting pedagogy across the various levels of education. The advancement in technology from analogue to digital has tremendously supported education, nowadays, technologies that are designed to facilitate learning can be found everywhere (Selwyn, 2011). It is therefore becoming necessarily overdue for educators and researchers in education to continue re-evaluating the existing learning techniques and inventing new ones to efficiently absorb the promising contributions of these technologies and innovations.

According to Wrenn and Wrenn (2019), in their book titled 'Enhancing Learning by Integrating Theory and Practice' the scenario-based Learning (SBL) approach is a technology-enhanced modern learning technique that connects learning theories with practice (Wrenn & Wrenn, 2009). That is, the learning approach possesses the capability to walk the learners through mental reflection and technicality of how the theory learnt in an abstract sense can be applied in a practical, real-world sense. Corroborating

with this claim by Wrenn & Wrenn, Chermack (2003) identified constructivism as a core theoretical domain that informs the process and implementation of SBL approach (T. J. Chermack & van der Merwe, 2003). Because, in a constructivist learning environment, learning occurs with active efforts and participation of the individual learner through making meaning of information and situations available to them. Situated learning theory also supports SBL as an approach that links theory with practice by posits that, learning should be embedded in an authentic context of practice (Lave, 2004). In the English dictionary, a scenario is explained as an imagined or projected sequence of events, especially any of several detailed plans or possibilities.

For a scenario to be useful and be simulated as a learning resource, the following conditions must hold; such a scenario must tell a good and educative story, entail narratives that are facts or near fact, enable dialogue and interactivity, create empathy with the learners, and most importantly, serve a teaching function by meeting the learning objectives. If all the characteristics listed above are met, such a scenario is recognized as being suitable for learning. According to Papert, a learning technique that is enriched with artefacts is expected to be effective in engaging the learners to be pro-active in the learning process most especially young learners and teenagers (Papert, 1980). In a clearer sense, SBL is described as a learning technique or approach which involves activities such as the creation of a representation of imagined and possible events, case studies, and narratives as a learning resource using technological tools and software. The output from these activities is always an e-learning course material to aid meaningful learning (Schelb, 2009).

In this introductory section, the researcher will present the underlined cause that triggered this reasearch and be brief on the significance of this research activity on education. Further, in the later pages are the questions that were raised purporting possible solutions and/or recommendations to the problem, the procedure for the research, and the way the entire thesis is organised.

Reasons and importance of the research

With the worldwide technological advances, the integration of modern technology tools for learning in education has gained more importance and attracts increasing attention across the different curricula of all educational levels; this has created a noticeable gap in the categories of learners and educational levels due to the inequality of attentions and supports by educators and concerned elites amongst the various educational levels.

Major learning theories such as cognitivism, constructivism, and behaviourism that are all subscribed to empiricism seem not to be actively being implemented at lower educational levels (e.g. secondary education) pedagogy systems (Wrenn & Wrenn, 2009). Through deep questing, it was found that the teaching-learning practices that will put the learners at the centre have not been remarkably adopted at the secondary education level. Also, it was found from the literature that implementing the components and practices of empiricism theory in pedagogy is the clear pathway to a meaningful understanding of how knowledge is acquired (Ettore & Constantin, 2018; Longworth, 2009). Empiricism, the theory in epistemology hold firmly that, experience is the primary source of all knowledge, that is, human organisms are born with basically no knowledge (*tabula rasa*), and anything learned is gained through interactions and association with the environment (Hammond, Austin, Orcutt, & Rosso, 2001). This assertion emphasizes that human learning begins by interacting with his environment, and knowledge is constructed from the experience, and that, the experience of the learner occupies the central place in all considerations of teaching and learning. The closer the learning context to the real-world phenomena, the more relevant is the learning, and the more attractive are the learning activities and this can promote learners' autonomy and engagement.

Therefore, it is becoming imperatively overdue that a learning paradigm, that is, an approach to learning which is relevant within the digital modern technology inventions, and which will be effective at placing the learners at the centre, and exposing them to the real-life practical contexts of the subject learned is needed to be introduced and consolidated at secondary school educational level.

Motivation (statement of the problem)

SBL approach is a great way to promote a more interactive learning environment and probably the only known learning approach that links learning theories with practice (Williams, 2017; Wrenn & Wrenn, 2009). This learning approach is being used effectively in all areas of human development both by practitioners and in academics because it processed learning through the active efforts of the individual learner (Brewster & Fager, 2000; Toshalis & Nakkula, 2012). However, a well-documented literature review has been undertaken and with a thorough search on the internet using relevant keywords, it was found that little or highly insignificant attention and development have been made by educators and concerned elites in making this paradigm an efficient tool for learning at the secondary education level. Most efforts and works on the usage and reviewing of SBL that are documented in the literature and by empirical evidence have been centred on professional and corporate bodies, and tertiary education.

I, the researcher, having been aware of how effective digital technology tools can be in supporting meaningful learning and noticed the prevalent rate of the use of technology tools for learning and social media among secondary school students. This serves as an indicator that, the focus group have access to resources and information than ever before but, with their access to information, and interaction with these modern learning resources, this category of learners (students) does not seem to frequently cogitate the knowledge, i.e., they do not appear to be processing the information beyond the superficial textual level to applying the knowledge acquired into real-life practices and behavioural modification. Hence, an underline motivator to conduct the research.

Moreover, since all the necessary tools, resources, and ideas required to administer and assess the effectiveness of SBL on the targeted group of learners are available the researcher recognized the feasibility of the research and it was conducted. More so, it is believed that there exists a direct relationship between a learning context that is well motivation oriented and the level of learners' engagement and responsiveness.

Research aim

The purpose of the research is to explore and understand the scientific and systematic approach of evaluating the pedagogical relevancies of SBL approach and social media on learning. Focus in this regard is on the articulation of SBL and social medial to support effective learning at the senior secondary education level**.** This learning approach is usually a students' centred learning model that always enables a more interactive learning environment and compelling skills-based learning.

Specific objectives

Given the research problem, and to assess the impacts of SBL and social media on the learning outcome, the following objectives were identified as the parameters or indicators:

i. To characterize students' ability to deal with **social and interactive educational media**.

ii. To identify the aspects of the learning approach that stimulate **learners' motivation** or interest to learn.

iii. To describe/typify the factors that trigger **learners' engagement** to keep focus and remain attentive during the learning process.

iv. To illustrate **learners' cognitive experiences** that enable learning gains through critical connections with previous knowledge and with learning relations to the surrounding realities.

Relevancy

This research is relevant because its results will give an insight on how effective are the contributions of SBL to secondary school students, learning outcomes and achievements that are in tandem with societal development and expectations. More so, this group of learners is recognised as young learners whose potential to influence and dominate the future is enormous (Benedict, 2017). Thus, preparing them for tasks and uncertainties of the future, SBL can enable them to apply their skills and knowledge in real world contexts. The research is also significant because it will contribute to creating an advantageous method for engaging the learners in effective learning and reflection to give them control over decision-making, and energise them to apply the skill to solve problems (Elliott-Kingston, Doyle, & Hunter, 2016).

Organisation of the thesis

The thesis is composed of an introductory and final considerations section and it has a main body organized into four chapters. Outlined below are the components and structure for each chapter:

Chapter 1 - **Conceptual framework**

This chapter covers the conceptual frameworks that guide the research thematic scope and this was developed by introducing at the beginning of this chapter the conceptual diagram which depicts the three major concepts that hold the research title, and under each of the concepts are various sub-concepts that are linked to one another. The three (3) stand-alone concepts are Scenario-based Learning, social media, and Learning. This stratification is important to allow for a deep exploration into the body of knowledge to understand the trends and cluster the existing works and contributions of experts. Since the aim of the research is find out how to support effective learning among secondary school students, the conceptualization, that is, abstract simplified view of the identified concepts and reviewing of the literature on each of the concepts and their sub-concepts are arranged and discussed accordingly while paying quality attention to issues, critics, models, and supporting theories.

Chapter 2 - **Methodology**

This chapter explains the methodology of the research and the procedural steps the researcher followed, and the activities that were involved in conducting the research. The research problem, questions and objectives are clearly stated in this chapter. This chapter reveals in its explicit how the research tools for data collection were selected and developed, and descriptions of the characteristics of the tools for data collection are well stated. It also contains the methods adopted in the selection of participants and the justification for the chosen strategies and methods of the data collection. How the data were collected, the type and form of the collected data, when and where the data were collected, and the ethical issue are clearly described. Data analysis procedure; information about the coding system and the statistical tool that was used for the data arrangement and analysis were explained in the chapter.

Chapter 3 - **Results presentation**

This chapter corresponds to the state of arrangement of the collected data and presentation of the results. The chapter concentrates on the arrangement of the collected data, the method used for the structuring of the data, and presentation of the results. It also depicts the full description of the available data to analyse; discussion on the forms of data with citations from the literature; relevancies of the nature of the available data.

Chapter 4 - **Results analysis**

This chapter consists the analysis of the presented results. It consists the process of structuring and interpreting the presented result to deduce meaningful information.

Final considerations

This is the final section of the thesis, which presents the conclusions of the whole findings, and expresses the limitations to the study, and the challenges experienced during the research. In this section, the reliability state of the results presented in the previous chapter is carefully discussed. Lastly, in the chapter is the pin-point on the contributions of the research outcome to the body of knowledge and suggestions for future research developments.

CHAPTER 1 - CONCEPTUAL FRAMEWORK

This chapter is organised into three sections to explore the literature in search of a deep understanding of the emergence and development of the 3 main concepts that guide the research thematic scope. Each concept is aligned to each section and is identified as a whole, researched independently of each other to be able to acquire meaningful knowledge, identify gaps and existing relationship, and have the full observation of their scientific functions. Thereafter, these three concepts were clustered to obtain common factors and the existing dependability patterns purporting the attainment of the research aim. The three stand-alone concepts are; scenario and education, social media, and learning.

The chapter contains the brief evolutionary history of each of the concepts, the abstract simplifications of the emerged sub-concepts, theories and models, and the contributions of authors well documented from the literature.

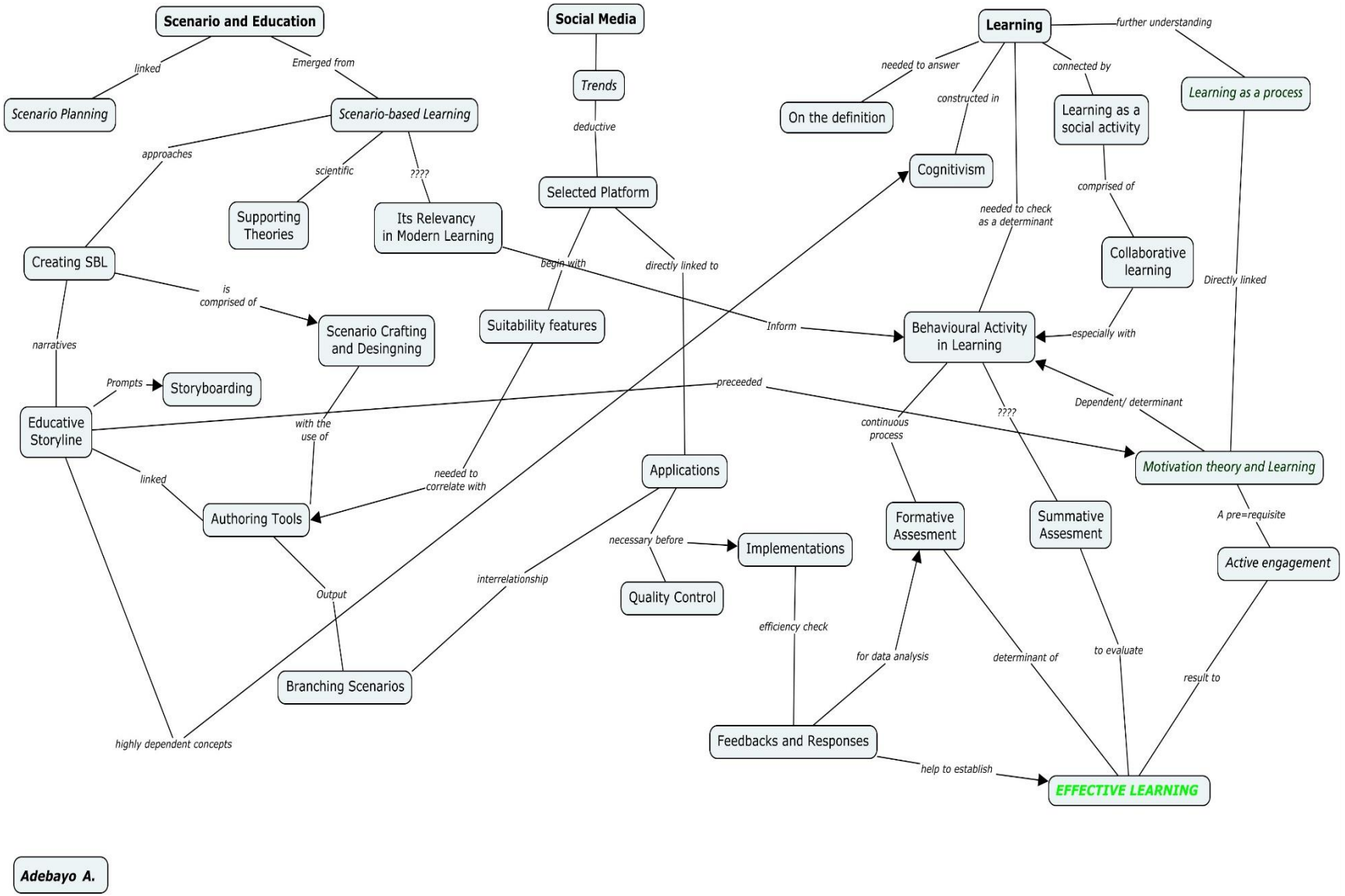
The conceptual diagram is adopted to help presenting the structure of the conceptual framework in a big picture; a kind of chart that illustrates the stages, forms of link, and orderliness of the chapter. The concept map is organised by starting with identifying the main concepts and proceeded to chunk the emerged sub-concepts based on their meaningful connections. This idea is introduced because it will assist in understanding in a glance the relationship between the main concepts and the emerged sub-concepts, and it can stimulate general understanding of the research aim and the theories that are involved. This chart view (conceptual diagram) displaying the overview of how the conceptual framework is structured, was prepared with Cmap tool[1] and is displayed in figure 1

Highlighted below are the three standalone concepts that formed the conceptual structure of the research:

Figure 1. Conceptual map

- Scenario and education
- Social media
- Learning

1 Cmap tool is used to create graphical nodes of concepts, design any type of relational charts, concept maps and other types of diagram to aid project analysis and execution. This software was developed and being maintained by Florida Institute for Human and Machine Cognition (IHMC).


Scenario and Education
linked
Emerged from
Scenario Planning
Scenario-based Learning
approaches
scientific
????
Supporting Theories
Its Relevancy in Modern Learning
Creating SBL
is comprised of
Scenario Crafting and Desingning
narratives
Prompts
Storyboarding
Educative Storyline
with the use of
linked
Authoring Tools
Output
Branching Scenarios
highly dependent concepts
Social Media
Trends
deductive
Selected Platform
begin with
directly linked to
Suitability features
needed to correlate with
Applications
necessary before
Implementations
Quality Control
interrelationship
efficiency check
Feedbacks and Responses
Learning
further understanding
needed to answer
On the definition
connected by
Learning as a social activity
Learning as a process
constructed in
Cognitivism
comprised of
Collaborative learning
Directly linked
needed to check as a determinant
Inform
Behavioural Activity in Learning
especially with
preceeded
Dependent/ determinant
continuous process
????
Motivation theory and Learning
A pre=requisite
Active engagement
Formative Assesment
Summative Assesment
for data analysis
determinant of
to evaluate
result to
help to establish
EFFECTIVE LEARNING

Adebayo A.

1.1. Scenario planning and education

The quote "Change is the only permanent thing in this world" by Heraclitus[2] means that the reality about nature and its habitats is transformation and modification (Russell, 1945, p. 105). Such applies to Humans' attitude towards growth and development. From the existence of man, no aspect of humans' life has remained static either consciously and unconsciously. The way human organisms have progressed from the early practice of sign language to traditional storytelling, and to scenario planning is also a corroboration of this fact. Hence, the exploration from the literature of humanities and the future.

The conceptual framework contains the elaboration of the evolvement in traditional storytelling to scenario development, and to digital storytelling which is in vogue in the 21st century. Also, the linear relationship between storytelling and scenario planning is justified with the existing similar features and precedence structure of the two processes. The relevancies of scenario to education, and to learning in particular are perused from the literature to establish supports for scenario-based learning approach as a learning paradigm that links learning theories to practice.

1.1.1. Evolution of storytelling

Since the beginning of human existence, the acquisition of the skills and the abilities to make informed decisions and to understand the facts about and the mysteries behind certain phenomena has been a priority to human development. The human quest for being able to do adequate predictions about the future which, in the real sense has proven difficult and sometimes unattainable poses persistent challenges (Ringland, 1998). In the early post World War II era, decision-makers and the concerned societies have been searching for better tools and methods for exploring the impenetrable future, various human discretions were applied in an attempt to actualize analytical knowledge about the future, but all these measures failed due to increasing uncertainty as the world proceeds to the modern era (Ringland, 1998) (Lindgren & Bandhold, 2003).

Subjecting to these findings, human questing for the abilities to unfold the unknowns about the world that we (human beings) inhabited have inevitably succeeded in developing an idea for event (past) narration and imaginations of possible occurrence to mark an occasion, to set an example, and for the simulation of possible occurrences to explain what seemed inexplicable (Zipes, 2019). The presentation

2 He was a great Greek philosopher, pre-Socratic, born c. 540 BCE, was primarily concerned with the explanations of the world around him, he stressed the need for people to live together in social harmony (Russell, 1945).

and simulation of such narrations and occurrences in real-life practices have enhanced the quality of human reasoning and is contributing to the possibilities of acquiring the necessary skills for mental growth and development.

Historically, storytelling has been the oldest approach to learn and one of the effective ways to pass or exchange knowledge (Mendoza, 2015). This approach is firmly founded on the principle of experience and reasoning. Historians and psychologists believe that storytelling is basic among many things that define and bind our humanity because humans are perhaps the only animals that create and tell stories.

It is almost impossible to trace the historical origin and evolution of fairy tales to a particular time but it is apparent that humans began telling tales as early as the time the capacity of speech was developed (Zipes, 2019). It is possible that humans may have used the signs language to communicate before the advent of speech**.** Following the trends in storytelling from the primitive times to the present digital age, the revolution of origin of speech at around 500,000 BC was recognised as the foundational process of storytelling which is assumed to be the first idea of verbal communication (Yılmaz & Ciğerci, 2018). In ancient Egypt, drawings were used to communicate stories in the form of hieroglyphs (Yılmaz & Ciğerci, 2018). This form utilized pictographic characters and symbols that have been used by humans to tell themselves stories about survival and life (Zipes, 2019). Other forms of earlier means of communication are petroglyphs, pictograms and, ideograms. All of which were in practice a long time ago before logographic -art of writings and alphabets emerged.

1.1.1.1. Digital storytelling

Traditional storytelling which has been in practice for many years gained a new form in the mid 20th century in Scotland when the Storyline approach was introduced in 1965 during the Teacher-Trainers program at Jordanhill College of Education (L. Sim, 2009). In the early 1990s, due to the evolvement of technology, this approach was transcribed to what is called 'Digital Storytelling' (Davis, Waycott, & Schleser, 2019), in the year 1993 with the first workshop organised by Dana Atchley, a pioneer in digital storytelling. This development led to the establishment of the Centre for Digital Storytelling (CDS)[3] in 1994 in Berkley, CA (Lambert, 2010). The Centre for Digital Storytelling has organized and held several workshops and partnered with organizations around the world to present projects on story

3 This establishment situated in California and is known for developing and disseminating the Seven Elements of Digital storytelling, which are often regarded as imperatively requisite starting point to build a career in digital story.

facilitation, digital storytelling and other forms of digital media production (Lambert, 2010). Digital storytelling is often referred to as the presentation method that involves audio-visual clips combining photographs, voice-over narration, put together with the use of digital technology tools. Through the years, digital storytelling has gained more attention which has led to many and continuous innovations in technologies for media and entertainment for humans' utilization.

1.1.1.2. The link between storytelling and scenario thinking

From a wider perspective, storytelling will be regarded as a conceptual lens to understanding the analytical description of a scenario. According to Ringland "Think of scenario as a fairy tale" (Ringland, 1998, p. 2), indicates that there exist common characteristics in the art of storytelling and scenario thinking. Storytelling aids human experience and memories because it requires an act of recalling and a narration of past events which are characterised with illustrations that can create empathy and participatory attitude in the listener and teller (Davis et al., 2019; Zipes, 2019). Scenario thinking also involves an intrinsic composition of plausible ideas; that is analytical thinking that requires intuitive, creative or brainstorming activities of presenting an event or case study as an example or for simulation (Lindgren & Bandhold, 2003).

Narrative theory by Walter Fisher is considered as the supporting theory to further establish the claim for the link between storytelling and scenario. The theory postulates that narrative is a basic human strategy for coming to terms with the fundamental elements of our experience (Fisher, 1984). That is, through narrative, humans are able to express, understand, present, and illustrate their experiences and ideas either real or illusion, past or in the imagined future. The advocates of this theory depict how stories help humans make sense of the world, and how people make sense of the stories. Therefore, storytelling is somewhat easy to relate to scenario thinking in an abstract sense, due to its narrative and descriptive features.

1.1.2. Meaning and definitions of scenario (and scenario planning)

From the perspective of how storytelling has informed scenario thinking, it is safe to posit that scenario is also a description of possible and plausible events within the consent of an immersive experience[4] and thoughtful ideology. According to futurists, a scenario is also described as a vivid description of the

4 This word is used to express the level of empathy a scenario or story is expected to put the listener and teller i.e., emphasizing the ability to emotionally understand and following the trend of the story or scenario.

future. Lindgren and Bandhold (2003), in their book 'Scenario Planning*: The link between future and strategy'*, outlined scenarios different from a forecast and or a vision and how each concept is related to the future. Scenarios are forms of narratives and imaginations of events that are possible and plausible in an attempt to explore the future based on uncertainties. While their constant opinion posits that forecast sees the future as a probable phenomenon, strong only in a short-term perspective and with a low degree of uncertainty, vision is expressed simply as the desired future. Thus, a scenario is a tool that is used to prepare for the future full of uncertainties.

Scenarios are basically stories, narratives, and imaginations that are useful in addressing issues, and trends that are often concerning decision making because it challenges users to think critically, which enables their imaginations to explore new horizons and consider possible outcomes.

However, like every other rigid concept in the literature, there is yet a conventional definition for a scenario as the concept has proven to be multifaceted due to its relative functionality and contribution to human development. Several attempts have been made by the futurists, social scientists and strategist thinkers to set a standard definition for the concept but, it always ended up that, each person structured their definition towards their understandings and experiences in their respective professions.

Below are some definitions of a scenario from different thinkers as synthesised in the book titled 'Scenario Planning*: The link between future and strategy'* authored by Lindgren & Bandhold (2003).

- Peter Schwartz (1991) defines scenario as "A tool [for] ordering one's perceptions about alternative future environments in which one's decision might be played out right" (Lindgren & Bandhold, 2003, p. 21).

- "That part of strategic planning which relates to the tools and technologies for managing the uncertainties of the future" (Ringland, 1998, p. 2).

- Paul Shoemaker (1995), "A disciplined method for imaging possible futures in which organizational decisions may be played out" (Lindgren & Bandhold, 2003, p. 21).

Also, an Oxford Learner dictionary defined a scenario as a description of how things might happen in the future.

Clustering all the definitions above, it is depicted that a scenario is a useful tool for exploring and preparing for uncertainties of the future, and it provides a more qualitative contextual description of the

phenomena under study[5]. It is also clear that scenario is not a forecasting tool nor is it useful for numerical precision. Instead, if used cleverly, it can identify a set of possible futures, each of whose occurrence is plausible.

Scenarios are instruments for ordering people's perceptions about alternative futures in which decisions made today might play out. It embodies a plausible[6] view of, or a perception of the future in a given period linked to conditions in the present via an internally consistent sequence of events (Blyth, 2005).

Therefore, scenarios are stories that are plausible, recognizable, challenging, and tales that are called for debates and reflection[7].

1.1.2.1. Scenario planning

There is a need for consistent planning to engage in a process to support decision-making that helps planners and policy makers to navigate uncertainties of the future both in the short and long terms. This process is known as scenario planning[8] which begins by exploring the current reality, and influential internal and external factors to produce a set of plausible potential futures. The broad view of strategic thinking is on the awareness that the future is full of uncertainties and, scenario planning, in particular, focuses on how to deal with these uncertainties. Scenario planning as a process encompasses those activities that are necessary while planning within uncertainties and during scenario development process (Ringland, 1998).

Decision making should be based on data and analysis instead of intuition and gut feelings (Moats, Chermack, & Dooley, 2008). It is, therefore, necessary to develop series of initiatives, plans, and policies (i.e., tactics) that may support the analysis of a given event or occurrence, a component of a scenario, multiple scenarios, or all scenarios. In light of this, knowing the inception of scenario will be advantageous to understand the components of scenario planning.

5 Careful observation of the listed definitions and the existing one in the literature was undertaken, phrases like description, uncertainties, the future, and decision-making are frequent to all the definitions. Therefore, the like terms of the ideas of those authors were assumed.

6 The words plausible and possible are the same in meaning as it's been used by some authors but, in the context of the topic being discussed, 'plausible' is assumed to be the right term.

7 I gave this definition based on the knowledge gathered reading all the materials I could found about scenarios and storytelling.

8 In the literature is often refer to as 'Scenario Planning and Analysis'. These two words are used interchangeably. Since they imply the same meaning, I chose to use 'Planning' only.

The idea of scenario planning emanated from the military operations' strategic thinking in the 1940s at RAND Corporations, North California, the USA by Herman Kahn[9]. It was the root of scenario planning and analysis in the field of strategic thinking as it is recognised and referenced by futurists (Amer, Daim, & Jetter, 2013). Kahn narrated this in a form of storytelling about how nuclear weapons could be effectively used by hostile nations against their foes and possible means to detonate and control them (Kahn, 1962). Below,the opinions and thoughts of Herman Kahn that lead to the emergence of scenario planning and strategic thinking (Kahn, 1962).

Excerpt: *Thinking About the Unthinkable in the 1980s*

12 European reporters polled August 7, 1939, predicted there would be no war. (Hitler launched World War II by invading Poland on September 1, 1939).

"Why we must think about thermonuclear war: In our times, thermonuclear war may seem unthinkable, immoral, insane, hideous, or unlikely, but it is not impossible. To act intelligently, we must learn as much as we can about the risks. We may thereby be able better to avoid nuclear war. But despite our efforts, we may someday come face to face with a blunt choice between surrender and war. We may even have a war thrust upon us without being given any kind of choice. We must appreciate this possibility. We cannot wish them away. Nor should we overestimate and assume the worst is inevitable. This leads to defeatism, inadequate preparations (because they seem useless), and pressures toward either preventive war or undue accommodation" (Kahn, 1962, p. 54).

Kahn demonstrated with the aids of logic and facts that military planning should be based on wishful thinking rather than reasonable expectations which he demonstrated by developing scenarios illustrating nuclear war miscalculations (Ringland, 1998).

Thereafter, Pierre Wack a futurist whose two published papers[10] are the most quoted in scenario planning literature (Amer et al., 2013, p. 25), introduced the thought and the theories of Harman Kahn (scenario planning) into the private sector. Wack was an unconventional French oil executive at Royal Dutch /Shell Groups of Company. His idea was effective and able to solve most of the confounding events of their time; such as the 1973 energy crisis, the severe price of oil in 1979, and the collapse of

9 Herman Kahn was an American futurist and the founder of Hudson Institute. He used the term "Scenario" to refer to his thinking and analysis on the likely consequences of nuclear war and recommending ways to improve survivability. His thinking and strategies have significantly informed the development of the nuclear energy in the United States.

10 Source: Harvard Business Review. Pierre Wack (1985) Scenarios: Uncharted Waters Ahead

Scenarios: Shooting the Rapids – Harvard Business Review

the oil market in 1983 amongst other challenging events (Bradfield, Wright, Burt, Cairns, & Van Der Heijden, 2005).

The capability of the scenario planning approach designed by Wack enabled Royal Dutch Shell to prosper more than its rivals in 1965 (Amer et al., 2013; Benedict, 2017). Also, the major role scenario planning played in the peaceful transition of a system from apartheid to a stable multiracial government system in South Africa gives more recognition to scenario planning as a strategic planning tool. Hence, various disciplines, organisations, institutions, and corporations began to adopt scenario planning or analysis as tools for decision making, to address uncertainty and to explore the reality surrounding certain phenomena.

1.1.2.2. The trend in scenario planning[11]

Studies show that before the year 1973, scenario planning was not widely used and very uncommon in European countries[12]. However, the eventual success of scenario planning at the first oil crisis in 1973 at Shell, implemented by Wack, led to its popularity and adoption by many European organizations as a strategic planning tool. This holds that before the year 1974, scenario planning was also not too popular amongst organizations in the USA ever since Harman Kahn instigated the technique in the 1940s but from the year 1974 onward following the resolution of first oil crises, the number of adopters and users increased as time went by till the present (Spaniol & Rowland, 2018).

Highlighted below is the trend in scenario planning (Klinec, 2011).

- The 1940s – 1950: Herman Kahn started the thinking and he developed scenario techniques at RAND Corporation[13]
- 1956: Emergence of the information society in the United States of America
- 1960: Hudson Institute founded by Herman Kahn

11 The discussion under this section is made very brief because it is not fully within the scope of the research but, its awareness can impact further knowledge on scenario planning in general. Most especially in the profession of strategic thinking.

12 Practically, the development of scenario planning and its analysis started in Europe in the year 1970s by Pierre Wack at the Royal Dutch Shell group of companies Netherlands (van der Heijden, 2005).

13 As indicated earlier about the link between storytelling and scenario thinking which has been in existence from the primitive ages. Futurists attribute the credit of introducing the term "scenario planning" to Herman Kahn because of the technique he developed to describe the future at RAND Corporation in early 1950 (Kahn, 1962; Ringland, 1998). Kahn adopted the term 'Scenario' to describe the stories. Of course, there were storytellers and thinkers before Kahn's idea.

- 1960: Books and Guides written by Herman Kahn on Scenario thinking and techniques surfaced
- 1970: Club of Rome Scenario warning
- 1973: Pierre Wack introduced scenario thinking into private sectors
- 1980-1986: Pierre Wack's continuous efforts on scenario planning development. During the indicated years were his two publications at The Harvard Business Review.
- 1987: Peter Schwartz, Stewart Brand, Lawrence Wilkinson, Jay Ogilvy, and Napier Collyns established Foundation of Global Business; an organisation to advocate modern scenario techniques
- 1990: The World Wide Web (WWW); an idea detected with aids of scenario analysis
- 1995: Wired Magazine – Scenarios Special Edition
- 1997: The Commencement of AC/UNU Millennium Project
- 1999: Jerome Glenn invented Future Research Methods 1.0
- 2003: Jerome Glenn and Theodore Gordon upgraded Future Research Methods to 2.0
- 2004: Peter Schwartz and Dong Randell; Pentagon's 2020 Scenario Warning
- 2005: International Water and Sanitation Centre
- 2009: Future Research Methodology version 3.0 by Gerome Glenn and Theodore Gordon
- 2010: Global Governance 2025 scenarios planning by NIC – CIA
- 2011: USAID 2030
- 2013: JICA Research Institute; Development Challenges in Africa
- 2017: The Shell Energy Scenarios for Germany

1.1.2.3. Approaches[14] to scenario planning

The literature on scenario planning reveals various approaches that are available to strategic thinkers, futurists and policy makers in scenarios building and development. These approaches or processes vary but all have certain elements in common (Moats et al., 2008). One important factor that is common to all the approaches is the 'out of the box thinking' skill. That is, the ability to think about or do something in a new, different, or creative way. However, out of these numerous approaches, three[15] overarching approaches that were identified as the most comprehensive and well-used processes, are discussed briefly[16].

- **Kairos Future's scenario planning approach**

Mat Lindgren and Hans Bandhold, the authors of the book *'Scenario Planning: The Link Between Future and Strategy'* and with over 2 decades of experience as futurists have impacted the world of scenario planning enormously. These two were consultants to a multinational company named Kairo Future and, during their services at this company invented and implemented a very active scenario planning process for the company (Lindgren & Bandhold, 2003) (Ringland, 1998). This idea is called TAIDA, which is a model of five stages which include; Tracking, Analysis, Imaging, Deciding, and Acting. The image below shows Kairo's Future scenario planning processes.

Figure 2. TAIDA of Kairo Future

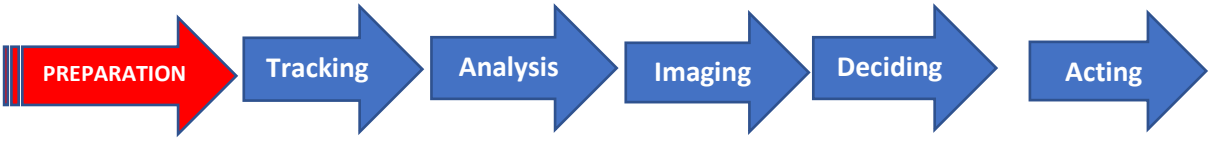


Illustration of an overview of the TAIDA process (Bradfield et al., 2005; Lindgren & Bandhold, 2003).

14 In some publications in the literature on scenario planning this concept is called 'Process'. To clear any element of ambiguity, the two words; Approach and Process are the same in this context and, are being used interchangeably by authors (Pastor, 2009).

15 The three scenario planning processing types were chosen for discussion because, these processes have significant success records in the literature, and their founders are notable and seasoned futurists have contributed immensely to the knowledge of strategic thinking and decision making.

16 I reiterate that, these approaches to scenario planning are discussed briefly in this thesis because it is not considered as the important integral parts of the research thematic scope but, also relevant as much as scenario planning analysis is concerned. Most especially in the profession of Strategic Planning and Management for the Future.

Activities that are contained in each of the stages are outlined below

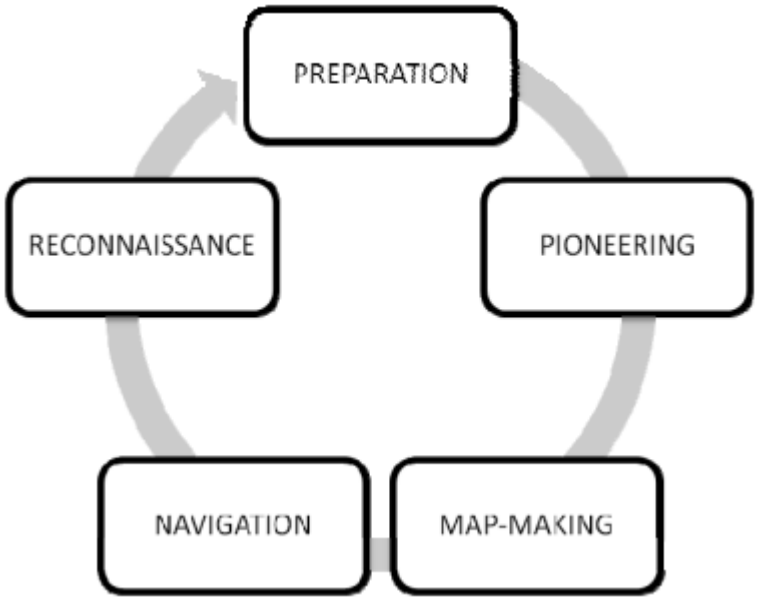
- Tracking: -Tracking changes within the concerned environment by being open-minded and paying active attention.
- Analysing: -Analyse trends, uncertainties and consequences. Stay focus.
- Imaging: - Identify possibilities and generate visions of what is desired.
- Deciding: - Weigh up the information, identify choices and strategies.
- Acting: - Move from intention to action, set up short-term goals, take the first steps and follow up our actions.

- **Shell's scenario planning approach**

This process by Pierre Wack gained a significant record due to its success when it was adopted as the strategic tool to solve the oil crisis in the 1970s (Lindgren & Bandhold, 2003; Ringland, 1998). The approach has since then helped generations of Shell's management teams to explore ways forward and make informed decisions. The process consists of five stages that are interconnected; Preparation, Pioneering, Map-making, Navigation, and Reconnaissance.

Figure 3. Shell's scenario model

Source: *(Benedict, 2017; Bentham, 2008).*



Preparation: - Planning of the project, outlining the primary purpose of the project, identifying the users and sponsors, allocation of responsibility, defining expected results from using the approach, time range.

Pioneering: - Obtaining relevant information, the contribution of ideas by all the participants, identifying the driving force and uncertainties in the process, establishing the structure and theme of the scenario.

Map-making: - Developing the scenario, making the stories in the scenario understandable.

Navigation: - Transmit and relating the stories in the scenario to capture the attention of the audience.

Reconnaissance: - Thinking about the scenario implication in the future, share perspectives, and realizing feedback.

- **Schwartz scenario planning approach**

Schwartz Peter, born in 1946 in Stuttgart, Germany, defines scenario as "making choices today with an understanding of how they might turn out", was the pioneer of Schwartz approach to scenario planning. The American futurist is an innovator and co-founder of Global Business Network, a multinational firm that specialises in strategic thinking and scenario planning. After Schwartz has succeeded Pierre Wack as the head of the planning division at Shell, in the year 1991 Schwartz introduced an approach to scenario building and this approach was significantly useful at the Global Business Network (T. Chermack, Lynham, & Ruona, 2001)[17].

Schwartz identified eight steps (Parraguez, 2016) in his approach to scenario planning. These steps are listed[18] below:

- Step 1: Identify a focal issue or decision

  What issues will the decision-makers be thinking about? What decision must be made to have a long-term influence?

- Step 2: Identify the key forces in the local environment.

  What are the key factors that influence the success and failure of the decision in step 1?

- Step 3: Brainstorming the driving forces in the macro-environment

17 Scenario Planning: A review from the literature (T. Chermack et al., 2001, p. 17).

18 All these steps are listed only without further explanation because this is not primarily parts of the research aim but it may be necessary to identify them as parts of the approaches to scenario building in strategic thinking.

What driving forces in the macro-environment will influence the key local forces you have just identified?

- Step 4: Ranking the key factors (from step 2) and the driving forces (from step 3)

  What are the most important and what are the most uncertain driving forces?

- Step 5: Development and selection of the general scenario logics according to the matrix resulting from the ranking exercise.

  What is the logic of the scenario?

- Step 6: Fleshing out the scenarios, return to step 2 and 3.

  What are the factors and trends?

- Step 7: Examine the implications of the developed scenarios.

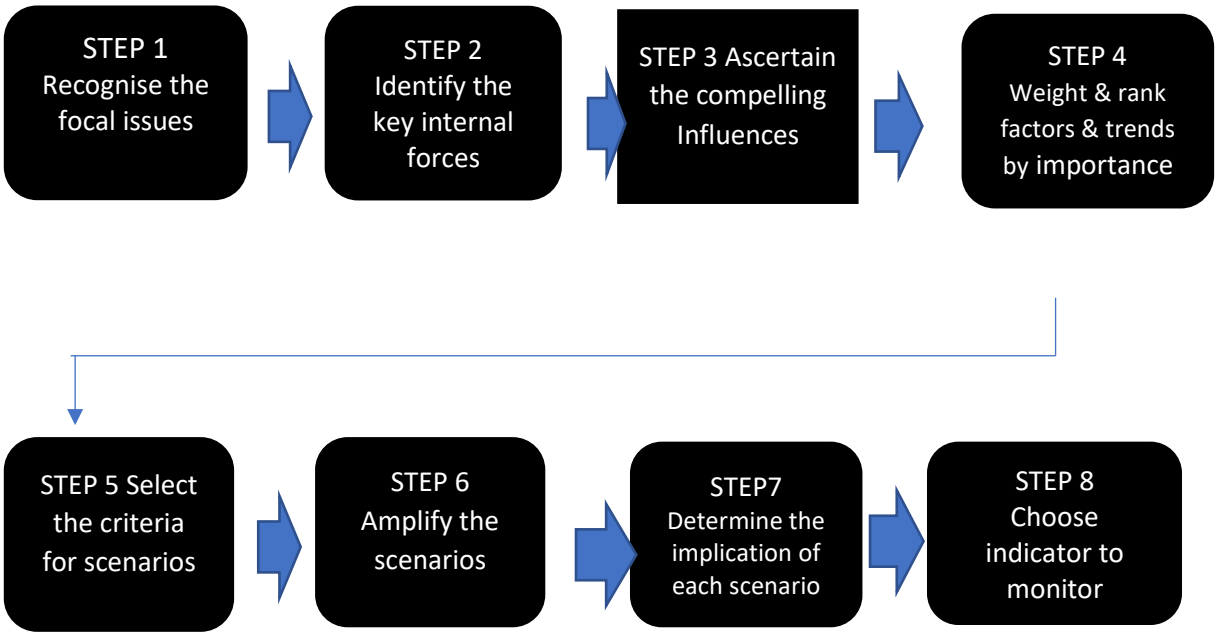
  How does the decision look under each scenario?

- Step 8: 'Leading indicator' that signifies the plausibility of the event.

  What variables might make good indicators of the direction of change?

Figure 4. illustrates the pattern of process in the eight steps of scenario planning as identified by Schwartz

Figure 4. Schwartz scenario planning process (Moats et al., 2008; Ringland, 1998).



Given all these conceptualizations about storytelling, scenario and scenario planning processes, summarizing their characteristics and the existing relationships among them is deemed necessary to prepare a good stance for understanding the proceeding topics of this thesis.

1.1.2.4. The relationship: storytelling, scenario and scenario planning

Storytelling requires the mental ability of the teller to recalling and narrate past incidences, and or events in such a manner that it creates empathy in the listener. So, also, is scenario thinking process; it requires active reflection ability to create stories, fairy tales, and the descriptions of plausible imaginations that are relevant for simulation as a case study to understand or simplify the future that is full of uncertainties. Expertise in the discipline of strategic thinking and management uses the term 'Scenario' to refer to a story, event narration and imagination, and this term was first used and introduced by Herman Kahn in 1960 (Kahn, 1962; Ringland, 1998; Spaniol & Rowland, 2018).

Scenario planning is the activities, skills, and procedures that strategic thinkers and futurists developed in building already anticipated stories, for its formative evaluation, and its implementation. This planning usually consists of complex and sequential processes.

Scenario planning helps concerned individuals to understand in detail the range of plausible outcomes as it provides a big picture to easily identify specific trends and uncertainties in the phenomenon under study.

"Scenarios are based on intuition but crafted as analytical structures. They are written as stories that make potential futures seem vivid and compelling. They do not provide a consensus view of the future, nor are they predictions: they may describe a context and how it may change, but they do not describe the implications of the scenarios for potential users nor dictate how they must respond" (Bentham, 2008, p. 8).

In summary, scenarios are descriptions of an event, a narration of an occurrence, or a basic imagination of plausible events. This also extends to storytelling, history capturing, illustrations and gameplays. Scenario development process is the working link between the duo concepts of 'scenario planning' and 'scenario' which involves using strategic management tools and ideas to communicate the scenarios for critical thinking and decision-making skills.

1.1.3. Scenario-based learning

Learning is considered as the broadest concept in education and, is being used interchangeably with education as a complement to each other in meaning (Hinton, Fischer, & Glennon, 2012; Papert, 1980b; Selwyn, 2011). To make it clearer and more comprehensible requires literal definition for each of the terms. For this attempt, education is understood as efficient utilization of acquired knowledge and skills. While learning can be explained as the activities of an individual to acquire knowledge and skills to improve behaviour and competencies. From this clarification, it is deduced that learning being an integral part of education is a requisite, which means that without learning, education does not exist.

Comprehending the importance of the paragraph above, a pedagogy activity that can stimulate active engagement of all the individuals that are involved in the teaching-learning process is essential to foster deep understanding and enhance the practical ability of the acquired skills and experiences within the surrounding realities.

Recalling the features of traditional education- the conventional approach to learning that considers students as passive receptors of information, without consideration of the need to actively participate in the learning process (Attard, Ioio, Geven, & Santa, 2000). This pedagogical practice has been criticised and considered ineffective due to its continuous failure to meet the criteria for learning that support humans and the societal development of the modern era. A lot of limitations have been attributed to the traditional education system due to its inability to considerably match the scientific and technical dispensation of innovations and technology tools for learning in terms of supporting the acquisition of meaningful knowledge necessary to meet the learning needs of the present generation (Sankey, Birch, & Gardiner, 2010).

Therefore, a learning environment that will encourage active participation and respect individual learners' characteristics, where each learner is allowed to learn and process knowledge at their own pace is imperative to meet a desirable learning achievement. Peg Neuhauser[19] and Jerome Bruner[20] have found that storytelling helps to learn because stories are easy to remember (Bruner, 2004). According to the two psychologists, a learning process that stems from a well-told story is bound to be remembered more accurately, and for far longer, than learning derived from facts and figures. Also,

19 Peg Neuhauser, born 1950, is an American psychologist and motivational keynote speaker and consultant with interest in the area of organizational culture, conflict management, and improving relationship among work colleagues.

20 Jerome Bruner was an American psychologist who spent the significant parts of his life contributing to human cognitive psychology and cognitive learning theory in educational psychology.

Brunner posits that research has proven that facts are more likely to be remembered easily if they are part of a story as excerpted from the web address[21] (Boris, 2017).

A well-told story holds the capability to capture the mind of listeners and put them on empathy (Lambert, 2010). This characteristic shows that storytelling can be suitable for all types of learners because, at the state of empathy due to the context of the story, the listeners start to imagine how they would have acted in such similar circumstances, and being able to work through situations in a risk-free environment.

In strive to operationalise SBL approach to enhance its theoretical and empirical understanding. I, the researcher, classified the concept in two different aspects namely; theoretical aspect, and technical adaptation. The theoretical aspect is also regards to as the scientific section, while the technical aspect is recognised as the pragmatic section of the learning approach. These two sections work in conjunction to produce an SBL project that is capable of yielding the desired teaching-learning goals. Topics of exploration and discussion under each section are tabulated in the table below.

Table 1. The operationalised illustration of SBL courseware.

SBL: **Theoretical section**	SBL: **Technical section**
Meaning and usefulness in education.	Educative storyline.
Features of a good scenario for learning.	Storyboarding.
Relevancies to learning and real-life activities.	Subject matter expert.
Modern learning and its environment.	Authoring tools.
SBL: A modern learning approach.	Crafting SBL courseware.
Supporting theories.	Branching scenarios.
	Learning Management System.

21 https://www.harvardbusiness.org/what-makes-storytelling-so-effective-for-learning/

1.1.3.1. SBL theoretical section

1.1.3.1.1. Meaning and usefulness in education

In the earlier paragraphs of this chapter, it has been illustrated how storytelling was termed as scenario by Herman Kahn and adopted as a strategic tool for optimizing uncertainties that portrays the probable pictures of the future (Halamandaris, 2007). This attitude of recalling and narrating past incidence, and or formulating a plausible one to be used as a learning tool is feasible, most especially, when such a story is educative and understandable. Stories and fabricated cases that are developed for learning possess the potentiality of enhancing the cognitive functions of the listeners and charge them to reflect and take actions accordingly based on the psychological context of the story. So also, the formulations of moral inclined stories requires active cognitive functionality.

Therefore, a learning approach that depends on using stories, past events, and imaginations that are plausible is literarily referred to as scenario-based learning (SBL). This approach concentrates on both scientific, empirical and technical aspects of education and technology (Sorin, 2011; Stewart, 2002). To access or disseminate the information and contents embedded in SBL approach, a certain level of technical skills of the usage of technology tools for learning is required. Because technology tools for learning form the basis that informs and aids the likelihood of feasibility of the learning technique (Ayse, 2018). SBL is the learning technique that combines the affluence of technology tools for learning with the relevance of stories within a virtual learning environment.

SBL is recognised as a modern learning approach that uses an interactive scenario to support active learning strategies (Stewart, 2002). That is, it relies on relevant and plausible stories that have educative storylines. This is a technology-enhanced learning approach where stories and plausible imaginations are simulated as a learning resource with the use of an authoring tool to create situations where learners can transform the way they address problems and opportunities to practice in a safe environment[22].

Uses of scenarios either as strategic tools for decision making or as tools for exploring uncertainties and for learning, have encouraged organisations and institutions to adopting this paradigm based on their individual entity's needs and objectives. However, considering the scope of this research, the focus is nourished on its usefulness in education/learning. In this ever-changing world of digital and modern technologies which has directly impacted the mode of teaching and learning, the usefulness of SBL in this regard cannot be overstated.

22 This definition of SBL is constructed by me. Having clustered all the knowledge and ideas (scientific and technical) acquired since the inception of this research work.

The introduction of technology into education and the modern education reform movement caused the shift in the learning environment and practice from conventional learning that has existed for many years to the recent and evolving modern learning. This development can be considered as the major polarised reason for the continuous adjustment, revision, and adaptation of various learning strategies in which the introduction of scenario in education is one (Daanen & Facer, 2007).

In learning, there are some cogent areas where strategic thinking is expected of learners to make decisions and solve problems. Learning with scenarios will expose the learners to improve critical thinking skills by interacting with the hypothetical situations presented in the scenario. This stimulates effective critical thinking skills in learners for a longer time (Sorin, 2011). Instead of imbibing information into learners, the use of scenarios in learning can encourage the learner to be autonomous in acquiring and processing information. According to Prof. Jack C. Richard, he posits that since learning is based on learner's needs and preferences, learner should take an increasing amount of responsibility for what they learn and how they learn it by making learning more personal and focused (Richards, 2021).

The introduction of scenarios in education has opened various learning benefits for learners both in a formal and informal learning structures. It places learners in the scene of diverse ranges of ideas and opinions at the edge of decision making and thinking (Stewart, 2002). Instead of telling learners information, as the case in traditional education, it will empower the learner to engage in creative thinking and act accordingly (Ray, 2009).

SBL as a technology-enhanced learning system affords an increasing range of possibilities of access to information and knowledge as development in innovations and technology has created a clear shift away from desktop computer technologies to mobile devices and affordable smart phones, this suggests that there is a greater tendency for SBL to be experienced by more masses in the future (Light & Luckin, 2008). Achieving this, the focus will then be on how to help learners of all categories to take advantage of this learning paradigm to enhance their learning ability and their roles in society. SBL possesses the characteristics to place the learners in a scene or situation in such a way that will task them to exercise their cognitive functions. Rather than simply telling learners information, SBL approach engage the learner to think and react (Ray, 2009).

Highlighted below are the summaries of the usefulness of scenario in education.

- Active involvement in the learning process

- Encourage reflection
- Offering choices and decision-making opportunities
- Enhancing the capacity of self-learning
- Encourage collaborative learning

1.1.3.1.2. Features of a good scenario for education and learning

Not all stories and imaginations are eligible for supporting learning, some narratives and past events are not suitable to be referenced as a resource that can meet certain learning objectives. However, outlined below are some characteristics that scenarios should possess to be useful as a good SBL project (Brummell & Macgillivray, 2014; Elliott-Kingston et al., 2016; Ray, 2009).

- A good scenario for SBL project should tell a good story and be relevant to the learning objectives.
- Such a scenario should either be fact or near-fact. That is, it should be plausible. It should include dialogue (interactivity), and have generality.
- A scenario for SBL project should create empathy for the concerned characters.
- It should serve a teaching function, and require a dilemma to be solved.

Having enumerated the importance and usefulness of scenarios in education and learning, facts hold it that education practices and learning environments are changing. The breath-taking speed of the developments in innovations and technology has greatly impacted the way human live and the mode of operation in their environments. Hence, education system is moving away from the old conventional practice to the modern era due to the influence and impacts of modern technological tools and ideas that are present. Frequently than ever before, the learning environment has inevitably been powered by modern technologies for learning and innovations which have made it a mandatory task for educators to devise new and revising existing learning techniques as a complement to the reform.

1.1.3.1.3. Relevancies of SBL to learning and real-life activities

SBL is basically a Technology Enhanced Learning (TEL), and a Narrative Learning Environment (NLE)[23] model that requires efficient usage of modern technological tools for learning in a conducive environment (Balacheff, Ludvigsen, Jong, Lazonder, & Barnes, 2009). As expected, the end products of SBL are e-Learning courseware, designed and prepared by instructional designers or e-Learning specialists with the intent to walk the learner through the processes of learning with priority on the learners' cognitive load optimization. Further, SBL approach to learning simulates near-facts and real-world events and present them in compatible e-Learning formats for the targeted set of learners. Most of the contexts in SBL are story-based contents that are educative enough to capture the mind of the learners and put them immensely in the learning process.

To understand modern learning, the basic knowledge of the term 'modern' is essential and efforts to contrast the attributes of conventional/traditional learning with modern learning as well as the learning environments. According to the WordWeb dictionary the term 'modern' is described as views in relation to the recent times; characterized by present-day; relating to or using recent up-to-date ideas, technology, fashions, etc. Therefore, the term 'modern' in conjunction with learning can well be understood as new ideas, practices and activities that are being adopted into teaching-learning processes in this present age.

However, education remains the fundamental mechanism of any society towards achieving a desirable development (Piaget, 1952). As the world turns around, several innovations in science and technology are coming out which is imposing direct effects on the mode of living of individuals and un-avoidable adjustments in societal behaviours at large. Meeting up with this challenge has forced the conventional learning system to go into gradual and quick obsolescence. The need for societies to go in tandem with the developmental pace in science and technology of this century has posed an inevitable adjustment on the learning environment and the process of knowledge acquisition.

Fiorella and Mayer (2015), introduced learning as a generative activity of making sense of information as learners actively try to make sense of the instructional materials presented to them. This comes with the premise that learning occurs when learners apply appropriate cognitive processes to incoming information (Fiorella & Mayer, 2015a). The transition from traditional learning to modern learning is called pedagogical change and, is a process of turning passive learning situations into active learning

23 The term was derived from the book "Technology-Enhanced Learning: Principles and Products" pg 75. Written by:- Nicolas Balacheff · Sten Ludvigsen · Ton de Jong · Ard Lazonder · Sally Barnes.

situations (Papert, 1993). Wherefore, the forms, strategies and environments adopted in modern learning are distinct from all the attributes of conventional learning which is assumed to be taking place in passive learning situations.

1.1.3.1.4.Modern leaning and its environment

Most modern learning theories in the literature describe how learners select, absorb, process and retain knowledge. Other attributes are; the learning style, learning environment, instructional materials, and assessments (McCormick, 2012).

The Learning style is

- Learner-centred - that is, learners are placed at the centre of the learning process while the teacher/instructor guides and helps them manage their expectations and enables them to consciously and constructively design their learning paths.
- Self-directed – learners are independent due to the opportunity of being active and at the centre of the learning process; more so, learners' passivity does not enhance meaningful learning (Nakamori, 2016).
- Independent knowledge processing - unlike conventional learning, where teacher devotes many efforts to teaching the students what to think, modern learning is based on the idea of the learners learning how to think; that is, allowing the individual learner's cognitive scheme to construct and reconstruct knowledge based on their existing experience (Angele, Emma Di, Koen, & Robert, 2010).

The Learning environment is highly flexible and interactive: - modern learning system is able to adjust to different conditions. This characteristic acknowledges the differences in the learning behaviour and the ability of individual learners and therefore requires the instructor to be flexible in managing the learning resources during a learning process. The environment can be virtual, it does not necessarily need that the instructor and learners meet face-to-face at an agreed venue before learning can take place; this makes the learning environment conducive for learners to access information and process knowledge at their own pace in a collaborative and conducive atmosphere.

Instructional materials or aids: - In this context, mean 'learning resources' both physical, human, and electronic materials which support and enhance teaching and learning either directly or indirectly. Modern learning resources such as modern technologies for learning and Learning Management

System (LMS), and sources of information (the internet) that are reliable and available than ever before are being introduced and adopted into the present-day teaching-learning processes (Balacheff et al., 2009). These materials have made learning more attractive due to immediate access to up-to-date resources.

Form of assessment

Assessment in a modern learning environment is expected to be an ongoing activity as the learning process proceeds. In this wise, assessment is considered as a process and not as a product. One of the advantages of modern learning is its ability to monitor learners' involvement and participation and suggest or provide feedbacks that are useful to improve the quality of instructor's input and learners' performance (Elliott-Kingston et al., 2016). A formative method of assessment is suitable to evaluate and check for adjustments during the learning process, to monitor the learning process in order to improve students' learning ability.

1.1.3.1.5.SBL: a modern learning approach

The usefulness of learning and questing for knowledge is probably for humans to satisfy the curiosity of a meaningful existence, and to increase the level of independence and efficiency (Ettore & Constantin, 2018). Knowledge is useful to humans when their existing experience enabled them to solve a problem and or make an informed decision among several alternatives. However, human beings are often left with compilations of physical and psychological challenges, increasing uncertainties about the future, and incredible alternatives. Possession of effective cognitive skills is required to make better and timely decisions among several available alternatives and to think critically, act efficiently in solving problems and eliminating challenges (Lutz & Huitt, 2004). The present-day mode of teaching and learning is prepared and designed to meet all these requirements.

As defined[24] earlier, SBL is a modern learning approach that involves the activity of simulating near-fact or real-life events as learning contents (courseware) that are targeted towards enhancing the cognitive skills of learners. This approach to learning is student-centred and is relevant to modern learning in that each learner tends to reflect differently on the simulated scenario and attempt to make meaning of the

24 I structured this definition, based on knowledge acquired while reviewing the literature on scenario planning and Scenario-Based Learning. I made efforts to cluster all the features of the learning approach, considered its aim, and procedure then I arrived at the definition.

knowledge, based on their previous experience. In this process, the learner integrates the new knowledge with the existing knowledge to construct new meaning.

Being a student-centred learning model, SBL approach functioning dependently on the theory of constructivism which enables learners to contextualize learning while acquiring transferable skills that are needed as a rational thinker. Since learners are at the centre of learning, chances are that learners will encounter new information, assimilate this information with existing experience and construct new meaning (Lee Andresen, Boud, & Cohen, 2000). This activates real understanding of the newly acquired knowledge rather than memorizing.

The presence of digital technologies in SBL, which is the bedrock feature of a modern learning environment tends to make the learning process more comfortable and motivating. When motivated intrinsically, the learner devotes quality attention to the contexts being learned and remains an active participant throughout the learning process. This will serve as a road path to meaningful learning which can subsequently lead to the acquisition of skills and practical knowledge needed to solve problems and techniques for making good and informed decisions.

Scenario-based learning techniques make use of plausible near-fact and real-life situations (Ray, 2009), as it provided a relatable and highly relevant experience to the learners as the ability to understand that there are impacts and or consequences for action and choices. Practice means perfection, SBL allows for try and error attempts without any wasted resources incurred, this can enable the learners to develop their skills at the proficiency levels.

In summary, SBL is a reference point to modern learning because it is capable of impacting the positive learning behaviour of learners by interacting with the learning resources that are designed to reinforce a sticky learning experience. SBL also facilitate the effective application of knowledge to the real-world situation which is the economic value of education at large.

1.1.3.1.6.Supporting learning theories of SBL

SBL research is increasingly interdisciplinary, it encompasses education, psychology, philosophy, sociology, and computer science. The learning approach is influenced by numerous theories about how people learn. The empirical pieces of evidence of the works, contributions and findings of some educators and psychologists on scenario-based learning cannot be overstated. More importantly, in this regard is the establishment of theories and models that supports and makes feasible the development and adoption of SBL approach in this digital age.

Range from theories and assertions by educators, cognitive psychologists, behaviourists, sociologists, and Instructional designers, it is therefore seeming essential to base SBL approach on some theories of learning from the literature to make scientific, technical and literal senses of the learning approach. Identified and explored below are the learning theories and models that are relevant and more connected with SBL conceptualization are outlined below

Situated Learning Theory (SLT)

Situated learning theory was an emerging model for instruction that was initially defined by J. S. Brown, A. Collins, and P. Diguid in 1989 as the way of understanding how knowledge is developed and organized within workplaces and in communities (Siti, Pg, & Besar, 2018). The theory holds that learning should be delivered in an authentic and social context within which it will be used. In other words, the theory focuses on the relationship between learning and the social situation in which it occurs.

The contributions of J. Lave and E. Wenger (1991) towards the expansion of situated learning theory has successfully posed a significant effect on the relevancy and usefulness of the theory in learning. The idea of Legitimate Peripheral Participation[25] by Lave and Wenger is believed to mark the anatomy of the theory (Herrington & Oliver, 2015). This is a critical aspect of the situated learning model, which explains the gradual process of how the apprentice (beginning learner) observing the behaviour of members of a community by participating in a culture of practice and progressing to become a member of such community, a development that occurs unaware[26]. As learning and involvement in the culture increase, the participant moves from the role of observer to a fully functioning agent. Legitimate peripheral participation enables the learner to progressively piece together the culture of the group and what it means to be a member. 'To be able to participate in a legitimately peripheral way entails that newcomers have broad access to arenas of mature practice' (Stewart, 2002).

To address the probable inconsistency of situated learning theory, J. Lave & E. Wenger (1991) draws together threads of earlier ideas from J.J. Gibson (1977) on the theory of affordances; L. S. Vygotsky (1978) on the theory of social constructivism; and J. Piaget (1953) on the theory of cognitive constructivism to form a substantial conceptualization of situated learning within communities of

25 This theory explains the process of how a new comer to a particular community gradually gets involved in the activities of a community to become a full member or even stakeholder. In the context of community of practice, a new comer or learner can observe the way members of a community interact before fully participating.

26 An unnoticed influence of environment on the behaviour of an individual, in the process, many choices and decisions are made unconsciously.

practice (Powell & Kalina, 2009). Further, J. Lave & E. Wenger (1991) continued that learning occurs when individuals are members of the communities, in which they are acculturated and at the same time participate actively in the diffusion, reproduction, and transformation of in-practice knowledge about agents, activities, and artefacts (Farnsworth, Kleanthous, & Wenger-Trayner, 2016). They also argued that to know is to be capable of participating and practising with the requisite competence in the complex web of knowledge.

Situated Learning Theory in Support for SBL

In support of situated learning as one of the base theories for SBL the literature has revealed some contentions and ideas of the theory that can be attached to SBL as a model of instruction by observing the following characteristics. It is based on cognitive functioning and social constructivism; required the learner to construct meaning from the illustration in the story. Learning should be situated within the context that it will be used; the SBL course simulate stories that are relevant to the learning objectives.

Learners start as Legitimate Peripheral Participants; actively engaged with the storylines of the scenario to concentrate on understanding the required task. Learners gradually become a full member of the communities of practice; learning with SBL equip the learners with long term knowledge.

The proposition that meaningful knowledge is acquired and fully understood when situated within the context where it will be used as established by situated learning theory (Lave & Wenger, 1991), is also a technical replicate of simulating real-world practices which may be rare for learners to come-by within the confinement of courses taught in classroom settings but through SBL. Also, the process that involves within the gaps of 'Legitimate Peripheral Participant' and 'full member of the communities of practice' requires the essentialities and activities of cognitive and social constructivism.

According to Jean Piaget, human development is a result of adaptation to the physical and social environments in which they live. This adaptation according to Piaget is seen in two processes; Assimilation and Accommodation. Assimilation is the process by which new knowledge and events are grasped or incorporated with the existing schemes/knowledge. Accommodation on the other hand is the process in which the existing schemes/knowledge is modified as a result of the intake of new knowledge (Bhattacharjee, 2015; Powell & Kalina, 2009). The scientific application of 'Legitimate Peripheral Participation' in situated learning theory to SBL learning approach is otherwise understood as the 'existing knowledge' and 'experience' of the learner before assimilating new knowledge,as it is believed by the empiricists.

Lave and Wenger (1991) opined that learning is situated and the context should be learned as it normally occurs in essence that, learning should be embedded within the activities, contexts, and cultures that are relevant to the matter(s) under study. In SBL, the events, storylines and simulations that are presented in scenarios are near-world realities and plausible. More so, successful SBL courseware is based on a sound analysis of reality and can influence the learners' decision-making ability and, assumptions about how the world works, this compels learners to change the image of reality (Chermack & van der Merwe, 2003).

Experiential Learning Theory (ELT)

To empiricists, sensory experience plays a central role in the process of learning, experience is the basis of knowledge and the foundation on which further knowledge is built (Rescher, 2003). Because, experiential resources suffice to explain the knowledge that we possess (Longworth, 2009). The experience of the learner occupies the central place in all considerations during the learning process. This is based on some set of assumptions that; experience is the foundation of, and the stimulus for learning because learners actively construct knowledge from their own experience.

Experiential learning theory by David Kolb (1984) is a pedagogical approach that was drawn from a wide variety of educational philosophies such as; intellectual experiential works of John Dewey's Philosophical Pragmatism, Vygotsky's Social Cognitivism, and Piaget's Cognitive Development Theory. Following these deductive, the theory has formed a unique perspective on learning and development. The word 'experiential' is featured here to accentuate the central role that experience plays in the learning process, an emphasis that distinguishes ELT from other learning theories.

Kolb (1984) defined experiential learning as a process whereby knowledge is created through the grasping and transformation of experience. This can expatiate further as a process by which knowledge and experience are gathered and transformed into learning that results in behavioural change. The process involved in the grasping and transforming of experience into knowledge is studied as an experiential learning cycle which is more of a concern on internal cognitive processes. The cycle as presented by Kolb comprises four (4) stages in which the learner has to pass through all the bases if effective learning is to established.

Experiential Learning Theory (ELT) in Support of SBL

From the wide range of other educational philosophies in which David Kolb (1984) coined the ELT, it is evident that they all established learning as a process that relies on humans' sensory experience and in conjunction with their cognitive skills. Basically, all the ideas imply learning as a social activity and, this activity is the major process of human adaptation (Herrington & Oliver, 2015)(Powell & Kalina, 2009; Vygotsky, 1978a).

More so, the important feature in Kolb's definition of ELT as 'the transformation of experience' which grossly claimed the sequential processes in the experiential learning cycle is an effort towards achieving effective learning which requires a cognitive and affective behaviour –an objective and purpose for which scenario-based learning model is being designed (Schelb, 2009). ELT possesses some characteristics that are indisputable evidence towards the acquisition of SBL's objectives – deep and effective learning are outlined below.

It involves an object personally meaningful to the learners. Such as artefacts. Learners are personally engaged. That is, it is learner-centric. Reflective thought and opportunity for learners to discuss their experience is expected to an ongoing practice throughout the learning process. Also, their intrinsic motivation is activated. The existing experience or prior knowledge of the learners is fully recognized.

Meanwhile, all the above-listed characteristics are enshrined in a successful SBL courseware project. Because SBL is a learning model whereby real-life events or near-fact storylines that are educative are crafted in scenarios and pose as problems for the learners to attempt and solve. For instance, a simulated real-life event as a learning situation such as a case study, role play, or an experiment in a community or at the workplace. Such courseware is sophisticated with rich graphics, sequence branches, consistent narratives that are flexible and plausible. All these features tends to encourage and engage the learners to continue participating in the learning process whereby the learners are also aware that individual learner is responsible for any activity and decision that is taken during the process.

Constructivism and Constructionism

Constructivism theory of learning has been influenced by many writers and experts in social sciences, humanities, and education. Those who have influenced the theory include John Dewey, Maria Montessori, Jean Piaget, Lev Vygotsky, Jerome Brunner, etc. However, the formalization of the theory is attributed to Jean Piaget, a Swiss psychologist who articulated mechanisms of how knowledge is

internalized by learners. Constructivism learning theory is established on a premise that human beings construct their understandings of the world they live through reflection on the existing experience (Piaget, 1952).

Also, Seymour Papert developed constructionism learning theory, an idea that was inspired by the constructivist and experiential learning theories. According to Papert; "knowledge, even in adult experts, remains essentially grounded in contexts, and shaped by uses, and the use of external supports and mediation remains, in his mind, essential to expand the potentials of the human mind—at any level of their development" (Ackermann, 2001, p. 5).

Expanding this quotation, Papert structured his constructionism theory on the features of constructivism, continued to stress that, developing or introducing an object (artefact) to aid learning makes such learning and the environment more meaningful, and conducive irrespective of the age of the learners.

Both Piaget and Papert were constructivists that acknowledged children as the builders of their cognitive skills, as well as of their external realities. For the duo, knowledge is constructed and constantly reconstructed through personal experience. But constructionism expresses further by adding the functions of artefacts to the process of learning. Both Piaget and Papert had spent a significant parts of their lives working and contributing to cognitive development, and towards the understanding of how children learn and human develop (Lefa, 2014; Papert, 1980b).

Constructivism transforms learners from passive recipients of information to active participants in the learning process. It only needs to be guided by the teacher. In the process, it gives learners the ability to construct their own knowledge actively rather than knowledge being ingested by a teacher or from a textbook.

In a constructionism learning environment, the focus is on the learners. In such a scenario, the teacher is no longer playing an active role of passing knowledge into students but a learning environment where students are guided and being encouraged to actively reflect on their existing knowledge and experience to make meaning of the presented artefacts. Thus, the teacher functions just as a facilitator guiding the learners accordingly towards being able to think critically and processing meaningful knowledge.

Constructivist learning theory does not support knowledge been memorised. In Constructivist and constructionist learning environments, learning is constructed, active, reflective, collaborative, inquiry-

based, evolving by considering the learners' existing knowledge as their entry behaviours to process new knowledge.

Constructionism involves the creation of artefacts to encourage learning. That is the production of learning resources to facilitate learning putting into consideration the learning objectives by designing a framework for learning. Most especially computational technologies (artefacts) as expressive media for students' learning comfortability. The evolutionary trend of the development of constructionism as a paradigm emanated from Papert's widely read and influential book; **Mindstorms** (Papert, 1980b). Papert developed constructionism with an idea that a good way to support the building of knowledge in human memory is to build an object or a gadget to support learning in the real world context - a computer program, drawing, story, robot, and so on (Papert, 1980b).

Constructivism and constructionism in support of SBL

The 3 key features that are applicable to the two theories and are connected with the procedure of SBL are outlined below:

Reflection and construction of knowledge: - This feature supports SBL because the narratives and illustrations that are presented, and with alternatives in the scenario engaged the learner in a deep reflection, this will charge them to try to make meaning out of the presented situation based on their existing experience that is relevant with the context of the scenario.

Learner centric: - Constructivism and constructionism both support a learning environment where learners are at the centre of the learning process. That is an environment that recognises the individual learner's needs and characteristics. SBL approach allows the learners to learn independently, and at their own pace by interacting with the e-learning course and making decisions on their own.

Building, and the implementation of artefacts: - This is one of the basic features of SBL; the creation of artefact. By simulating[27] a story or plausible imaginations as courseware. This is an artefact, and using an artefact in learning is very helpful in aiding long term retention.

27 This is an act of creating a representation or model of something. In this context, we mean creating a representation of the story as learning resource using technology tools.

Flow channel theory

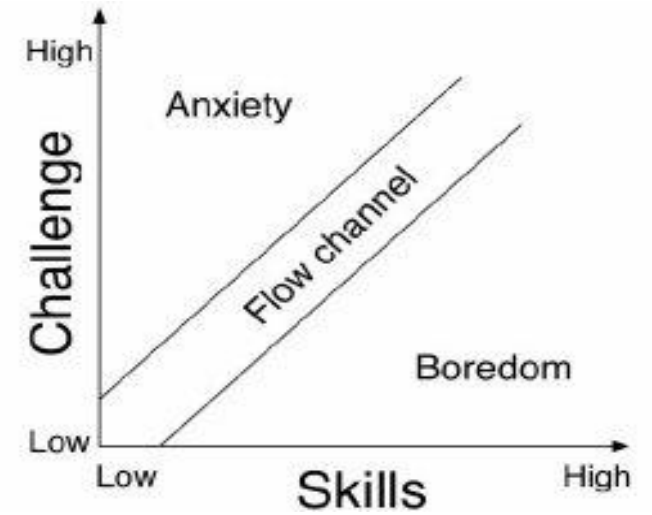
The psychology of optimal experience studied the positive and complex conditions in which cognitive, motivation and emotional components exist together as a coherent and reciprocal integration that aids personal growth. It explains the balancing mechanism between the difficulty or challenges that emanate from completing a new task or activity and, the perceptions of our skills level. Positive psychologists refer to this as 'Flow' - this concept applies to any human activity.

The flow channel theory by Mihaly Csikszentmihalyi (1990) concentrates on the idea that depicts how human being is immersed and being carried away with task and activity to an extent that no other thing is of matter at the time. Whereby, the basic factor triggering this attitude is intrinsic motivation which is characterized by engagement, feeling, fulfilment, skill, and great absorption (Csikszentmihalyi, 1990). In its simplified form, the flow channel explains the psychological mental state of a person who is absorbed in an activity with energized concentration and optimal enjoyment towards the achievement of a clearly stated objective.

Flow channel theory is often adopted by game designers due to its inspiration, intuition, and creativity features that can put the players in the flow. Games normally require the player to attempt, solve and proceed on challenges that are programmed on difficulty levels. For a player to continue progressing on the game interface requires that certain elements of intrinsic motivation have been met. Having understood this, games needed to be designed with some vital components in a consistent approach ever to be able to put the players in the flow– being immersed in the gaming.

Because the goal of game designers is to keep their players engaged (on the flow) as long as possible. Csikszentmihalyi (1990) presented the explanation of Flow Channel in a simplified diagram that depicts how human being operates and responds to the likely negative experiences that may develop while performing a task or a new activity. The diagram illustrates how the experience, challenge, and skills are psychologically working together to promote performances and enhance human development in any activity that is involved (Csikszentmihalyi, 1990).

Figure 5. The Flow Theory Channel



The Flow Channel Theory in Support of SBL[28]

Figure 5 contains four vital components; Challenge, Skills, Anxiety, and Boredom. In categorizing these factors, Challenges and Skills in this regard are the two variables that are dependent on each other. Anxiety and Boredom are the outcomes from the relationship between challenge and skills.

The desired state of evolution under study is the progressive column of flow channel. At the beginning, the learner will prepare to understand the required task of the SBL courseware, because it is assumed that he/she is new to the context. So, the learner feels comfortable at the low level of the challenge being the beginning of the course.

To proceed, if the required task rises too slowly or is not stated clear enough compares with learners' level of expectations and experience as the learning progresses, the learner will switch to the right-bottom of the flow channel, which is the Boredom realm. Here, the learner feels that the course is not interesting and probably might be a waste of time, and will not be able to meet his/her learning achievement. Thus, such learner is likely to abandon the learning process for another activity.

To the other side, if the challenge or required tasks of the course rises too fast or too hard, this possibly leads to declining consistency and sequential increase in the cognitive loads. The learner will switch to the left-upper of the the flow channel, which is the Anxiety zone. Here, the learner will feel that the course is too difficult and is more likely to lose concentration and abandon the learning for another activity. To put the learner in the flow which is the channel, the overall difficulties and challenges that

28 This theory is most connected to SBL at the technical aspect and the most important of all the theories that support the learning approach. It is important, and will be productive if e-learning developers and instructional designers are aware of this theory and endeavor to incorporate and practicing it when crafting and developing SBL courses.

are posed in the courseware should be increasing but, at a considerable pace to keep the learner engaged, comfortable, to offer an optimum learning experience. This dynamic process explains why flow activities are part of the determinants of learning achievement. More so, one cannot enjoy continuing to do the same thing at the same level for long. It will create boredom or frustration. As humans, the desire to advance and be better pushes us to stretch our skills or to discover new opportunities for using them.

1.1.3.2. SBL technical section

Being the continuation of an extensive exploration of SBL approach and its operational procedure to serve as an effective learning technique at the secondary education level as concerned in this research. The technical section covers from storylines composition to storyboarding, to authoring tools, and lastly to the methods of access to the SBL courses.

1.1.3.2.1.Educative storyline

Storylines are defined as a detailed description of the plot of a motion picture, TV series, etc., for use by writers, producers, prospective investors, or the like[29]. Elsewhere, on the internet, Wikipedia refers to storylines as the narrative of work, whether of fictional and nonfictional basis; narrative threads experienced by each character or set of characters in a work of fiction. Given these definitions, storylines can be rereferred to as the synopsis of the fiction intends for structuring the SBL course project.

This is the first stage when contemplating building an SBL course (Lorna Sim, 2009). The term 'storyline' was introduced into education in 1965 by the JordanHill staff Tutor team of the Scottish Education Department when searching for an active teaching-learning approach that would put the children (young learners) at the centre of the learning process, and integrate subject areas across the curriculum[30]. After the success recorded from using the approach, in Scotland, teachers and teacher trainers in several countries of the world have since then developed and adopting the idea. In March 2010 Storyline workshops were held in Istanbul and Ankara.

By conceptualization, storylines of a narrative or, of an educationally inclined scenario will create mild impetus between the story and the audiences. Because it provides the context within which the

29 Source: Story line Definition & Meaning | Dictionary.com

30 Source: What is Storyline? ← Storyline Scotland (storyline-scotland.com)

audiences feel motivated through the chapters of the story. This condition is necessary before creating the characters that will bring the story to life.

Articulating an educative storyline for SBL course project encourages audiences (learners) to study and search for information with a real sense of purpose. Each line of the story aims at grasping the curricular contents and practices. Thus, create links for knowledge, skills, creativity and analysis to prepare the learner for active reflection and with the sense that, learning is within their will.

Particularly, when contemplating on using a story for learning purposes, the composition of the storylines of the course must be a reflection on case studies, past events and imagination that could enable participants (learners) to start developing critical thinking skills i.e., developing a self-directed and self-corrective skill of analysing facts to form a rational judgment.

1.1.3.2.2. Storyboarding

After the designing and actualization of relevant educative storylines that meet the learning objective for which the course is being designed, following in the process is the creation of a storyboard to simplifying the making of the course. Although this stage takes more time, but, preparing it is worthwhile, for it can serve as a guide to execute and efficiently manage the resources[31] or the project. This activity of storyboarding was first practised in 1931 by Webb Smith[32] at Walt Disney Studio. He drew scenes of a story he anticipated and started pinning them on a board to tell the story in sequence, this unconscious act created the first storyboard (Finch, 1975). After this discovery, Walt Disney Studios invested attention and resources into developing a complete storyboard and, since then, the idea has been professionalised and been useful for studios and moviemakers.

1.1.3.2.3. Meaning and importance of storyboarding

According to the free dictionary by Farlex, Storyboarding is an act of depicting series of sketchy pictures or images showing the sequence of a film or interactive project. That is, drawings and illustrations that show the directional notes and planning aid to outline the events and actions that constitute a movie, or interactive project. It is a scene by scene that breaks the movie down into components (Stopmo Studio,

31 Resources in this manner consists of time, expertise (skills), money, software, materials and all other components that are required to craft and complete a SBL course.

32 He was an American screen writer and animator at Disney Studios. He began as a scriptwriter and draftsman of preparatory sketches in 1931.

2017). Shots that are drawn in boxes, with writing or caption that explain what is happening, and what is next to happen.

Benefits of storyboarding

As stated earlier, preparing a storyboard before defining the characters of an interactive project is worthwhile due to the numerous advantages it can offer. Outlined below are some identified benefits for storyboarding

- To work out and discuss ideas: - It provides the best way to share one's vision.
- Description of the scenes in sequence.
- Define the purpose of the project.
- Step by step guide to developing the project: - It makes production much easier. Act of storyboarding means setting up a plan for the production of the project.
- Clarity during development: - Storyboard helps the developer or instructional designer to be clear of what is expected and have a big picture of how the whole project will look like.
- Cost reduction: - Storyboarding will eliminate or reduce to the last minimum errors and unsatisfactory illustrations that would have occurred.

Aims for storyboarding

The purposes for storyboarding to E-learning developers and instructional designers are categorised into two (Pennington, 2010).

- To communicate ideas as accurately as possible to others.
- To resolve problems as early as possible in the production.

Highlighted below are the important points to keep in mind when storyboarding a project.

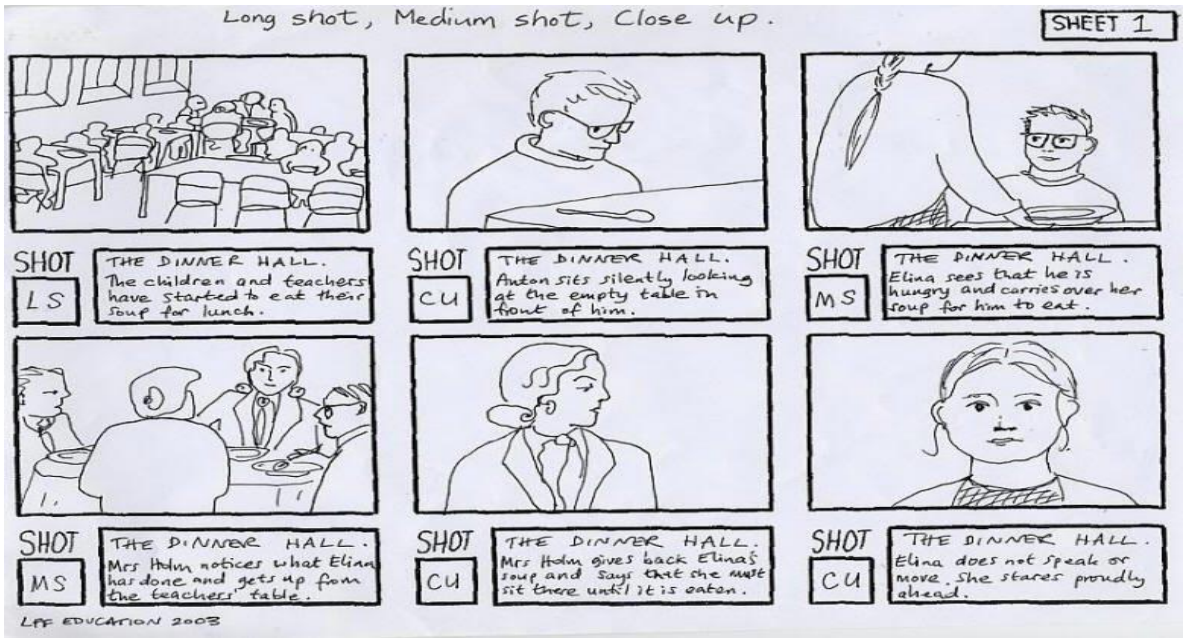
- Who is the target audience (learners).
- Available resources (budget and time).
- Method of output, output format, and mean of access by the learners.
- How simple and clear are the illustrations in the project.
- Does the storyboard contain all the necessary information needed to complete the project?
- Consideration of emotional responses of the learners.

Working with storyboards

A complete storyboard should contain all the information needed for the production of the project. These include characters in each frame, their directions, dialogue, the duration for transition between the present and previous frames. Other important information includes soundtracks, a summary of the action, sets of illustrations, video clips, animations, and descriptions of transition between slides.

Figure 6. Simple storyboard for branching scenarios

Example of 3 by 2 storyboard on A4 sheet[33]



1.1.3.2.4.Subject matter expert

A Subject Matter Expert (SME) exists in all disciplines, and is a person who is an authority in a particular profession, area or topic. That is an individual who possesses a profound understanding of a particular discipline, subject, or profession. The person's contribution is extremely vital when developing learning and training materials on a topic in such an area of knowledge. An expert in the thematic scope of the topic on which SBL courseware is being prepared is needed by the personnel[34] that is developing the material, to furnish them with some relevant assistance and advice in order to eventually arrive at the preparation of a useful courseware capable to meet the already designed learning objective (Mattoon, 2005).

33 Source: Storyboard Examples - Information Technology - A Digital Focus (google.com)

34 In this context, is usually an e-learning developer or instructional designer.

In most cases, the developer of SBL courseware and the SME will have to work together until the e-learning course material is produced and completely analysed by the SME to confirm its suitability to attain the learning objective.

1.1.3.2.5. Authoring tools

An authoring system is a software that has pre-programmed elements that allow for the development and production of interactive multimedia applications. In relation to the development of educational software, the term is referred to as authoring tool, this tool enables a non-programmer person i.e., someone with no knowledge, skills, nor expertise in programming and coding to create engaging and interactive learning courseware by linking together objects, paragraphs of text, illustrations, sounds, and or signs[35].

In simplest term, authoring tools are pre-programmed software that allows its users (usually instructional designers or educational technologists) without any technical skills and knowledge about programming to creating, packaging, and updating pieces of learning resources and deliver them to the end-user. Being a pre-programmed tool, authoring tools come with a ready-made interface nourished with templates, tools, media, signs and colours, interactions, and options that the user can easily arrange and manipulate to create a meaningful project.

Types of authoring tools and features

The use of technology in education to enhance learning is a great innovation that has passed the test of time in history with notable contributions. The practice of technology-enhanced learning has been in existence since 1924 when Sidney Pressey[36] designed the very first electronic learning device, the "Automatic Teacher" to replace standardized testing through an automatic machine (Bezhovski & Poorani, 2016). Following the timeline, and considering the vast development in technology and science, several successful innovations have been introduced into learning until the year1999, when the phrase "E-Learning" was mentioned for the first time in a professional context by Elliott Masie during the TechLearn[37] conference at Disneyworld (Bezhovski & Poorani, 2016). Hence, the increasing

35 Source; Authoring system - Wikipedia.

36 He was an American professor of psychology who invented teaching machine. The first known technological idea invention in learning 30 years earlier to B. F Skinner's popularised the idea of teaching machines.

37 TechLearn Conference formerly known as 'Online Learning Conference' has been active in the training industry for more than 50 years. It hold annual learning technology conference, and post-conference virtual certificate programs for trainers and learning professionals

popularity of the paradigm attracted the attention of innovators and educators to prepare and introduce software programs (authoring tool) that will facilitate production and re-production of e-learning course material both for offline and online access.

Various authoring tools with different interfaces and varied features have been produced by educational technology companies and coding expertise but, all of them tend to serve the same purpose (creation of e-learning courses) at the end (Yergeau, 2018). However, several factors usually determine the usability rate of these tools such as complexity level of the interface, subscription plans, and costs, publishable to LMS, supporting output formats, amongst others depending on the preference and objectives of the users. These authoring tools are classified as SaaS[38] or Cloud-based, Desktop based or locally hosted, and Recording and Screen capturing e-learning authoring tool. Following these classifications five (5) most common consuming authoring tools in the industry of e-learning are listed below:

- Adobe Captivate
- Articulate storyline (360)
- Lectoral
- i Spring suite
- ActivePresenter, and many more.

ActivePresenter is a screen recording and interactive e-Learning authoring tool available for Microsoft Windows and Mac operating systems (OS) users manufactured and maintained by ATOMI Systems, Inc. in Vietnam. This authoring tool is also used to create software demonstrations, software simulations, and quizzes. The integration of these useful functions in ActivePresenter allows a developer to quickly capture and recording a screen to create a simulation for learning, create e-Learning content, and edit recorded videos with just simple steps. For SBL courseware, ActivePresenter enables the formatting of concluded projects into SCORM, HTML5, and or xAPI.

ActivePresenter has a simple and friendly user interface sufficient to support novice and newbies to start a journey into the e-learning industry while making sense of their activities in e-learning courses development and simulations. Another unique feature of this tool is the similarity of its interface with Microsoft PowerPoint and, its support to import presentations and slides from Microsoft PowerPoint for

38 SaaS is otherwise known as 'Software as a Service' This is the term given to the idea of delivering applications over the internet- as a service. Instead of installing the application in the personal computer and maintaining it, one will rather access it from the internet or in cloud by subscription and as a free user. Suppliers of these services are called SaaS companies

advance editing and authoring functionalities of the course material to meet the standard of interactive e-learning courseware.

After much time of practising with other authoring tools such as Adobe Captivate, and Articulate 360, and comparing the experience with ActivePresenter, the following are the reasons for chosing ActivePresenter.

I. Familiar Graphical User Interface: - The GUI is simple and clearer, having many similarities with MS PowerPoint.

II. Accessibility: - The accessibility of the full functionality of the software is allowed for a free user with just a trivial limitation of embedded watermark on any project produced with the free version.

III. Affordability: - To upgrade from a free user to a standard premium user only requires a token and an affordable amount of money. This is probably the cheapest locally hosted authoring tool that serves the same purposes as others in the market.

IV. Artificial Reality AR can be created in a tool and simulated.

V. Flexibility: - PowerPoint slide transition effects and conversion to a web-friendly format.

VI. Availability of conditional triggers aside from the pre-programmed ones.

VII. HTML5 deployment output format.

1.1.3.2.6. Crafting SBL courseware

Building an interactive SBL project is a process that requires a sequence of tasks with adequate technical skills in computers, technologies, and software that are designed to aid learning. Having stated earlier that SBL is a technology-enhanced learning system; this denotes that it is being powered by modern technology tools for learning. Hence, relevant knowledge and skills in the areas of education and technology respectively are paramount for a supposed developer to crafting effective courseware (Stewart, 2002).

Two conditions apply to an SBL courseware developer. The first possible condition is a situation whereby the developer is an instructional designer and also a teacher. The second condition is a situation whereby the developer is an E-learning developer or educational technologist, and learning

specialist. In either of the conditions, empirical findings[39] claim that knowledge about the principles of e-learning is required plus a significant portion of computer appreciation skills. If the developer is not a teacher who is going to make use of the course material himself by administering it to the learners, then the attention and contributions of an SME is required to guide the developer in the structural development of designing the right course that will meet a propose educational need.

Having the developer understood the purpose for developing the courseware, activities that are involved in the process range from analyses of the storylines for the scenario to uploading the crafted courseware on LMS. The activities are highlighted below.

- Analyses of the storylines.
- Storyboarding.
- Working the storyboarding with the SME.
- Crafting the courseware using an authoring tool; this activity is often performed in conjunction with the attention of SME.
- Review and presentation of the crafted courseware for quality control.
- Upload to LMS or any other supported output platforms

1.1.3.2.7. Branching Scenarios

SBL approach provides the learners with varied alternatives to a challenge and makes them aware that for every choice made, there is a consequence. This principle subjects learners to bear the responsibility for their actions during the learning process. To actively engage the learners in SBL approach, branching scenarios e-learning course is needed, and not the common idea of standard linear e-learning courses.

Branching scenarios is an interactive form of e-learning that challenges the learner to make a decision amongst several available alternatives and then face the consequences. In this sequence, each consequence leads to new challenges and more alternatives[40]. As the learner continues, he gets more engaged with the process, thereby making the learning an interactive one. According to Tom Kuhlmann,

39 SBL courseware is always in an output form of e-learning, and e-learning has its own basis, principles and guiding rules that must be well understood before delving into the creation of one. If the priority is to creating an e-learning course that will serve the learning purpose.

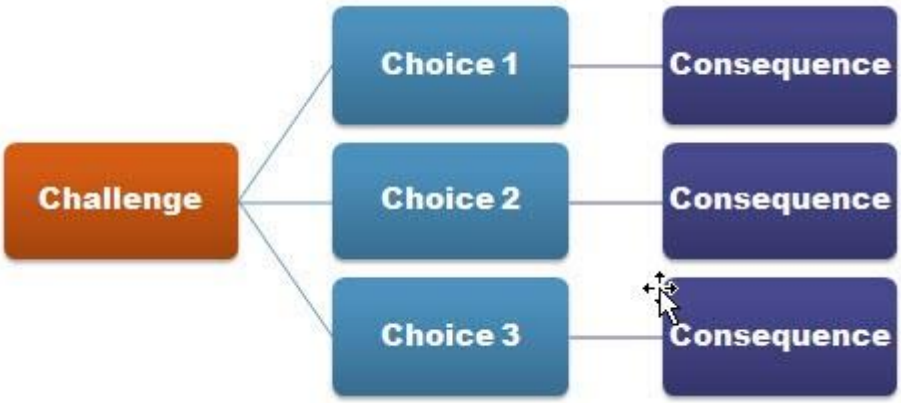
40 Source: Branching Scenarios: What You Need To Know - eLearning Industry

an educational technology and learning specialist who is the host of 'The Rapid E-learning Blog' website[41], developed a model for branching scenario which he called the "3C Model". That is Challenge, Choice, and Consequence which he described as follow[42].

"I start by creating a generic 3C model where I provide a challenge, choices, and consequences. Then when I want a scenario, I drop in a 3C. If I want to continue the scenario, I drop in another 3C. So, I can make my branch as simple or complex as I want it to be. Once I have the infrastructure built, I swap out the placeholder content with my real course content and I'm done".

The model is presented in figure 7 showing the starting branch that depicts a challenge and three choices that produce consequences.

Figure 7. The 3Cs of branching scenario model



As depicted in the above picture, a challenge is posed to the learner. The learner will have to make a decision and, in this process, select a choice from three alternatives. The choice made produces consequence. The emerged consequence as a result of the previous choice made will lead to another challenge and the process continues in this mechanism until feedback is provided or the learner arrives at the right answer at the end of the course. This process is called continuing branching scenario as shown in figure 8.

41 Source: The Rapid E-Learning Blog | Practical, real-world tips for e-learning success. (articulate.com)

42 Source: Build Branched E-Learning Scenarios in Three Simple Steps | The Rapid E-Learning Blog (articulate.com)

Figure 8. Series of branching scenario

Source: Tom, (2009)[43].

The image above shows a series of branching scenarios of how consequence leads to a new challenge and continue like that. This process can be structured into segments by ascribing each challenge to its consequence, feedback can be provided at the end of each segment after the learners may have encountered the consequence. Then, a new challenge can be posed and the process rolls again.

1.1.3.2.8. Learning Management System (LMS)

An LMS is a software application for the administration, documentation, tracking, reporting, automation and delivery of instructional materials. The learning management system has been in the peripheral of education since the year 1950s at the start of the application of the computer to education (Watson & Watson, 2007). However, it began to gain limelight recognition in late 1990 when e-Learning got more attention as technology tools that support online and electronic learning were progressing (Bradley, 2021). A careful exploration into the history and definition of LMS has revealed that the concept is still in the infancy of the literature of educational technology and modern learning.

It is important to stress that this research activity does not require an in-depth discussion about the components of an LMS due to the thematic scope of our research aim. But important areas that have to do with theorising, and the implementation of the SBL approach will be outlined. Areas such as the definition of LMS, features of LMS, clarifications of LMS and other computer-assisted learning programmes, and its relevance to the SBL approach.

43 Source: Build Branched E-Learning Scenarios in Three Simple Steps | The Rapid E-Learning Blog (articulate.com)

According to Govender and Govender (2012), an LMS is defined as a software platform that enables and promotes efficient management, delivery of instructional materials, and interaction between teachers and students (Garcia, Abaratigue, & Alcantara, 2021). Also, Buckner and Kim (2014) defines LMS as a program used in the classroom that allows students to respond to, share, and answer questions online. In another dimension, Turnbull et al. (2019) defines LMSs as websites with online technologies that are used for the establishment, administration, and provision of course materials for learning (Garcia et al., 2021). To Szabo and Flesher (2012), an LMS is the infrastructure that delivers and manages instructional content, identifies and assesses individual and organizational learning or training goals, tracks the progress towards meeting those goals, and collects and presents data for supervising the learning process of the organization as a whole (Watson & Watson, 2007).

Following the definitions above, it is easy to notice that the proponent of each definition defines LMS in regards to its characteristics and advantages. That is their definitions evolve around the functionality and the purposes of adopting an LMS in a modern learning environment. Watson and Watson (2012) have pinpointed the necessity of clarifying LMSs from other computer-oriented learning systems such as computer-based instruction (CBI), computer-assisted instruction (CAI), and computer-assisted learning (CAL). They argued that these forms of computer-oriented learning systems are not the same as LMS, as it has been used to define and describe a number of different educational computer applications. They posit that the key to understanding the difference between LMS and other computer education terms is to understand the systemic nature of LMS (Watson & Watson, 2007).

LMS is the framework that handles all aspects of the learning process, it delivers contents and addresses issues such as registering learners for courses, tracking and reporting, course administration, and skills gap analysis. According to Bailey (1993), characteristics that LMSs in education should possess are (Watson & Watson, 2007):

- Instructional objectives are tied to individual lessons;
- Lessons are incorporated into the standardized curriculum;
- Lessons are provided based on the individual learner's progress;
- Courseware consistently extends several grade levels.

Towards the effort to distinguish LMSs from other computer-oriented learning programs, The American Society for Training and Development has recommended some functional requirements a corporate LMS should cover:

- Integration with Human Resources system.
- Providing access to content, involving the medium (classroom or online) method (instructor-led, self-paced), and learners (students, employees, or customers).
- Administration tools that enable the management of user registrations, profiles, roles, tutor assignments, contents, internal budgets, user payments, instructors and classroom.
- Developing content, including authoring, maintaining, and storing.
- Assessing learners' competency gaps and managing skills acquisition and status.
- Providing and supporting authoring of assessment.
- Adhering to standards such as SCROM and AICC which allow for importing content and courseware that complies with standards regardless of the type authoring system used.
- Providing security such as passwords and encryption.

Scores of LMSs have been introduced and are being used by academic institutions, organisations and corporate bodies to manage e-learning and deliver instructional materials to their students and employees respectively. All these LMSs typically share a common purpose- to administer and optimize the sharing of instructional materials. The structure of instruction, learning objectives, and organization needs are the three points of consideration while choosing an LMS. Some of the LMSs are free and they are being operated on an open-source, and some are commercial. The users of this form of LMS enjoy a reliable and consistent technical supports system. Another factor that differentiates LMSs isthe nature of hosting; some are installed programmes (locally installed computer hard drive), while some LMSs are SaaS (software as a service) which is hosted on the vendor's server (cloud).

The important features of LMSs as related to observing learning as a process aiding learning through an SBL approach are highlighted below. But, before making the list, the major support of an LMS to SBL approach is that it makes easy the sharing and disseminating of instructional resources and information to the learners. LMSs are built to support most e-learning output formats such as SCROM, xAPI, HTML5 and so on. Instructional designers and course developers use LMS as a prepared medium to share course materials with the learners. Other functions of LMSs to e-learning are stated below:

An LMS facilitates the smooth delivery of learning activities in an engaging and motivating mode. The fact is that different learners learn in different ways, corporate LMS possesses the characteristics of tailoring learning towards individual learners' need.

Using an LMS to manage SBL approach will streamline the teaching-learning administration process by allowing the instructor to plan activities calendar and share it with the learners. It encourages an easy and secure exchange of learning data, and flexible access to learning resources. Assists in problem-solving with processes for decision making, and monitoring the learners' activities

1.1.4. Synthesis of the section

Learning through or with scenarios can be reckoned with as a modernized idea that stemmed from the traditional storytelling system. Scenarios being narratives of plausible and, or real-life events shared the same characteristics with how stories are being told. Evidence has been derived from the literature about how learning through storytelling stimulates retention. Thus, a learning approach that based its contextual functioning on simulating scenarios to meet the learning objectives is expected to foster deep understandings.

To establish the significant space that scenario-based learning (SBL) holds in pedagogy, theories of learning that adequately support SBL as a modern learning approach were identified and discussed extensively. Also, based on the practical experience the researcher has acquired during this research, the operationalisation process of SBL as a learning approach was stratified into theoretical section and technical section with their components well outlined.

1.2. Social media

This aspect covers the exploration into the origin of social media, its relatively rapid growth as sociological and educational forces and, the changes it has informed the process of learning. Also, features and the suitability of social media platform that was adopted as an aid to enhance Scenario-Based Learning (SBL) approach in this research were intrinsically discussed.

1.2.1. Meaning of social media and social networking

These two terms are been used interchangeably but, to the value of knowledge, research into the literature of social media and networking reveals the clear gaps between the two terms. One is a platform, that is, an avenue to establish a connection. While the other is an act, that is a continuous process of nurturing an established connection (Zhang & Vos, 2014).

Social media is comprehendible as platforms or technologies such as websites, and applications that facilitate the establishment of connections among individuals to share multimedia content, exchange

messages, and perform VOIP[44] to relate services amongst businesses (Kaplan & Haenlein, 2010). Social media create connections quickly via applications and aim at triggering engagement of the target audience by sharing or posting relevant and attractive content such as videos, infographics, and images that will demand corresponding actions from the audience.

Social networking[45], on the other hand, comprises of all activities performed on social media and or networking sites to nourish relationships that have existed amongst the users that are sharing similar points of view and characteristics. Activities, such as creating groups on Facebook or WhatsApp to enable users of similar characteristics to discuss and share opinions is a coordinated example of social networking. Acts whereby businesses and organizations create or maintain a good relationship with their clients and customers through the creation of pages on social media, activating of media link buttons and any other activities that can enhance strong social interactions. Therefore social network is comprehended as the articulation of social relationships among individuals, communities, businesses and so on (Durland & Fredericks, 2005).

Word Web Dictionary defines social media as internet and mobile technologies for interactive social networking. According to Merriam-Webster Dictionary, social media is defined as forms of electronic communication (such as websites for social networking and microblogging) through which users create online communities to share information, ideas, personal messages, and other content (such as videos).

1.2.1.1. Trends in social media

The act and practice of social networking have been in existence as early as humans' efforts have begun to relate and communicate with each other (Pereira, Pereira, & Pinto, 2011). These are acts of social interaction which involved sending signaling systems of flags, smoke, or lights to share ideas and opinions in the communicative form they all understood (Dundar, 2003). History revealed that this practice remained in use until 550 B.C. before the postal system idea of delivering messages over long distances was unleashed and performed by the horse riders (Dhingra & Mudgal, 2019). Also, the Pigeon post method where homing pigeons (birds) were used as agents of long-distance dispersal of messages was part of ancient practices of communication and social interaction.

44 This is an abbreviation of Voice Over the Internet Protocol; a technology that allow its user to make voice calls using broadband internet connections instead of a regular or analogue phone line.

45 Social Media Vs. Social Networking | Wayward Kind

The invention of the telegraph by Morse[46] in 1838 (Dundar, 2003), marked the advent of technology in communication[47] and the beginning of the early development of modern social interactions and networking. In October 1832, Samuel Morse, before the invention of the telegraph, met research inclined Dr Charles Jackson[48] whose quest was about whether electricity took much time to travel over a long wire. Morse was triggered with the inquiry made by Charles. Thoughts and actions by Morse in response to the inquiry led to the basic ideas of the telegraph (Dhingra & Mudgal, 2019).

After the invention of the telegraph, social media has developed through the years. The invention of supercomputers in the early 1940s marked the inception of the significant growth and continuous development in social media to the present digital age. Socia media domain started experiencing the big push development when the world migrated from web version 1.0 that uses WAP[49] which was the first stage of the World Wide Web evolution to web 2.0 in the year 1999 which is based on (TCP/IP)[50]. Web 2.0 is embedded with great features that enhanced the usability and availability of social media. Features such as Podcasting, Blogging, Tagging, Social networking, Curating with RSS, and Web content voting.

These features provided by web 2.0 created a grand shift from static surfing of the internet to mobile and flexible activities on the internet that enabled more individuals access to information (Kaplan & Haenlein, 2010).

Karen McIntyre, (2014) discussed three significant media evolution theories that best explained the trends in social media (Mcintyre, 2014).

- Media Displacement: - The theory postulates the idea that when a new form of media is introduced, it competes and might eventually replace an old one. (Dutta-Bergman, 2004). This theory is easy to be confused with the 'social media displacement theory' which states that the more time you spend on social media, the less time you will have socialising with people in the real world.
- Functional equivalence: - Newer media dominate older media. This theory predicts that "as new media come along that better serve a particular function, the use of the previously dominant medium that served that function declines" (Neuman, 2010, p. 12).

46 Samuel Morse was born in 1791, aged 81, an American painter and inventor who created electric telegraph and co-inventor of the Morse code. Samuel Morse - His life, work and inventions

47 Julia_F.pdf (d2y1pz2y630308.cloudfront.net)

48 He was born in 1805, lived 75 years, was an American physicist.

49 WAP is an abbreviation for Wireless Application Protocol is a set of protocol for connecting mobile phones and other applications to the internet.

50 Transmission Control Protocol / Internet Protocol is a suite of communication protocol used to interconnect network devices on the internet.

- Complementary theory: This theory posits that newer media supplements older media. That is some new technologies are the accompaniment of the similar existing media and do not compete with the old media directly. This theory contrasts with the displacement theory.

The above theories depict some contributory components to the incredible shift and progression in the usage of social media platforms and devices. As innovations arrive, old ones tend to become obsolete and gradually fade out. Many theories in the literature conceptualize the evolution of social media and its characteristics. Another theory of social media relevant within the scope of this research is Adaptive Structuration Theory (AST).

Adaptive Structuration Theory by Anthony Giddens (1984), based on the idea of understanding the kind of structures that particular technology tools were designed for, and the form of structure that emerge in humans as a result of their interactions with, or using these technologies. To analyse the meaning of this theory means checking the disparity of, or linear correlation between the intended or expected kind of contributions of using a particular technology tool and the structure of its actual impacts on humans. This theory is relevant to this research when assessing the impacts of social media on the learning behaviour and achievements of learners.

Social media developed through a timeline spanning more than four decades with the first email sent in 1971 (Mcintyre, 2014). These early inventions of social media platforms and communication, e-mail and BBSs are precursors to the present modern age social media (Svetlana & Philipp, 2012). That is those platforms and networks that have existed which announced the coming of this digital age social media platforms. The timeline (Boyd & Ellison, 2007) of social media as documented on the Wikipedia[51] is depicted in table 2.

51 Source: Timeline of social media - Wikipedia

Table 2. Timeline of social media

Year	**Evolution**
1970s	**BBS (Bulletin Board Systems)** BBSs came online in the late 1970s. Originally these were primarily hosted on personal computers and users had to dial in through the host computer's modem[52]. Only one person at a time could gain access to the BBS.
1979	**UseNet** by Tom Truscott and Jim Ellis. This allows its users to post articles to a newsgroup.
1985	Online Services by CompuServe and Prodigy were the first corporate attempts of accessing the internet by introducing a chat program.
1988	**Internet Relay Chat (IRC)** was developed for file sharing and link sharing. This is the first instant messaging application.
Early 1990s	**ICQ** was the first instant messaging application developed for PC.
Early Social Networks	
These are dating sites and are often referred to as social networks.	
1995	**Classmates.com** was launched being the first social network site that allowed its users to create profiles, list and surf their friends.
1997	**Six Degree** was the second modern social network that allowed users to create a profile and be friends with other users. From 1997 onward, several sites have cropped up to deliver similar services.
1999	**Live Journal** was introduced with all the features of Six Degree but with an added feature of constant-update blogs. It enabled its users to follow one another, create groups and interact. LiveJournal was the precursor to the live updates we see in social networks today.
1999	**Yahoo Messenger!** was launched. Another popular instant messaging service.

52 MODEM is a short word for 'Modulator' and 'Demodulator'. It is a hardware device that allow a computer to send and receive information over telephone lines.

1999 **MSN Messenger!** Microsoft launched its instant messaging app.

2000 In the early 2000s, social networking and social media experienced huge developments. Although, most of the innovations and ideas of those periods have been discontinued.

2002 **Friendster** was the first modern general social network with most of its traffic coming from Asia.

2003 **Hi5** is also a major social network most popular in Asia, Latin America and Central Africa.

2003 **LinkedIn** was the social network developed by Microsoft for business and professional purposes.

2003 **Myspace** was founded as social networking and with additional features such as IM, real-time status updates, and news feed showing friends' activity. Myspace was the first social media site to reach one million monthly active users.

2004 **Facebook** was created as Harvard -only social network but it quickly expanded to other environments of users. In 2008, Facebook became the most popular and the largest social networking site and continues to grow.

Media sharing

It will be educative to mention that social media is not limited to instant messaging and social networking. It also consists of photos and videos sharing, and other multimedia content.

2003 **Photobucket** was the first major photo-sharing site and the site was acquired by Fox Interactive Media in 2007.

2003 **Skype** was founded by Niklas Zennstorm from Sweden, and Janus Friis, from Denmark. However, in the year 2011, Microsoft acquired Skype.

2004 **Flicker** was created by Ludicorp and is a popular means for amateur and professional photographers to host high-resolution photos.

2004 **Orkut** was launched by Google Inc.

2005 **YouTube** was the first major video hosting and sharing site.

2005 **Reddit** was launched. It is an American social news aggregation, web contents rating, and discussion website.

2006 **Twitter** was founded as social media for real-time updates by enabling its users to tweet (share) status updates and happenings at that present moment.

2007 **Tumblr,** a popular microblogging and social networking website.

2009 **WhatsApp** is the most popular modern IM application that allows its users to send text messages and voice messages, make voice and video calls, and share images, documents, user locations, and other content.

2010 **Pinterest** was launched. This is an image sharing and social media service.

2010 **Instagram** was launched, a photo and video sharing and social media services.

2010 **Quora,** a popular social media platform designed for question-and-answer.

2011 **Snapchat** was launched.

2017 **Tick Tok** was launched. Known in China as Douyin. A short video-focused social networking service owned by Chinese company ByteDance.

2017 **Co-Star** was launched. An astrological social networking service.

2020 **Clubhouse,** a social audio app for mobile operating systems (Android and iOS) for communication in audio chat rooms, with several social networking features.

Social media has come a long way since the days of BBSs and IRC chats, and has since, been an integral part of the daily activities of human lives. This attribute accrued so much attention to it, and continue to evolve daily. From 2006 onward, and till this present age the industry has experienced massive growth with major social networks and social media sites making improvements and advanced services on an almost daily basis towards satisfying and meeting the demands of their users. This process is probably perpetual.

Jimmie Manning (2014), in his journal article titled "*Social media: Definition and classes of*", categorised the evolution of social media into two separate ages; the broadcasting age and the interactive age (Manning, 2014). In the broadcasting age, access to media content was centralized. Meaning that media information was been disseminated to people in a generalised form via public gadgets such as television, radio, and newspaper companies. There was little or no mediated

communication between individuals during this age. Personal information or messages during this era were transferred via post mail or a family postal mailing system.

However, the rise in the availability of digital technology, and mobile devices as years go by, brought continuous reformation to social media usage patterns as individuals could afford personal digital devices. Media companies were developing means of sharing media content to digital devices for even distribution. This lead to a persistent increase in the level of social interaction amongst individual consumers of information (Manning, 2014). At this age, which Manning referred to as the Interactive age, an individual could have access to information, news and sorts of media contents, make use of it, and share it with families and peers.

Table 3 shows the numerical illustration of a chart in the databases of (Statista[53] and TNW (2019)) which was retrieved by ourworldindata.org[54] on the rise in the users of social media worldwide from 2004 to 2019. It indicates the variability and percentage change in the number of active users for some major social media platforms. From the chart on their websites, estimates correspond to monthly active users (MAUs).

Table 3. Rise in the users of social media in the world

Platforms	**Closest (year)available data point**	**2019**	**Absolute Change**	**Relative Change**
Facebook	100 million (2008)	2.38 billion	+2.27 billion	+2,275%
YouTube	1.9 million (2005)	1.90 billion	+1.9 billion	+97,520%
WhatsApp	300 million (2013)	1.33 billion	+1.03 billion	+344%
Twitter	43.25 million (2010)	330 million	+286.75 million	+663%

53 Statista is an online portal providing quantitative data on global economy, demography, public opinion, media, consumer markets, and macroeconomic trends.

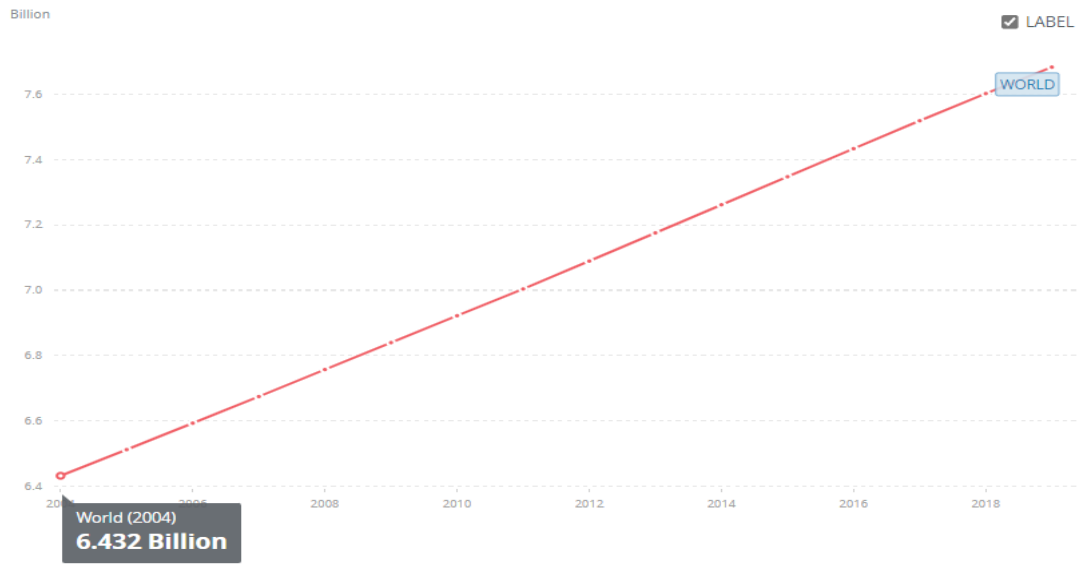
54 Source: Number of people using social media platforms, 2004 to 2018 (ourworldindata.org) Being a third party data protected by the copyright law of the original source.

Instagram	117.50 million (2013)		1.00 billion	+882.50 million	+751%

Also, data retrieved from the world bank webpage[55] on the world population growth between the year 2004 and year 2020, compared with the information in table 3. It shows that the rise in the overall number of users of social media in the world is twice the increase in the world population within the same given period of years. This means that during the last decade, the number of social media users have grown astronomically relative to the increase rate in the world population. This fraction indicates over one-third of the world population. In the year 2004, world population was estimated to 6.43 billion, and as of 2019, the world population stood at 7.683 billion and 7.753 billion in 2020.

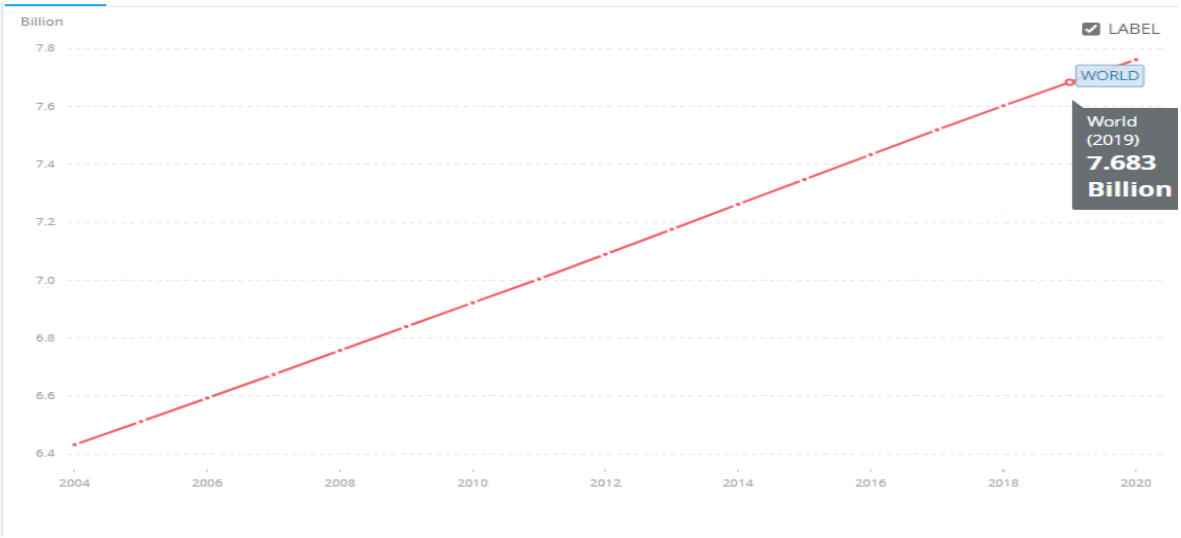
Figures 9 and 10 depicts the world population for the year 2004 and year 2019 respectively

Figure 9. World population in year 2004



55 Source: Population, total | Data (worldbank.org)

Figure 10. World population in the year 2019



Considering all other demographic factors, the data in figure 8 and 9 indicate that the world population ha increased by 1.32 billion within sixteen (16) years (2004 to 2020) while the users of social media have increased by over 3.2 billion, a variable that tends towards a continuous growth. However, Hruska and Maresova (2020), claim in their findings that as population age increases, the number of social media users decreases (Hruska & Maresova, 2020). That is as the aged population increases, users of social media decreases.

Social networking is one of the most popular activities on the internet. According to the data published in the year 2020 by statista.com, over 3.6 billion people used social media in the year 2020 worldwide and, 3.78 billion in the year 2021, and this number has been projected to rise to 4.41 billion in the year 2025.

1.2.1.2. Importance of monitoring social media users' growth

The awareness of the growth rate of the users is important to guide educators and concerned elites to foreseeing ways to empower the efforts to improve the efficiency of usage, and learning behaviours of the end-user and, to foster the understanding of factors that are responsible for changes in social behaviours. Also, it can assist researchers from different backgrounds to understand the users' statistics which is very useful in a survey and participatory research design (Zhang & Vos, 2014).

To illustrate that social media is completely changing the world, the way social interaction occurs within our world is gradually becoming virtual, holding the theory of social displacement (Mcintyre, 2014). It

also helps in identifying the emerging trends and age distributions of the users by providing researchers with the early knowledge of future trends.

1.2.2. Impacts of social media on learning

Ideally, the Web is created for a purpose to serve as information space and storage that enable people to communicate and share their knowledge in a special way (Baird & Fisher, 2005). That is a base for information where people with knowledge and ideas drop their contents for those that will need to learn from. However, the ubiquity of modern technologies and the continuous availability and affordability of the internet has remodified the phase of the web from its purpose of inventory (Selwyn, 2011). It is being used for different purposes in everyday life. Technologies and innovations have changed the human environment and how they interact.

Human organisms being social creatures that inevitably mingle with the environment components. The emergence and rapid evolution of social media within environments have fundamentally changed the structure of social interactions among humans- consistently making interactions among humans more virtual. This paradigm shift has enabled humans to access information within their reach and beyond, and have expanded their connections with one another. The availability of information at human's disposal due to the ubiquity of social media is making the learning process more personalised, because of the enablement it gives individuals to obtain information from the internet and process it at their own pace (Cardoso-Leite, Green, & Bavelier, 2015; Deaton, 2015). This development has been encouraging a set of skills that can assist in making sense of information acquired through creative thinking (Deaton, 2015).

Social media have impacted all forms of learning directly, be it formal, informal, and non-formal learning. Considering learning as a social activity - a process that requires the learner to interact with his environment to acquire new information (Bandura, 1971), social media have contributed immensely to the creation of such environment where learners are being able to relate and exchange ideas both physically or virtually to multiply knowledge (Scialdone, 2014). Social media encourages collaborative learning by influencing learning environments in such a manner that it helps the learners on how to construct and nourish the relationship with their peers both in the classroom and outside the classroom (Watkins, Carnell, & Lodge, 2014). Thus, social media develop a community of learners.

In the field of online learning facilitation, social media provide instructors with the enablement to hold a learning session in synchronous mode (Ayse, 2018; Baird & Fisher, 2005). This enabled the instructor to share the course contents with the learners online in a live session to receive comments from the

learners and giving feedback at the same time. Social media have encouraged an easy process of learning evaluation, some social media platforms are embedded with features that are used in recording learners' information and tracking their learning activities (Ayse, 2018; Isik-Ercan, 2012), a good example of this feature is the social learning feature for Facebook Groups that was introduced in April 2019.

Social media supports positive learning and attitude and is encouraging life-long learning through the support it gives to adult education in terms of flexibility in time and space. We are undoubtedly in the information age which denotes that the requirements and processing of information extend to all aspects of life. Following the rapid development in technology and innovations, hence, changes and development in all areas of life. Every individual is expected to acquire knowledge and skills needed to go in tandem with the reforms and developments in the world, social media platforms and networking activities help individuals and organizations to access sources of information and learning orientation to meet these challenges (Angele et al., 2010; Ayse, 2018).

To summarize these claims, the impacts of social media on learning are highlighted below:

- It aids the efficacy of social learning theory
- Accessing the sources of information
- Sensitive to individual differences
- Supportive to learning when required
- Encouraging collaborative learning
- Enabling process evaluation
- Supporting life-long learning
- Supporting cognitive skills development
- Enabling interactive learning environment
- Supporting the development of a positive learning attitude

1.2.2.1. Social media platforms and networking sites

In a literal sense, in computer studies, the term 'Platform' is referred to as a surface combining of a particular computer and a particular operating system where computing activities such as data input

and output view are being performed. In the context of social media, a platform is described as a web-based surface that allows users to consume and publish content, engage in dialogues with other users, and interact with brands and companies (Lin & Rauschnabel, 2016).

These platforms are in various structures and features tailored towards meeting specific objectives of the inventors and target users. The most common structures of these platforms are designed in form of blogs, content sharing and Instant messaging that is intended to be operated on digital technology devices such as computers (desktop and laptop), tablets, smartphones, and other PDAs (Hruska & Maresova, 2020; Svetlana & Philipp, 2012).

We are in the information age where most human activities and their ability to make decisions largely depends on the information at their disposal (Klinec, 2011). There are numerous social media platforms and networking sites but, still, there are a few amounts of these platforms are regarded as 'major' platforms due to factors such as the number of active users, embedded features and services, responsiveness and UI adaptation, and type of audience (Scialdone, 2014).

According to recent researches on social media, platforms and networking sites that are recognised as 'major' based on the identified factors are Facebook, Twitter, YouTube, Instagram, WhatsApp, and LinkedIn. These platforms and networking sites are the most common based on their MUAs and on the volume of traffic they pull on the internet. However, among all these most common platforms and networking sites, Facebook pulls more active users and possesses more useful features for end-users than the rest. Apart from being a social networking site, it has a patented instant messaging platform known as Messenger.

1.2.2.2. Selected social media platform: Facebook

Considering the peculiarity of SBL approach at the secondary education level and the targeted category of learners which are secondary school students for this research, the social media platform that possesses the features and potentiality of making the research process a realistic one was adopted. Based on the available facts, pieces of evidence, and findings, Facebook is considered as the suitable networking site or social media platform for the research purpose.

Part of the justification for choosing Facebook is that, initially, the networking site was invented by a teenager[56] and originally designed to be used within teens and young students' environments.

56 Mark Elliot Zuckerberg is an American computer scientist and psychologist, co-founder and CEO at Facebook. He was 19 years old in 2004 at Harvard University when he started the idea of matching students' name with photos (face appearance) of classmates. Hence, Facebook, originally lauched to function only at Harvard community but, the site expanded rapidly beyond the university's environment and gradually reached one billion users by 2012.

Zuckerberg and his roommates intended to use the concept to virtually connect students at Harvard University (Kaplan & Haenlein, 2010; Scialdone, 2014). Based on this purpose, the networking site was then developed and embedded with user interface (UI) and features that are understandable and attractive to young students. Also, based on the findings published by Pew Research Center in 2019 on the most use among social media platforms, and users by age group. Facebook is the most popular and most visited networking site; users spend more hours on the platform than on any other one. Also, the age group 18-year-old – 24-year-old claim 74% of overall users of Facebook in the United States[57].

Data retrieved from a website named statista.com with a survey period of 2017 to 2021 indicates that Facebook users in Nigeria in the year 2017 was 11.3 billion, in the year 2018; 14.1 billion, in the year 2020; 23.83 billion, and in the present year 2021 is 29.64 million and forecasted that, by the year 2026 the number might have risen to 69.4 million.

Facebook has specifically become an integral part of modern society with total active users of more than one-third of the world's population. The platform is embedded with powerful features that satisfy different individuals. Features such as Social Learning Group, Gaming, Facebook business tools, Market place, Forecast, and many more features that cater for different individuals in their various professions and areas of interest.

According to the data available on ourworldindata.com on the rise of social media, the growth level of Facebook users worldwide from 2008 to 2021, shows the rising pattern in the active users Facebook within the fifteen years.

In 2008, registered users were 110 million and as of 2019 the active users on Facebook had risen to 2. 38 billion. A significant increase of additional 2.27 billion users in twelve years. This data is for two years ago, and according to recent data published on statista.com about the monthly active Facebook users; as of the second quarter of the year 2021, the number of active users stood at 2.895 billion. The mathematical interpretation of this change is that in one year and six months, active users on Facebook have increased by 625 million; a figure up to 50% of the Africa population and almost 87% of the European population as of October 2021, according to the data on the population of the continents of the world as retrieved from www.worldometers.info

Given the data above and dwelling on the information, it may not be considered an overstatement to say that Facebook has truly become an integral part of our social lives.

57 Source: 10 facts about Americans and Facebook | Pew Research Center

1.2.2.3. Facebook relevance with SBL approach

The benefits of Facebook social networking site in learning range from being cost-effective to enhancing positive learning behaviour and innovation skills, communication skills, collaboration skills, cognitive flexibility and information literacy. More so, social interactions, when combined with learners' experiences help to construct knowledge through social networks (Deaton, 2015; Topçiu & Myftiu, 2015). This enables students to provide relevant feedback on course contents and process understandings with their peers' comments and questions through the adopted social media platform or networking site.

Facebook is a social networking site with lots of features that aid social interactions and motivation to acquire knowledge due to the access to a pool of information it offers its users. Features such as Facebook Groups, Feedback tools e.g., polls, review and rating, conference call and group chat on Facebook messenger, are valuable features that can encourage collaborative learning and even knowledge sharing.

Robert Gagne (1985), in his book '*Nine Events of Instruction'*, discussed how external instructional events (stimulus) can encourage internal learning processes and foresee ways for new technologies inventions to empower and stimulate a positive learning attitude. SBL approach is being powered with modern digital technologies for learning that provide instructors with the ability to interject emotional stimulus in a social learning environment and gain the attention of the students to make emotional connections with classmates and peers just as it should be in a real-time classroom model.

1.2.3. Synthesis of the section

The contextual meaning of social media as different from social network/networking have been enumerated. Theories of social media that are applicable to everyday activities of users were also outlined. To understand the historical evolution, and generation progressiveness in social media and networking, the timeline of social media was retrieved from various but reliable sources on the internet, and were compiled in a table.

Having acknowledged the influence of social interactions on individuals' behaviour, successful efforts were made to identify responsible factors such as rates of increase in the users, rate of increase in the world population, monthly active user, and age distribution of users. All these were identified based on the available data gathered from reliable publications and clustered to identify the contemporary trends in the usage of social media. The importance of monitoring the rate of increase in social media users was outlined followed with the impacts of social media on learning. Facebook, being the chosen social

media networking site for the research, important features about the networking site were outlined, as well as the justifications for choosing it for the research.

1.3. Learning

Introduction

Every stage of human life is inevitably requiring the fundamental skills and indispensable tools that can help to strengthen our inner well-being, nourishes our mind to observe and understand the world around us, and contain the phenomena of life in a better way. Part of these quests started by the earliest humans in the primitive age was on how to possess and maintain the capability to deal with the continuous change in our life- an endeavour that consists of both a propositional and a procedural sense processing. This activity is one of the most specific human processes because it is the foundation of other sciences (Peter, Folescu, & Zalta, 2004; Rescher, 2003), and the result of this process is called knowledge. In fact, 'knowing' or 'quest for knowledge' have been subjugating human inquiry from ancient times to contemporary civilization.

In this section, the fundamental beliefs of how humans acquire knowledge are discussed. The process of knowledge acquisition, which includes activities such as studying, practising, embedment, observing, being taught, or through experience are also examined in relation to basic categories of learning theories that explicitly define the scopes and structures of human cognitive development and learning. Also, contained in this section is the analytical components of emotion as the basis of, and the sole determinant of students' learning outcomes. Learning activity is regarded as a derived function of the goals and objectives of the learners, hence, the use of assessment as the strategies to measure, determine, and optimise learning achievements are also explored. The chapter is concluded with the synthesis of all the concepts and theories discussed and how they are connected to portray learning as a process.

1.3.1. Epistemology

Epistemology is one of the branches of philosophy that is concerned with understanding the concept of knowledge and was propounded by Plato in the 3rd century BCE (Ettore & Constantin, 2018). Epistemology exclusively studies the nature and processes of knowledge with much concern on inquiries such as i) what are the necessary and sufficient conditions for knowledge? ii) what are its structures? iii) the sources of knowledge and its limitations. Epistemology is about issues having to do with the creation and dissemination of knowledge in particular areas of inquiry (Rescher, 2003).

Following the establishment of epistemology by Plato and his Platonic Academy as the study of knowledge, two basic schools of thought emerged in the 17th century on the conceptualization of knowledge and studies of its sources (Russell, 1945). These schools of thought gathered momentum for prepositions among philosophers during the time. Rationalism is a philosophical movement propounded under epistemology as a Platonic concept of Innate knowledge, it was elaborated by the French philosopher René Descartes to make a proposition about the source of knowledge for humans (Hammond et al., 2001). Empiricism is the second substantial school of thought on knowledge under epistemology and it can be regarded as an Aristotelian concept before it was well developed by an English philosopher John Locke. These two schools of thought exposed epistemology to well-elaborated studies and caught the attention of experts across other disciplines such as education, psychology and sociology to explore and propagate further theories and facts about knowledge (Ettore & Constantin, 2018; Russell, 1945).

1.3.1.1. Rationalism

Rationalism, an epistemological view of knowledge originally propounded by Plato as indicated above and later revived by René Descartes (1596-1650). It posits that knowledge is a result of the reasoning process and that reasoning is a unique path to knowledge. More formally, rationalism is regarded as a theory of Knowledge that strongly maintains that 'reason' has precedence over every other means of acquiring knowledge and, the truth comes through intellect and deduction, rather than sensory input. One of the central theses of rationalism holds that 'reason' is a true test and source of knowledge.

Plato stresses that "*what we know by reason alone is superior in an important metaphysical way to what we are aware of through sense experience"* (Peter, Folescu, & Zalta, 2004, p. 4). The Platonic assertion that knowledge is acquired through reason alone and is independent of experience is a pointer to the three basic claims of rationalism which consist of;

- the intuition/deduction thesis state that people can use their intuition to gain insight and reach conclusions about a phenomenon;
- the innate knowledge thesis which claims that humans already have innate knowledge within themselves;
- the innate concept thesis is the belief that some concepts or ideas are part of a human's rational nature and do not require experience to unlock them.

Buttressing this assertion that reasoning is regarded as the basis of knowledge was further analysed by

Descartes through his personal and self-developed ability to doubt everything exists and searches for certainty. He posited and I quote;

"I can do nothing else until I have learned for certain that there is nothing in the world that is certain" (Descartes, 1997, P. 139).

"What of thinking? I find here that thought is an attribute that belongs to me; it alone cannot be separated from me. I am, I exist, that is certain" (Descartes, 1997, P. 141).

"I am, however, a real thing and really exist; but what thing? I have answered: a thing which thinks" (Descartes, 1997, P. 142).

By expanding the quotes of Descartes, he maintains that his thoughts were coming from the mind and the information was acquired from the sensory system. Descartes continued and posited that thought is the only attribute that belongs to him that cannot be detached from him. That is his ability to think is owned and been controlled by him. That means that the only test of our existence is the fact that we think and through thinking we acquire knowledge. In his famous formulation "Cogito, ergo sum!", mind and body are like two different worlds, and while bodily sensations fail the reliability test, thinking proves to be the unique characteristic that is reliable and certain (Ettore & Constantin, 2018).

1.3.1.2. Empiricism

Empiricism is a philosophical school of thought on knowledge propounded by Aristotle and later revived by Jonh Locke in the 17th century (Ettore & Constantin, 2018; Hammond et al., 2001). The theory of knowledge posits that knowledge comes only from sensory experience; that humans are born with no knowledge (*Tabular rasa*), any knowledge acquired is through the experience obtained with the interaction with their environments (Charmaz, 2008; Peter et al., 2004). This theory emphasizes the importance of empirical evidence in the formation of ideas, and as well as the acquisition of true knowledge is concerned, it is contingent on the human experience.

Francis Bacon (1561-1626), a British philosopher whose works were credited with establishing the "scientific method" of inquiry into natural phenomenon, introduced an inductive method as the centre of any scientific method (Francis Bacon, 1602). The inductive method of observation is the grand difference in the approach at which the Aristotelian movement view knowledge different from the Platonic deductive approach (Rescher, 2003). Empiricism took the modern reformation following the contributions of the continental (British) empiricists; John Locke, George Berkeley, and David Hume. These are philosophers from different ideologies but with complex views in strong supports of

experience as the only source of human knowledge (L. Andresen, Boud, & Cohen, 2000; Rescher, 2003).

According to Hume (1748), all human knowledge is founded solely in experience since human behaviour is likely to be governed by passion and not by reason and all true knowledge can be verified by experience. Hume's proposition is clear when experience in this context means past events or an occurrence that can be remembered, perceived, have been touched, have been heard, and have been seen (Bennett, 2017). In his book '*A treatise of Human Nature'* Hume posits that 'reason' is and ought only to be the slave to the passions, each idea is derived from a simple impression, thus, all our ideas are ultimately derived from experience. To distinguish his stand, Hume classifies impressions as the impression of sensation (sense experience) and, impression of reflection (emotional experience).

Given the contradiction of agreement between the two schools of thought which are centred on searching for the true source of knowledge for humans, both the rationalists and empiricists acknowledged 'knowledge' as the substantial resource for human development but, acquiring this knowledge remains the most important process to understand. An attempt by each of the two schools of thought to establish their prepositions lead to further conflicting responses, criticisms and questions about what knowledge is.

1.3.1.3. Definition of Knowledge

From inception, knowledge has proven to be an elusive concept due to the majority of contradictory ideas scholars had about the concept. Addressing its components, and approaches to its application, explanation of its features bring more disagreement among the concerned elites, and efforts to allude to a conventional definition to the term are still fuzzy (Ettore & Constantin, 2018).

The common and frequently cited definition of knowledge in philosophy can be traced to Plato when he proposed that the only condition for someone to believe in something is that there has to be some sort of justification (Rescher, 2003). That is there should be an element of conviction that the proposition the person believes in is exactly what is it.

Plato defines knowledge as "Justified true belief" (Ettore & Constantin, 2018, p. 2).

Some authors and thinkers have injected their analytical methods and skills into the definition given by Plato to expand its context and they came up with a condition called 'Tripartite account of knowledge'. Below are the detailed description and empirical illustration of the definition as opined by Plato:

- The truth condition. It requires that if one knows a proposition then that proposition must be true. If the proposition is not true, then that person does not know what he claims to know. The truth condition makes the difference between opinion and knowledge.
- The belief condition. This condition demands that if one knows a proposition then he believes that proposition.
- The justification condition. That condition requires a practical way of justifying that the belief one has is true.

Summarising these conditions, it can be put together that, the sufficient condition to accept that "something" is what it is, one has to be sure, being sure in a sense to bring assurance that it is true. Secondly, having no doubt or uncertainty about it, that is, be confident about the 'something'. And lastly, one shows the right by providing proof about the 'something' (Peter et al., 2004; Rescher, 2003). The descriptive form of the illustration above is given as follow:

'S' knows 'P:

If S knows that P is true

... and 'S' believes the condition(True) for 'P'

... and 'S' is justified in believing 'P'

Then, "S" has the knowledge of 'P'

One major critic of the attractive analysis of the necessary conditions sufficient for the definition of knowledge given by Plato was the attempt made by Edmund Gettier in 1963.

1.3.1.3.1. Gettier problem

The definition of knowledge as a Justified True Belief was widely accepted until in the early 1960s when Edmund Gettier (1927-2021) a professor at the University of Massachusetts, Amherst opposed the necessary sufficient condition for knowledge as opined by Plato (Gettier, 1963). In his three-page article titled: '*Is Justified True Believe Knowledge'* published in 1963. He argued that the condition stated in the analytical expression of Plato's definition of knowledge does not satisfactorily constitute a sufficient condition to accept that someone has the knowledge of something as claimed. His point of argument is quoted below:

"*I shall begin by noting two points. First, in that sense of "justified" in which S's being justified in believing P is a necessary condition of S's knowing that P, it is possible for a person to be justified in believing a proposition that is in fact false. Secondly, for any proposition P, if S is justified in believing P, and P entails Q, and S deduces Q from P and accepts Q as a result of this deduction, then S is justified in believing Q. Keeping these two points in mind, I shall now present two cases in which the conditions stated in (a) are true for some proposition, though it is at the same time false that the person in question knows that proposition*" (Gettier, 1963, p. 2).

Gettier proceeded by citing an illustration of a case study to support his point of argument. *"Suppose that Smith and Jones have applied for a certain job. And suppose that Smith has strong evidence for the following conjunctive proposition: (d) Jones is the man who will get the job, and Jones has ten coins in his pocket.*

Smith's evidence for (d) might be that the president of the company assured him that Jones would in the end be selected, and that he, Smith, had counted the coins in Jones's pocket ten minutes ago. Proposition (d) entails:

(e) The man who will get the job has ten coins in his pocket.

Let us suppose that Smith sees the entailment from (d) to (e), and accepts (e) on the grounds of (d), for which he has strong evidence. In this case, Smith is clearly justified in believing that (e) is true.

But imagine, further, that unknown to Smith, he himself, not Jones, will get the job. And, also, unknown to Smith, he himself has ten coins in his pocket. Proposition (e) is then true, though proposition (d), from which Smith inferred (e), is false. In our example, then, all of the following are true: (i) (e) is true, (ii) Smith believes that (e) is true, and (iii) Smith is justified in believing that (e) is true. But it is equally clear that Smith does not KNOW that (e) is true; for (e) is true in virtue of the number of coins in Smith's pocket, while Smith does not know how many coins are in Smith's pocket, and bases his belief in (e) on a count of the coins in Jones's pocket, whom he falsely believes to be the man who will get the job" (Gettier, 1963, p. 3)

According to Gettier, the case study shows that the definition of knowledge by Plato does not state a sufficient condition for someone's knowing a given proposition. Gettier maintains that since 'justification' sometimes might not be reliable, hence, this point of critic remains a debatable issue in philosophy, and psychology of education (Rescher, 2003; Sackris & Beebe, 2012). Because a person

may be completely justified in believing something which can be false. This situation is known in the literature as Gettier Problem.

Several arguments have arisen over a couple of years ago validating the classical definition of knowledge by Plato (Ettore & Constantin, 2018). Some philosophers and authors of the 21st century have begun to debate on which is more important as sufficient condition for knowledge; justification or truthfulness. Some epistemic externalists have suggested the justification condition to be replaced with reliable indication, sensitivity, or some other externalist condition (Sackris & Beebe, 2012). Timothy Williamson (2000) makes an analogous point when he presents reasons that the fact that knowledge entails justification does not show that justification is the most integral part of knowledge.

Different from traditional epistemology that emphasises the absolute static and non-human nature of knowledge, Western epistemology focuses on truthfulness as also the main component of knowledge, and considered knowledge as a dynamic human process of justifying personal belief towards the truth (Russell, 1945). More so, the objective of any inquiry is to get to the truth about the phenomenon being inquired and avoid error, so any property of belief that is materialised from a purely intellectual point of view had better find some connection between justification and truth.

WordWeb Dictionary defines knowledge as the psychological result of perception and learning and reasoning. While Oxford Learner's Dictionaries define knowledge as the information, understanding and skills that you gain through education or experience. The structure of the definition of knowledge from the two dictionaries corroborates the claim of western epistemology that acquisition of knowledge is basically a human process which is also regarded as; understanding, comprehension, awareness, consciousness, grasp, apprehension, mastery, and proficiency. All these do not simply exist, rather, they are formed, nurtured, culturally and socially established in an inclined individual.

1.3.2. Learning: definition, meaning and theories of learning

1.3.2.1. Definition and meaning

Human beings do two things very well: survive and learn. In the context of education, then the science of learning, knowledge is otherwise referred to as existing and formal or informal experience and skills that are integrated into the process of learning. Learning remains the broadest concept in education, endless research has been lavished on the concept by several scholars, educators, and psychologists from different views, ideologies, and connotations. Still, with no existing conventional definition for it. The understanding of the concept is shaped by the way it is chosen to be studied (Beck, 2016).

Activities and situations that are regarded as learning are varied across phenomena and contexts but, all are crammed together and labelled as learning. For instance, the phenomenon of a child learning to speak might be a case of actualizing an innate biological potential, whereas learning to read is a case of acquiring a set of culturally based skills. The differences in the contextual base make it essentially challenging to come up with a single concise definition of learning (Petersen, E. N, Muckadell, S. C. D., & Hvidtfeldt, 2016).

Learning is not something or a phenomenon attributable to a specific group of individuals, nor is it often measurable in quantity. In many educational contexts, learning is comprehendible as a product and in some contexts as a process. Some learning outcomes are demonstratable, while some learning achievements add value to the cognitive ability or scholastic aptitude of the learner, these are parts of conditions that make its definition suffer conventional agreement among researchers and elites (Jorg, Davis, & Nickmans, 2007).

However, a concise definition of learning is imperative to this research because it can serve as an enhancement to assess the available learning theories. Without this, it may be difficult to ascertain if a theory covers all relevant possible instances of learning. Also, a precise definition of learning can reduce vagueness and ambiguity and enable the researcher to make accurate categorisation of the emerged pattern of the data, and representation of the findings in a corresponding manner.

Given all the identified conditions that are probably contributing to the challenge of reaching a consensus about the definition of learning, some conditions have been underpinned from the literature that might necessarily be considered in any attempt to give a comprehensive definition of learning (Jorg et al., 2007).

- Is learning being considered as a product of some type of endeavour, or a process, or is it both?
- How do we know if something has been learnt?
- Must all learning be set in the context of performance or assessment?
- Is it possible to learn something without even realising it?

Acknowledging the importance of knowledge and learning to human development, the concern about what we should demand of a definition of learning makes the researcher concentrate on some

definitions of learning among the numerous definitions that are available in the literature. Highlighted below are a few definitions of learning that seems coherent with the general aim of the research.

Richard E. Mayer defines learning as the relatively permanent change in a person's knowledge or behaviour.

- Petersen, et al. (2016) suggest a definition of 'learning' adopted from psychological research. According to this definition, "something is learning if and only if it is a 'process by which relatively permanent changes occur in behavioural potential as a result of experience' (Anderson, 1995, p. 4-5)" (Petersen, E. N, Muckadell, S. C. D., & Hvidtfeldt, 2016, p. 34).
- "Learning is a generative activity. This statement embodies a vision of learning in which learners actively try to make sense of the instructional material presented to them. They accomplish this goal by actively engaging in generative processing during learning, including paying attention to the relevant aspects of incoming material (which we call selecting), organizing it into a coherent cognitive structure in working memory (which we call organizing), and integrating cognitive structures with relevant prior knowledge activated from long-term memory (which we call integrating)" (Fiorella & Mayer, 2015, p. 5).
- "Learning is a reflective activity which enables the learner to draw upon previous experience to understand and evaluate the present, so as to shape future action and formulate new knowledge (Watkins, Carnell, Lodge, Wagner, & Whalley, 2002; p. 2)
- "Learning is the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 38)

Given the above definitions, understanding of what learning is to an individual can be obtained by clustering the components and featured descriptions of each of the definitions to filter the common terms applicable to all, and this can represent the common views about what learning entails. A further step away from observing the definition of learning to understand its meaning and essence is to study some theoretical backgrounds and frameworks that explain, guide and present its factuality.

1.3.2.2. Learning theories

Often the functions of theories in research are that they logically consist of concepts, assumptions, and generalizations. A theory of learning with all these functions must contain a clear understanding of the meaning of 'learning' so as to make it clearer what the theory is about and what it applies to.

There are so many theories of learning (traditional and modern) existing in the literature and, there is a tendency for more to be introduced in the future. A close observation of the expressions and conceptualisation of some of these theories of learning indicates some similarities and repetitions in their opinions and ideas, models and procedures, and claims. To minimise this ambiguity and unnecessary tautology of hypotheses, learning theories have been categorised into three substantial educational approaches (Conole, Dyke, Oliver, & Seale, 2004). Table 4 depicts the mapping together of similar learning theories, their characteristics and proponents.

Table 4. Categories of learning theories

Category	Characteristics	Proponents
Behaviourism	• Focuses on behaviour modification via stimulus-response pair • Encourage trial and error learning • Pedagogical focus is on control and adaptive response • Learning through association and reinforcement • Focuses on observable outcomes	*John Watson *Burrhus F. Skinner *Albert Bandura
Socio-cultural &	• Focuses on the process by which learners build their own mental structures when interacting with an environment • Pedagogical focus is task-oriented • Favours hands-on and self-directed activities • Useful for a structured learning environment, such as simulated worlds; construction of conceptual structures	*Lev Vygotsky *John Anderson *Etienne Wenger

cognitivism	• Focuses on internal cognitive structure; views learning as transformations in these cognitive structures • Use of artefacts in learning to stimulate deep understanding • Focuses on human development • Language as a tool for learning and joint construction of knowledge • Takes social interactions into account and learning as social participation • Emphasis on interpersonal relationships involving imitation and modelling	*Jean Piaget *Seymour Papert
Situated & experiential	• The learning activity is situated within the real-world context • Experience as the foundation for learning • Learning as the transformation of experience into skills, and attitudes • Reflection as a means of transforming experience • Problem-based learning focus • Theory formation and test in practice	*Jean Lave and Etienne Wenger *John Dewey *David Allen Kolb *Peter Jarvis

The structuration of learning theories by their similarities as shown in the table above can help in mapping learning theories and cluster the related ones to form a model that will make the relationship between theory and practice more explicit, which is one of the specific objectives of this research. Having clustered the characteristics of the identified learning theory in the literature, it is deduced that

all the proponents understand and present learning as a process, and not just a process, but a cognition process.

Theories of learning that explicitly posit the process of learning as social activities and independent cognition processing are singled out among the numerous that are available in the literature. One of the factors that makes these theories worthwhile observing and discussing is that their proponents are from different disciplines and expertise such as sociologists, educationists, psychologists, philosophers, computer scientists, counsellors among others. Still, their views and submissions on conceptualising learning seem to be similar.

1.4.2.2.1. Lev Vygotsky's social constructivist theory

Lev Vygotsky (1896-1934) was a soviet psychologist more popular in the Soviet Union (now Russia) for his work on psychological development in children. His works and propositions about cognitive development were unpopular especially in the western parts of the world until 1962 when his work began to gain significant attention after it was translated into the English language from Russian (Beck, 2016). Although, concerns that the translated versions do not adequately reflect the original ideas of Vygotsky are still in the debate (Veer & Yasnitsky, 2011). Vygotsky's main assertion of the socio-cultural theory was that Children are entrenched in different socio-cultural contexts and their cognitive development is advanced through socio-interaction with the more skilled individual(s). He maintains that what a child cannot do today but with the assistance of more knowledgeable others (MKO), such a child will be able to do by themselves tomorrow (Vygotsky, 1978a). He further described learning as a process of social interactions and that the origination of human intelligence is in society and culture. Majorly, Vygotsky's framework is enclosed in a perception that social interaction plays a fundamental role in the development of cognition.

Although it is deduced from the literature that Vygotsky's socio-cultural theory of cognition development was responsible for the fundamental groundwork of social constructivism (Lutz & Huitt, 2004), his perceptions were focused on the following psychological concepts; (i) Social Interaction, (ii) Zone of Proximal Development (ZPD), and (iii) More Knowledgeable Other (MKO) (Vygotsky, 1978a); (Beck, 2016).

- **Social interactions**

Just as it is stated above, in the opinion of Vygotsky, social interaction plays a fundamental role in the development of cognition. In support of this claim, he states that the process of cultural development in

a child appears twice; first, on the social level and second on the individual level (Vygotsky, 1978a). The social level process he called *Interpsychological* –between people while he called Intrapsychological the private or individual level –independently/inside the child. The child begins to acquire knowledge at an early stage in life from his parents or through interactions with people around him such as siblings, digest this knowledge and start to make sense of it. The transformation of the acquired knowledge from social interaction to personal value is to admit that learning has been taking place and social interaction is the source of such learning (Topçiu & Myftiu, 2015).

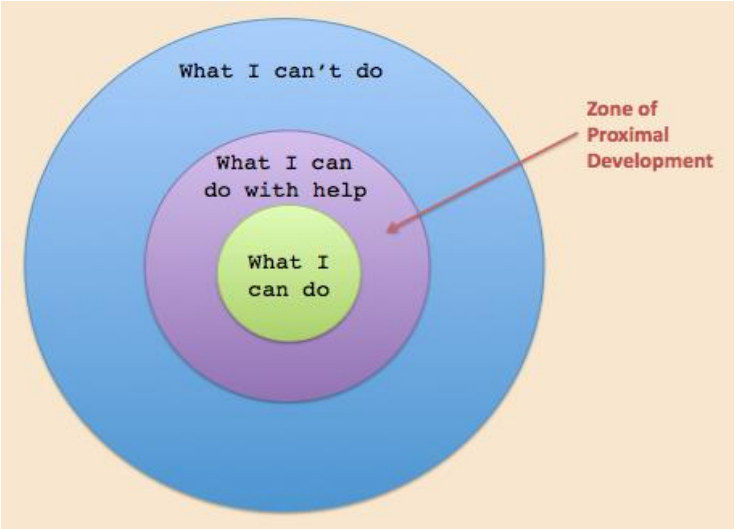
- **Zone of Proximal Development (ZPD)**

This concept measures the range and or tendency of the ability the learner has acquired to perform a particular task independently or if he still needs the support and guidance of a teacher or knowledgeable people around him. That is the difference between what a learner can do without help and what he cannot do when help or support is rendered (Vygotsky, 1978a). This approach was developed by Vygotsky in his strong attempt to emphasise the need for the psychology of human development to assess and study "what the capability of the human organism is yet to attain relative to what is expected as an outcome and what is possible to be reached" (Laplane, 1992).

The zone of proximal development refers to the area of exploration for which the learner is cognitively prepared but requires help, supports and social interaction to fully develop. That is the difference between the extreme level of an individual ability to perform a task and a stage where such an individual needs the support and help of more experienced individual(s) to progress. Such help and or supports could be given to the learner by a teacher or a more knowledgeable person (Lee Andresen et al., 2000; Topçiu & Myftiu, 2015; Vygotsky, 1978a).

The concept of ZPD has been nourished and exemplified by the 21st Century socio-cultural theorists, and the term "scaffolding" was coined out. Scaffolding, just as ZDP is a process through which a teacher or a more competent person gives aid or supports to the learner during a learning process (Dongyu, Fanyu, & Wanyi, 2013). To properly scaffold a learner, one has to come down to the level of the learner's understanding and then build from there. It is necessary to note that Vygotsky never mentioned the term 'Scaffolding' as it is been used contemporarily and interchangeably with his ZDP. His claim about ZDP is that the zone of proximal development is the point where learning is taking place. Figure 11 illustrates Vygotsky's idea about the zone of proximal development and what it meant to a learner.

Figure 11. Zone of Proximal Development



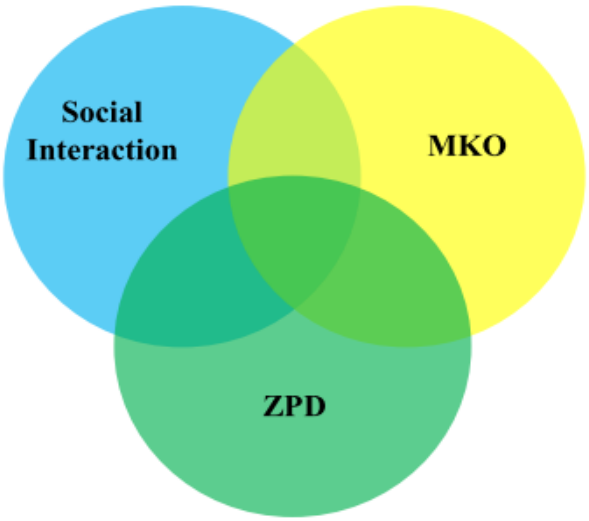
The ZPD idea of Vygotsky is presented in three layers where each layer represents each level of the learner's knowledge and the ability to acquire more. At the inner layer coloured in lemon is the present ability, knowledge and or experience of the learner. The middle layer coloured light purple is the level at which the learner cannot progress to acquire new knowledge independently, at this level he needs the support of the more experienced person in the learning process to proceed. This is the stage Vygotsky referred to as the ZPD and the level he emphasizes as the point where learning is taking place.

- **More Knowledgeable Other (MKO)**

This is referred to as a person that has more understanding, ability, and experiences in a particular task, process, and concept than the learner. The MKO is normally being considered as a teacher, instructor, facilitator, and sometimes it can be peers or younger ones in as much that such an entity has possessed more knowledge and experience in a particular task than the learner (Vygotsky, 1978). These are part of what Vygotsky referred to as agents of learning in child development.

The mechanism of the three components of Vygotsky's social constructivist theory is arranged as a subset of each other, to indicate the interconnected relationship among the three. It is denoted that the three components function together as a system in ensuring desirable outcomes in child development. Figure 12 below shows the set of the three components and how they are interrelated.

Figure 12. The interrelation of Vygotsky's idea.



Vygotsky's approach argues that social interaction precedes development; consciousness and cognition are the end product of socialization and social behaviour. It consists of the three major components which are social interaction, the more knowledgeable other (MKO), and the zone of proximal development (ZPD) for the approach to take effect (Vygotsky, 1978).

1.4.2.2.2. Jean Piaget's theory of cognitive development

Otherwise known as developmental stages theory, Jean Piaget was a Swiss developmental psychologist (1896-1980) who was well known for his theory of cognitive development about the nature and development of human intelligence (Piaget, 1952). The theory explains how human beings acquire, process, and make use of information. Also, cognitive development is a branch in neuroscience and psychology that focused on developmental processes in a child regarding information processing, perceptual skills, language learning, and other aspects of human cognition.

The Piagetian theory of cognitive development is broadly analysed in two forms: i) theory of adaptation and process of using the cognitive scheme, ii) theory of cognitive development stage (Lutz & Huitt, 2004). To get familiar with the first aspect of the theory is to understand the fact that individuals are born with reflexes that enable them to interact with the environment and be able to construct mental schemes for an adaptation. The adaption is established on the belief that knowledge is a continuous activity of self-construction; as a result of continuous interaction with the environment, knowledge is acquired and cognitively structured (Lefa, 2014; Lutz & Huitt, 2004).

Adaptation and process of using the cognitive scheme

According to Piaget, the adaptation process is said to occur in two different ways; i) through the process of assimilation, and ii) the process of accommodation. Assimilation is referred to as the process by which new knowledge and information are grasped or incorporated within the scope of existing schemes. While accommodation is explained as an alteration of the existing schemes as a result of new knowledge (T. J. Chermack & van der Merwe, 2003; Powell & Kalina, 2009). The main difference between the two concepts is that in assimilation, new ideas and information are fit in with the already existing ideas and information while, in accommodation, the new ideas and information change or alter the already existing knowledge (Lutz & Huitt, 2004). Both serve as means to achieve the state of equilibrium of learning.

Piaget's stages of cognitive development

According to Jean Piaget, there are 4 sequential stages through which every individual progresses in cognitive development. He asserts that the stages are age-dependent and based on cognitive readiness (Lefa, 2014; Lutz & Huitt, 2004).

Stage one: According to Piaget, this is a sensorimotor stage, ranging from age 0-2, this marks a transitional stage from biological to psychological being, the stage of intelligence in action as the child interacts with the environment by manipulating objects. Stage of Object Permanence; infants are being able to develop a mental representation of an object (Piaget, 1953).

Stage two: This stage is called pre-operational and it is ranged from age 2-7. According to Piaget, this stage is still sub-divided into two; age 2-4 (pre-conceptual), and age 4-7 (intuitive). The stage is marked with the demonstration of intelligence through the use of symbols, thinking dominated by perception, and language development (Piaget, 1953). This stage is called pre-operational because, at this stage, children have not yet mastered the ability to perform mental operations (Piaget, 1953).

Stage three: The range of age in this stage is from age 7-12, it is called concrete operational, the stage when the child is able to demonstrate logically integrated thought. Children at this stage have already grown to be exposed to such kinds of physical, logical, and mathematical knowledge which they need to interact with the environment to a relatively high extent (Jean, 1953; Lutz & Huitt, 2004).

Stage four: This stage is from age 11 or 12 onward, Piaget posits that an individual can think logically

about potential events or abstract ideas. This stage is also known as the Formal Operational Period. Table 5 shows the picture illustration of Piaget's cognitive development stages.

Table 5. Piaget's cognitive stages

Stage	Human pictures	Cognitive change
Sensorimotor stage Birth – 2 years		Understands world through senses and actions
Pre-operational stage 2-4 years 4-7years		Understands world through language and mental images
Concrete operational 7 -12years		Understands world through logical thinking and categories
Formal operational		Understands world through hypothetical thinking and scientific reasoning

Source: Researcher's idea

However, these four sequential stages of cognitive development proposed by Piaget have been criticized by other researchers given several verifiable criteria (Lutz & Huitt, 2004). Some of the important reasons for Piaget's cognitive development theory not being conventionally accepted are highlighted below;

- His study lacks scientific control.
- His theory did not observe the influence of motivation and emotion.

- The reliability of his work is questionable because he used children that are in a specific situation. Hence, his findings cannot be generalised.
- Cognitive development does not continue throughout the adulthood.
- Bower (1982) and Harris (1983) have conducted a research and they found that some children develop object permanence earlier than Piaget thought.

Further, critics argue that with ever-increasing pressure to raise standards and expectations of higher-level processing, the way children are assessed is important. Meanwhile, Piaget's stages theory of cognitive development creates conflict between what can and should be taught. Also, according to Bloom taxonomy, children of all ages display certain information-processing skills at all levels of the cognitive but maturation level is the factor that determines the complexity of their use (Krathwohl, 2001).

1.4.2.2.3. Vygotsky's and Piaget's ideas in contrast

Despite the significant contributions and similarities in the ideas of Lev Vygotsky and Jean Piaget to the theories that addressed cognitive development and learning, there exist differences that are critical to the understanding and the application of those theories in an educational setting, most especially in the process of learning. Important areas about their points of view relevant to the study of learning and effective learning were extracted from the literature and are highlighted in a table below. Table 6 illustrates in a glance the differences between the two approaches to cognitive development.

Table 6. Differences between Jean Piaget's and Lev Vygotsky approaches to learning

Jean Piaget's Approach	**Lev Vygotsky Approach**
Cognitive development is driven by a child's inbuilt nature.	Cognitive development is driven by social interaction.
Children learn through assimilation and accommodation which brings about complex cognitive development.	Children develop through informal and formal conversations with adults.
Development occurs in stages.	The first few years of life are critical for

	development; thought and language become independent.
Development may be hampered by cognitive conflict.	Children can perform more difficult tasks with the help of more advanced/knowledgeable individuals.
Children learn through self-discovery.	Children learn through instruction and guidance.
Effective learning only takes place when there is motivation.	Learning could be accelerated with the use of ZPD.
Cognitive development is the same universally.	Cognitive development differed across culture, belief and time.

The conclusion from both perspectives is that Vygotsky emphasises that learning is actualized through social interaction. While Piaget insists that self-discovery is important in a learning process.

Lev Vygotsky and Jean Piaget have different views of cognitive development in conceptualization and theorising. Their propositions are based on different ideologies and spectrums. Vygotsky asserts that social interaction and the more knowledgeable other (MKO) have major roles to play in the process of cognitive development of a child (Vygotsky, 1978a). While Piaget in his own view asserts that self-initiated discovery—children learn best through doing and actively exploring, to form a mental representation of the world, and the stages of cognitive development are pivotal to cognitive development in a child (Beck, 2016).

Despite the differences in their approaches and philosophical views, both Vygotsky and Piaget contribute interesting points to the understanding of how humans developed and acquire knowledge. They both made some clarified points between learning, cognitive development, and the learning environment. Although, they have both contributed differently but equally important fundamental insights into the socio-genetic and bio-genetic approaches to understanding the concept of learning (Beck, 2016).

1.4.2.2.4. Seymour Papert's constructionist learning theory

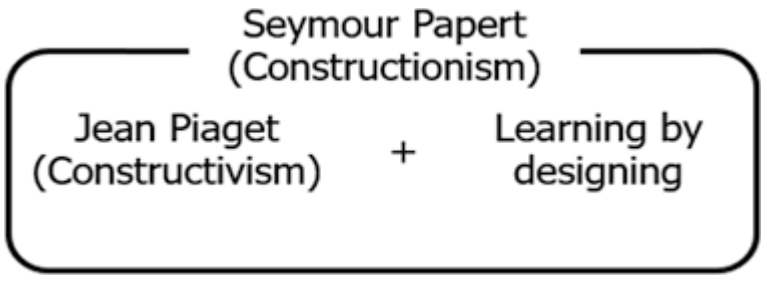
Professor Seymour Papert (1928-2016) was a professor of mathematics and computer science at the Massachusetts Institute of Technology. He had worked with Jean Piaget at the University of Geneva from 1958-1963 and this gave him the privilege to incorporate Piaget's constructivist ideas in the development of the LOGO programming language while at MIT (Papert, 1980a). The LOGO programming language was co-designed by Wally Feurzeig, Seymour Papert, and Cynthia Solomon in 1967 to introduce children to the possibilities of learning with computers and programming (Papert, 1994).

Papert in 1991 as quoted *"Constructionism—the N word as opposed to the V word— shares constructivism's view of learning as building knowledge structures through progressive internalization of actions... It then adds the idea that this happens especially felicitously in a context where the learner is consciously engaged in constructing a public entity, whether it's a sandcastle on the beach or a theory of the universe"* (Papert 1991, p. 1).

Constructionism enables learners to acquire knowledge by "construction" rather than by "instruction." That is a situation where learning is not something done to the learners, but rather something that is done by learners. This will allow the learners to discover knowledge rather than receive knowledge. This approach fits into Piaget's idea of assimilation and accommodation.

Constructionism is modelled as Piaget's constructivism plus the idea of "learning by design". This idea is the emphasis of the theory, as Papert claim with several empirical evidences that, object creation during learning and for learning stimulates true knowledge in the learners. Figure 13 depicts the structure of ideas in constructionism.

Figure 13. Constructionism idea



Due to the similarities between constructivism and constructionism they are often, but should not be, used interchangeably (Ackermann, 2001). It is important to carefully attribute constructionism to its own characteristics and ideologies.

To state it clearly, constructionism involves the creation of a product to show learning. That is, the production of artefacts (any object or asset that can enhance learning) to facilitates effective learning. In other words, the building of public learning artefact that is seen, can be touched and interacted with by the learners. The constructionism learning environment encourages creative thinking in the process of building concrete artefacts that apply to the study contents or interact with the artefact to facilitate meaning learning (Resnick, 2012).

Papert's idea as "Learning through making" where he opined that learning should take a form of reconstruction rather than as a transmission of knowledge. Then he extends the idea of manipulative materials to the idea that learning is most effective when part of the activities the learner is involved in is based on interacting with objects that are designed to aid learning product (Ackermann, 2001). Papert is more interested in how the learner is engaged in the interaction with the artefacts. The driving point in the theories of Papert and Piaget is that they both agreed that knowledge is actively constructed by the child while interacting with the world around him.

To Papert, knowledge is grounded in the contexts and can be well understood by the use of external supports (artefacts) and mediation. The constructionist theory emphasizes how to actively engage the learner in the process to construct a mental model and also construct a meaningful project (Papert, 1994).

1.4.2.2.5. Situated learning (Jean Lave & Etienne Wenger)

Situated learning theory focuses on learning and on the social situations in which it occurs. It emphasises that learning should be located in the process of co-participation (Lave, 1991). In other words, it means a learning atmosphere where knowledge is being presented in an authentic context to suit the realistic situation as it would occur (Lave & Wenger, 1991). Situated learning has its antecedent in the works of various psychologists such as in Vygotsky's social constructivist theory, Piaget's cognitive development theory, and Papert's Constructionism amongst others. Lave and Wenger did not view learning as a process of social cognition but as a process of becoming a member of a sustained community.

Situated learning is a learning approach where the learner generates meaningful thought from the real activities and is actively immersed in an activity that requires critical thinking skills (Lave, 1991). Good examples of this were the activities of Seymour Papert with LOGO at the MIT lab (Papert. S, 1982) where he made the children work and play, and construct knowledge with the use of turtles and other

artefacts. Knowledge is essentially "situated" and thus, should not be detached from the situations in which it is constructed and updated (Seely Brown, Collins, & Duguid, 1989). The situatedness as proposed by the proponents of the theory is not physical locations in the world but, a contextual real-life situation relevant to the purpose of learning in places, settings, or environments.

Lave and Wenger introduced an idea to explicate the process of their theory. In their idea, they gave a narration of the procedure and stages it requires for someone to be situated in an environment and become an active member of such an environment (Lave & Wenger, 1991). To consider learning as a situated activity, Lave and Wenger defined a process called legitimate peripheral participation (LPP) to explain the activities of a newcomer in society and how he participates to gradually fit in as a member of such a community.

Legitimate peripheral participation (LPP)

LPP recognises learning as a contextual social phenomenon that is achievable through participation in a community of practice. Community of practice in this context is regarded as the groups of people with similar concerns and passions who cooperate and plan to move forward at once towards the achievement of specific goals (Lave & Wenger, 1991). This term is used to speak about the relationship between newcomers and old-timers, and about activities, identities, artefacts, and communities of knowledge and practice that are in vogue (Lave & Wenger, 1991). It describes the way newcomers become experienced members and eventually old-timers of a community of practice or collaborative project.

LPP focuses on two aspects of human development; the development of knowledgeable skills, and the identity of an individual in the community of practice. The process follows that newcomers become old-timers unconsciously by gradually participating in the ongoing community practice (Lave, 2004). As the newcomer continues to stay and relate within the community, he will develop an adequate understanding of the community norms and practice over time and be able to participate peripherally in ongoing activities of the community.

The movement of learning under LLP is centripetal. That is a movement like spiral curve circling about the centre but at increasing distances from the centre. It acknowledges the learner from being a novice/newcomer to becoming an old-timer or experienced member of the community (Floding & Swier, 2011). Figures 14 and 15 give a clear idea of how the learning movement in LLP looks like as

newcomers acquire more understanding about the community of practice and advance in experience and competencies.

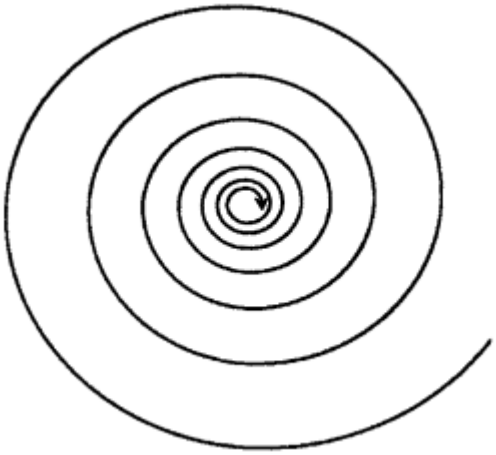


Figure 14. Centripetal learning movement

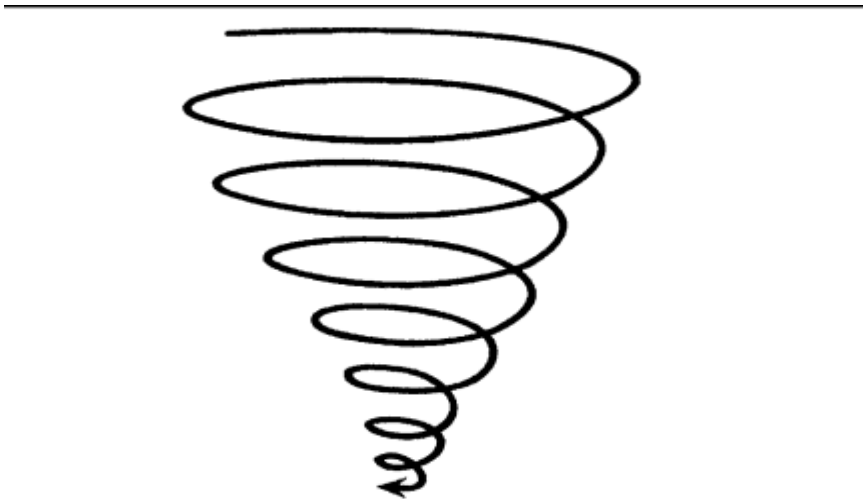


Figure 15. Spiral of deepening competency

The images above depict the flows of expansion in the levels of acquisition of knowledge as a newcomer continues to stay and relate with peers and subordinates within the community. As a newcomer, it is assumed that he is a complete novice of the norms and practice of the community; this condition denotes the inner arrow (as shown in the picture) being the starting point of the learning movement.

1.4.2.2.6. Experiential learning (David Kolb)

It is not an overstatement to say that experience plays an important role in learning irrespective of the level of the learners and the adopted approach. As mentioned earlier, this learning theory takes its antecedent in empirical epistemology which makes the process of learning different from behavioural theories of learning (Kolb, 1984). Experiential learning focuses on knowledge creation through the transformation of experience (concrete and abstract experiences).

It should be noted that experiential learning has a supportive base in the long-term memory of the learner (Balacheff et al., 2009; Dienes, 2011). The process involves the reflection upon previous experiences by retrieving information from the long-term memory to process meaningful understanding to similar phenomenon or task during a learning process. The most evident of the characteristics of experiential learning theory is that, as long as the learner lives, this process lives in him (Lee Andresen et al., 2000).

Kolb's experiential learning is tied to the intellectual origins of the works of Dewey, Lewin, and Piaget due to the constructivism and cognitive functioning aspects of the learning process. But, the emphasis is on the central roles that experience plays in the learning process (Kolb, 1984). Emphatically, the learning theory shared from the ideas of the behaviourist and constructivist proponents does not mean it should be presented as an alternative to behavioural and cognitive learning theories. Instead, to imply the possibility of experience towards integrating perception, cognition, and behaviour.

Kolb's experiential learning style theory is typically represented by a four-stage learning cycle in which the learner touches all the bases.

Concrete Experience

It is the first stage of Kolb's experiential learning model. A stage where new experience is encountered or reinterpretation of existing experience. This stage reiterates the ability to be involved in the personal and or environmental experience.

Reflective Observation/Thought

This is the second stage of the learning cycle which involves the process of reviewing and having a deep thought on the new experience and identifying any inconsistencies between experience and understanding. The process involves the learner analyses of the the experience to identify the 'unbalance' that was emanated from the new feelings and challenges- a sense of something unknown. Reflective observation (thought) is an internal process that ignites the understanding of experience.

Abstract Conceptualization

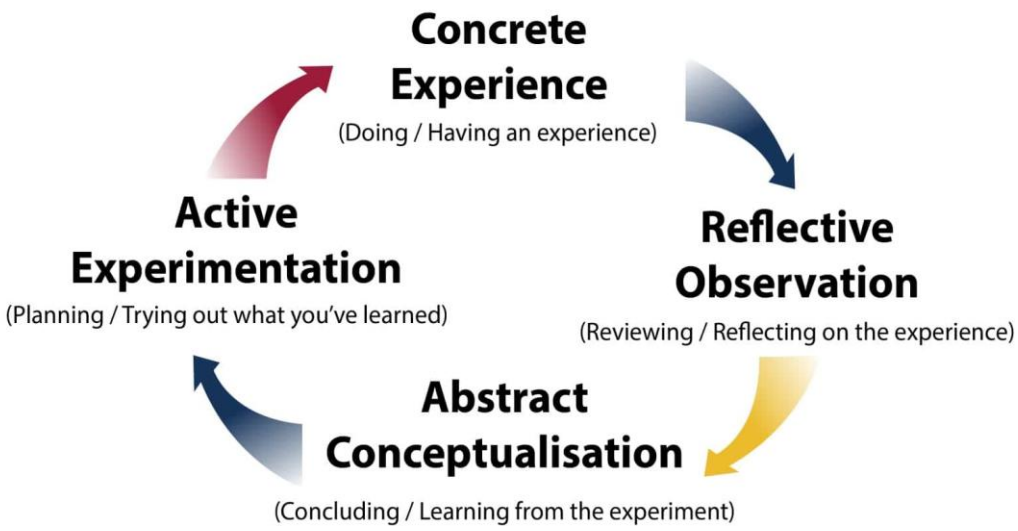
This stage is always the most complex of the four stages. It is a stage that charges the learners to infer connections between their reflections and their existing forms of knowledge and information. This is done by using theories, logic, and ideas rather than feelings to understand problems or situations through systematic planning and develop theories and ideas to solve the problem.

Active experimentation

At this stage, learners apply the experience garnered into real-life situations. The learners attempt to experiment with what was learned and to apply new knowledge to near-fact situations. In this sense, learners would take a practical approach to be concerned with what works, as opposed to simply watching a situation.

In this learning approach, the learner follows through the four stages sequentially and all the stages are dependent on each other, none of the stages can be jumped or stand alone as a learning procedure. These stages work as a system through the active synchronizations of personal and environmental experiences. The interdependency relationship among the four stages of Kolb's experiential learning and their movement direction is shown in figure 16.

Figure 16. Stages of Kolb's experiential learning



1.4.2.2.7. Thorndike's laws of learning

Edward Lee Thorndike[58] (1874-1949) was a 20th century American educational psychologist who introduced a scientific approach to the study of learning as a process. Earlier, he propounded a theory of learning called "connectionism" where he described it as the association between sense impressions and impulses to action (Woodworth, 1952). This theory concentrates on the principles of active learning which led Thorndike to the development of the three laws of learning which postulates that learning is achieved when an individual learner can form associations between a particular stimulus and a response.

Connectionism concludes that learning is the result of associations forming between stimulus and responses. It states that stimulus triggers a response based on an internal evaluation of the organism which can be conscious or unconscious. Hence, it represents the S-R theory. The distinctive characteristic of connectionism is that, due to the stimulus-response action approach, the process of learning could be explained adequately without referencing any unobservable internal states (Bradshaw & Hultquist, 2017).

Thorndike's Laws of Learning aims at presenting learning as a process through adequate explanation of organisms change in behaviour. Organisms in Thorndike's experiments consist of animals and humans. The laws consist of three main laws namely readiness, exercise, and effects.

Law of readiness: **-** It posits that individuals learn best when they are physically, mentally, and emotionally ready to learn**.** Simply put, motivation is needed to develop an association or change in behaviour. When there is no reason to learn, the individual does not actively engage.

Law of exercise**: -** Human memory is fallible, concepts most often repeated and applied into practice are best remembered. The connection between stimulus and response is stronger when being used and weaker when not used.

Law of effect: **-** Thorndike posited that learning is strengthened when accompanied by a pleasant or satisfying feeling which has a direct relationship to motivation (Thorndike, 1932).

These are the three primary laws of learning by Thorndike. Additional laws or principles of learning developed by Thorndike are the law of recency, the law of primacy, and the law of intensity (Woodworth, 1952).

58 Thorndike was recognized as the most meticulous experimental psychologist and the proponent of first formal learning theory. Philosophers and psychologists that have contributed to human organism cognitive development before Thorndike are listed ascendingly according to their existence and activeness Descartes (1596-1650), Darwin (1809-1882), Romanes (1848-1894), Morgan (1842-1936), Washburn (1871-1939).

Learning as a process entails the smooth synchronization of the biological functioning of the brain and mind, emotion and state of being of the learner, the environment, external factors such as artefacts, traditional and modern learning facilities, and the technique or approach that is adopted. Meaningful learning is beyond a process of adding information to and retrieving information from the memory. Instead, it is based on the idea that knowledge is constructed based on the material presented to the learners and their cognitive activity which plays vital roles during the learning process.

1.3.3. Emotion and learning

While all humans are capable of learning, all learning has its emotional basis that serves as the causality of learning activity within individuals. Something has to convince the individual that the knowledge they are receiving is worthwhile of their attention and efforts. Either intrinsically or extrinsically, ranging from inspiration or coercion, activating the desire to learn in an individual requires a push. The push can be an encouragement or reinforcement (Parsons & Parsons, 2014; Selwyn, 2011).

Researchers in psychology and neurosciences have found that the linear relationship between emotion and activeness is evident because positive emotion leads to increasing activeness (Hinton et al., 2012). Sufficiently, to achieve adequate activeness and achievement in an endeavour, the desire must be present. A desire gives rise to emotion and, sometimes an emotion leads to a desire. In some contexts, the two words mean the same thing and are being used interchangeably. Thus, very difficult to disentangle.

The emotion of the learner is an important factor that vies for the attention of educators, and it is necessary to understand and acknowledge learning as a complex process. In the literature on educational psychology emotions of learners have been categorised into three, namely motivation, engagement, and relationship (Brewster & Fager, 2000; Parsons & Parsons, 2014; Toshalis & Nakkula, 2012). The categorisation of emotion being one of the determinants of meaningful learning will enable easy exploration of each of the categories to acknowledge their features and how they are mechanised to function as a system during the learning process.

1.3.3.1. Motivation

The desire to learn is influenced by several factors out of which motivation is one. According to WordWeb Dictionary, motivation is the psychological feature that arouses an organism to action towards

the desired goal. This definition has substantially described motivation as a propeller that gives an incentive for actions. Motivation is a state of being that activates certain behaviours towards a goal.
Kast and Rosenzweig (1985) define motivation as what prompts a person to act in a certain way or at least develop an inclination for a specific behaviour (Ronald, 1990, p. 3).

Also, Yorks (1976) defines motivation as those forces within an individual that push or propel him to satisfy basic needs or wants (Ronald, 1990, p. 3).

To these and other definitions of motivation that exist in the literature, two characteristics are common to most of the definitions which can be interpreted as given below:

- It is a presumed internal force that energizes for action;
- It determines the direction of action.

Given this as reality, motivation is critical to achieving meaningful learning and other achievements in life within both formal and informal learning environment (Parsons & Parsons, 2014; Toshalis & Nakkula, 2012).

At the corridor of mere expression, motivation may intuitively seem fairly simple a concept, but deep research from the literature reveals the number of ways in which researchers in social sciences and psychology have been divided over the conceptualisation and theorising of the term. Due to differences in their underlying beliefs and contextual variation, there is already overlap in the existing theories and conceptualization of motivation. For this reason, ascertaining the causes or sources of motivation is usually a challenging task in the educational context (Toshalis & Nakkula, 2012), (Ronald, 1990). Some theorists emphasise belief in oneself and one's competency as the determinant and product of motivation, some researchers emphasise goal orientation, while another group argues that the difficulty level of the task shapes individual motivation.

There are several theories of motivation developed within the spectrum of human and resources management and organisational theory to study how, and what factors are responsible for increases in productivity in humans and organisations. Theories such as Maslow's Hierarchy of Needs, Herzberg's Motivation/Hygiene (two factors) Theory, McGregor's X Y Theories, and McClelland's Need for Achievement Theory (Ronald, 1990). Motivation as applicable to education, learning to be precise, have as well some relevant modern theories and models that can be adopted in conceptualising learning as a process.

1.3.3.1.1. Theories of motivation in learning

Research in motivation has evolved, with each area changing the way educators and behaviourists view learning, and the observable behaviours of the learners. Theories have been developed in the quest to arrive at some facts about the rational behaviours of human organisms, how and why they respond to certain stimuli. But before discussing some relevant theories of motivation in learning, it is worthwhile to clarify the subtle characteristics of the differences between the two types of motivation viz; Extrinsic and Intrinsic motivation.

Extrinsic versus Intrinsic motivation

Primarily, within the behaviourist framework, extrinsic motivation has been understood as the external stimuli that propel certain actions in humans. Such stimuli could be social expectations, gifts, praises, rewards, punishments, risks, and stress. In other words, extrinsic motivation, just from the word "external" means desire or a cause that is attributed to 'coming from outside' that drives the human organism to behave or act in certain ways. These kinds of rewards or desires can be tangible or intangible. Examples as given above, money, or gifts (tangible), or praises, or fame (intangible). On the other side, intrinsic motivation embraces behaviour that is driven by internal rewards. That is, desire or willingness to engage in an activity or behave in a certain way arises from within the individual because the satisfaction is in accordance with nature.

In education, attention has been shifted from the behaviourist explanation of motivation towards more constructivist ones. It is believed that the best and most potent motivational influence and inducement to behave in a certain way comes from within (Toshalis & Nakkula, 2012). Therefore, on motivation in learning, educators focus more on intrinsic motivation because their rewards are inherent to the activity itself and not due to some external factors. Motivators are intrinsic to the learners. Four theories of motivation that are relevant to the study of observable behaviours in learning are discussed below.

Self-determination theory

The self-determination theory of motivation acknowledges three feelings as contributors which are experiences of competence, autonomy, and relatedness. The feeling of competence is activated when the learners feel like they can do what is being asked of them with some levels of effectiveness. That is when the learner discovered that he is adequately or well qualified physically and intellectually to perform or execute a given task (Toshalis & Nakkula, 2012).

The second feeling is autonomy. When the learners feel that or know that they have some control over a certain thing in a process, and or immunity from the arbitrary exercise of authority that makes such a learner personally independent, this brings self-esteem and the eagerness to perform effectively. Also, the feelings of relatedness enable the learners to feel meaningfully connected to those around them which can increase their collaborative and teamwork skills. Above all, the higher the level of frequency of self-determining experience among the learners, the more durable the motivation tends to be.

Achievement goal theory

This theory claims that one's desire or the will to act can be linked to a set of attitudes and beliefs towards a goal. Two conditions have been established in this form; performance goals and mastery goals. Performance goals are related to self-esteem, satisfying personal intention, or achieving a sense of competitive advantage. Mastery goals are related to the willingness and the inclination to want to master certain skills or acquire deep knowledge about certain disciplines or tasks to be an expert and or authority in such a field. Learners with mastery goals tend to be consistently devoted to their studies, and make refinements. Characteristics of mastery goals are coherent with intrinsic motivation in the constructivist manner (Chuter, 2019; Toshalis & Nakkula, 2012).

Expectancy value theory

As straightforward in meaning, as it is called, this simply means that expectations and values influence performances and tasks. When the learners are focused on achieving a selected goal or objective, it is more likely that such a goal will be accompanied by the expectation of success or value (Chuter, 2019). This theory operates with two components. The first one is the efforts of the learner and the attention devoted to the execution of the task or during the learning process, while the second component is the importance the learners attached to learning or to acquiring new skills and knowledge. These two greatly determine the level of motivation. This theory posits that we are motivated to devote energy to those activities in which we expect to succeed, and we subsequently tend to value those activities over others.

1.3.3.2. Engagement

Enabling a motivation-oriented situation and environment for learners is imperative and it is seen as the primary requirement and continuous condition that needs to be attained during the teaching-learning process. Motivation is the key to desire to learn, but identifying what actually motivates students to achieve, and giving the direction of what influences students' decisions to engage in learning is still a

challenging task in education. This aspect is discussed later in the recommendation section of this thesis.

As stated in one of the paragraphs earlier in this chapter, understanding learning as a process requires an open knowledge of the interconnectedness of various disciplines which comprises neuroscience, psychology, education, and sociology. Now that learning environments and approaches to learning are being modernised due to the influences of innovations and digital technologies, the discipline of information and communication technology has also been added to the areas of expertise that constitute learning as a process.

While the flexibility and adaptability of the brain and other complex functions of cognition are related to neuroscience and are acknowledged as the biological aspects of learning as a process, emotions such as motivation, engagement, and stress are known to be the psychological aspect of the process which is adequately important to clarify their relationships and functions in the learning process.

Engagement is the immediate product of motivation. That is, when one is motivated to behave or act in a certain way there is a high possibility that one's attention and time will be consumed by that act. In other words, motivation is a prerequisite to engagement. This claim is supported by the efforts to understand the indicator to assess the contributions of motivational process in learning and development (Brewster & Fager, 2000; Toshalis & Nakkula, 2012).

Toshalis and Nakkula (2012) define engagement as "the range of activities a learner employs to generate - sometimes consciously, other times unconsciously - the interest, focus, and attention required to build new knowledge or skills" (Toshalis & Nakkula, 2012, p. 16). The literal English meaning of engagement from the dictionary is 'act of commitment'. The level of engagement determines the learning outcome to a large extent, it is what students do after they have been motivated, and this is next to active learning.

Engagement as one of the important components in learning creates empathy in the learners and is generally understood as an umbrella term for other observable behaviours in learning. We learn when our minds are challenged and piqued with curiosity. We learn when we feel a sense of success and accomplishment.

Due to its imperative status, researchers have identified various subdimensions of students' behaviours that would commonly be referred to as engagement by generalisation (Toshalis & Nakkula, 2012; Veiga,

Reeve, Wentzel, & Robu, 2014). Identifying the differences among the subdimensions can deepen our knowledge about engagement in the learning process and its importance.

Emotional engagement: comprises high interest and enthusiasm, low anxiety and boredom.

Behavioural engagement: comprises prosocial classroom conduct, persistence, extracurricular involvement, attendance, and asking and answering questions.

Psychological engagement: experiences of autonomy, self-esteem and connectedness.

Cognitive engagement: concentration, strategic thinking, self-regulation, perceived relevance of school works to future endeavours and acknowledging the value of the knowledge or skills to be learned.

These four dimensions at which students' engagement as observable learning behaviour is divided represents the resourceful descriptions of engagement. Behavioural engagement and cognitive engagement are more important in understanding students' learning and achievement (Linnenbrink & Pintrich, 2003). However, understanding each of these and how to nourish them in students are parts of the implementations that make meaningful learning a process- a sequential one indeed.

1.3.3.2.1. Relevance of engagement in learning

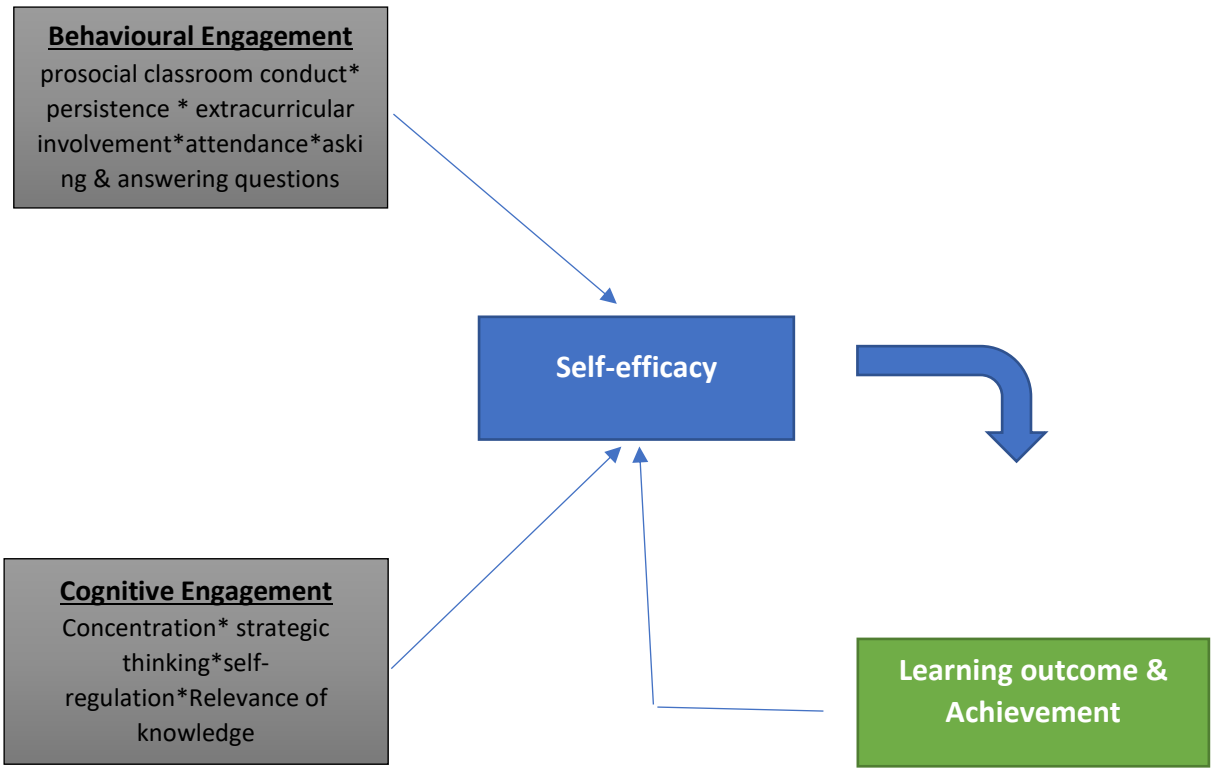
The importance of active engagement towards the realisation of meaningful learning for students cannot be overstated. Irrespective of the form of the learning, students' engagement is required for a gainful learning experience and retention. Because the quality of students' engagement has a direct impact on the learning achievements and academic progress (Veiga et al., 2014). Therefore, the importance of active engagement as the component of learning are highlighted as follow:

- Students' engagement promotes creative and critical thinking abilities. As a result, students are fully immersed and participating in all the activities due to a rising desire to know and uncover new knowledge about the phenomenon under study. Hence, their ability to think and proffer answers to the question will arise**.**
- An actively engaged student is possibly been able to think beyond the confinement of the classroom and the curriculum because the fear of being wrong is likely not present in their mind. This kind of attitude enables students to think out of the box and proffer possible solutions to the posed question or problem (Bennett, 2017; Bradshaw & Hultquist, 2017; Chuter, 2019).

- Students' engagement promotes resilience and self-efficacy. Albert Bandura (1986, p. 361) defines self-efficacy beliefs as ''people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances'' (Linnenbrink & Pintrich, 2003, p. 120). An actively engaged student is probably not vulnerable to side attractions or any form of distraction because being actively engaged in a task denotes being engrossed in such a task. All his attentive energies and cognitive functions are already been made imperceptible into the task. This fosters persistence and self-efficacy in the sense that full concentration and participation in a task enables one to master the features of the task, get used to the ideas, and become better at performing or executing such a task (Chuter, 2019; Linnenbrink & Pintrich, 2003).

Given the definition of self-efficacy and its characteristics, it is found that both behavioural and cognitive engagement possess the characteristics that can lead students to be self-efficacious and resilient. In that, the components of these two sub-dimensions of engagement are the products and determinants of self-efficacy. A model has been designed in figure 17 to illustrate the relationships among self-efficacy, behavioural, and cognitive engagements, and how they determine learning achievement.

Figure 17. A model for self-efficacy and students' engagement



Self-efficacy and resilience are part of the possible outcome when a student is actively engaged in a learning process or skills acquisition. Because participation and practice bring about optimum performance and professionalism. In the diagram above, behavioural engagement and cognitive engagement are given as precedence to self-efficacy because all aspects of student's commitment have a positive impact on students' learning behaviour and outcomes. Being confident or Self-reliant in the performances and execution of a task tends to increase achievement and ability for creative thinking (Nakamori, 2016).

Self-efficacy and learning and achievement are reciprocally related. Increasing capacity or power to produce the desired effect can lead to more and better achievements and preferable learning outcomes. Accordingly, the more a student is actively engaged in learning the better they perform, which can yield advanced self-efficacy (hence the arrow back to Self-efficacy from learning and achievement (Douglass & Morris, 2014; Linnenbrink & Pintrich, 2003).

1.3.3.3. Social relationship

Relationship is the third component of emotions that determines learning outcomes. Human beings are the products of their environment, and the relationship between humans and the areas in which they exist and live is in-bound. The fact is that learning takes place in an environment of relationships (Bandura, 1971; López Abeledo, 2008), and the flexibility and adaptability of the brain makes it easier for humans to experience a primed behavioural modification as human relates in and within their environment (Hinton et al., 2012).

The pattern of relationships that exist between a student and people around him is fundamental to how he learns. Relationship in this context means the interconnectedness of the entities (human and non-human) in an environment where learning inevitably occurs. If a positive relationship exists between a student and other inhabitants around him, it promotes learning in a more assisted and friendly manner. Vygotsky emphasised the importance of social interaction on learning, a process he termed More Knowledgeable Other (MKO) (Vygotsky, 1978). Parents and more experienced peers provide learning assistance to their younger ones to grapple with advanced knowledge.

When relevant and friendly learning support is given to a student, he feels the sense of being acknowledged and connected with people around him. This is a pleasant emotion that can increase motivation to learn and stimulate retention (Hinton et al., 2012). For instance, as a student struggles to understand the mystery behind a certain phenomenon, a parent or other experienced person can guide the student through the learning by performing experimentation to simulate the phenomenon under

study, for the student to experience the learning in a real-world context (Papert, 1980a). This kind of bond between students and the people around them facilitates the desire to learn (Hinton et al., 2012). Environments that promote positive relationships, therefore, promote learning.

An enquiry into the concept of learning, environment is considered as one of the major components that constitute the process of learning. The unavoidable inter-relationship between humans and their environment has made the study of social interactions a field of inquiry among scholars from different disciplines and ideologies. Albert Bandura is known as a figure who has worked and contributed immensely to the conceptualisation and theorising of society and its impact on humans' development (Nabavi, 2012).

One area of significance in Bandura's contributions that makes it different from the works of other behaviourists and cognitive psychologists is that Bandura emphasised how human beings are connected and being influenced by their environment (Bandura, 1971). And, with his impressive findings, he claims that the causes of human behaviour are found not in an organism but in environmental forces. That is, man's actions are under external control and his behaviour is environmentally determined. However, this proposition was not generally accepted due to a variety of reasons, one of which is that Bandura's claim is a one-way influence process that reduced man to a helpless reactor.

1.3.4. Assessment

Like every other derivative endeavour and process that humans are involved in and participating in, it will get to the point when it will be necessary to check if the purpose for participating has been achieved. Based on the various definitions of learning, one can regard learning also as a derivative process, and the gross assumption for an individual who is involved in a learning process and or activity will be to enable such an individual to prepare for their future, obtaining the skills needed to contain uncertainties, and reaching their optimum potential as lifelong learners. Therefore, it is necessary to improvise a mean, a procedure or a system to find out and report on whether the benefits for involving and participating in a learning activity have been attained.

Assessment as a concept in education and pedagogy is mostly attributed to learning, to serve as the means to find out and report about what has been learnt in correspondence with the anticipated learning objectives (Amua-sekyi, 2016). Assessment is a strategy in the hands of educators, policymakers in education, and curriculum developers to ensure adherence in the discharging of their

duties relative to the anticipated set of objectives and policies. Activities in assessment come in various forms and are discussed in the later paragraphs.

What is assessment?

Assessment is defined as "all activities that teachers and students undertake to get information that can be used to alter teaching and learning" (Amua-sekyi, 2016, p. 1). Also, assessment is defined "as part of classroom activities that are required to promote learning and ultimate achievement" (Jones, 2005, p. 4). Therefore, contrasting the contextual meanings of the two definitions, assessment can be described as learning and classroom activities that include teachers' observation and analysis of students' works and behaviours, collection and interpretation of data to make a judgment about student performances.

1.3.4.1. Why do we assess students?

Every individual is involved in learning activity whether consciously or unconsciously. Also, learning assessment is not subjected to teachers' obligation, individuals such as peers, and a group can assess their performances and skills themselves during and after learning. Reasons for assessment during and after learning irrespective of the forms of learning are highlighted below.

- It helps teachers and facilitators track progress to ascertain when to adjust and the kind of adjustment that is required during the teaching-learning process.
- Assessment is also useful as extrinsic motivation to increase the students' desire to learn.
- To identify the pattern of student's learning behaviour.
- To boost self-efficacy.
- For quality assurance purposes.

Ascertaining the originality and dependability of instruments and series of actions that are being used in determining the progress, quality and usefulness of any piece of work that is undertaken is as important as air to life to prove efficiency. So far that assessing students' performances is the only means to verify the relativity of teaching-learning exercise with the anticipated learning aims and objectives, it is highly imperative to ensure the validity and reliability status of an assessment process and or tools to be used.

1.3.4.2. Valid and reliable assessment

Validity and reliability are two words in the domain of quality appraisal to check for effectiveness and dependable status of an apparatus, model, theory, etc. In learning, components, characters and variables are observable and physical while some are internally perceived, depending on the purpose for which the assessment is administered. For instance, if an assessment is administered for the purpose of checking the performance of the specific learning outcome, validity may be necessary because accuracy is expected to be among the parameters to be measured. On the other hand, reliability of assessment portends that an assessment is an objective, able to stand the tests of time, free from criticism and re-useable to interpret the learning outcome and achievements. Validation of an assessment method is a prerequisite to its reliability.

Towards attaining meaningful learning through assessment, assessment is needed to be handled as an activity and not a tool. There are stages of students' behaviour that requires finite observation to know the proper measure to proffer. Because not all learning assessment ends up in awarding grades and marks. There are some variables in the process of assessing a student performance that may vie for psychological supports.

Some concerned educators and authors have been anxious about the issue of ensuring valid and reliable instruments of assessment in learning. For instance, in the conclusion part of a journal article titled 'Assessing students' engagement: A review of instruments with psychometric qualities', the authors of the article suggest as quoted "there is a real need for well-validated and reliable instruments which allow the multidimensional measurement of students' engagement in school, as well as its prevalence and quality (Veiga et al., 2014, p. 52).

Having emphasised the importance of quality students' assessment (in terms of reliability and validity) in the learning process, the forms of assessment are to be clearly stated. In learning, assessing progress, outcome, and achievements are carried out in two major forms; summative assessment and formative assessment.

1.3.4.3. Summative assessment

This is otherwise known as assessment for learning. Which literally means evaluating the outcomes and performances of the students after the completion of the learning process. This form of assessment is administered on completion of a topic or unit of a curriculum and frequently contributes to the grading of the students, usually by positions (Jones, 2005). The main focus of summative assessment is based

on the outcome. Advantages of this form of assessment to both parties (instructor and learners) that are involved in a learning process are not limited to the few listed below:

- It supports practitioners and helps them to identify the weak areas in students.
- It also shows how quality feedback can be used to help learners progress.
- To gauge students' understanding.
- Useful in academic records.
- It offers a systematic approach to assess the effectiveness of the assessment system and learning it enables.

Summative assessment is equated with a standard benchmark to decide students' performances, and achievement (Balacheff et al., 2009), and is performed periodically to determine what students have known different from what they do not know. Examples of tools used are test scores, final examinations grades, and any other students' conclusive performances.

1.3.4.4. Formative assessment

Formative assessment is also known as assessment of learning. This is the kind of appraisal activity that goes with the learning process. Learning assessment is more than evaluating the outcome or achievement of the learning, it entails observing, appraising, and monitoring the stages of the learning process (Elliott-Kingston et al., 2016). When using the formative assessment method, the learning objectives will be defined before the commencement of the learning process. These objectives are made known to the students and are set as the targets.

In the process of assessing the students' learning abilities and behaviours, various adjustments are applied flexible enough to make the students attain the planned objectives. This form of assessment is fundamental to successful teaching-learning and many researchers have acknowledged its important role in improving students' learning experience (Amua-sekyi, 2016).

Effective formative assessment exercises should cover all the segments in the learning process, and in a sequential manner. As stated earlier, this form of assessment is flexible and applicable to all students and learners irrespective of the psycho-social factors that are present. One of the purposes of using formative assessment is to check whether the learning approach adopted and the resources being used are working effectively, and accordingly as planned.

In fact, the contextual meaning of 'assessment' means appraisal of strategies which is understandable as a process. This is to affirm the fact that formative assessment is a process that goes with learning as the learning process proceeds. Areas of learning that formative assessment usually focuses on are listed below but, not limited to the list.

- How to enhance the students' desire to learn.
- How to strengthen personalised learning agenda where learners are empowered to take an active part in their own learning.
- Help in how to develop the confidence of the learners to undertake peer and self-assessments.
- Help the teacher to know when to improve or change his teaching technique.

Formative assessment fosters an effective relationship between teachers and students by enabling teamwork between the two parties to evaluate the process of learning and students' ability (Cefai, Downes, & Cavioni, 2021). Some of the strategies used in formative assessment are; Observations, Goal setting, and responsive questioning strategies.

Assessment can take many forms and serve various purposes, contrasting the two forms of assessment will be important to identify the features, merits and demerits of each of them. Such as Assessments are useful for purposes such as intervention, providing formative feedback on instruction and learning, evaluating learners' performance at a particular age, and programme and teaching technique appraisal. The common classification of the roles of assessment in teaching and learning that marks the clear differences between summative and formative types of assessment is; summative assessment evaluates the outcomes of instruction, while summative assessment determines the direction of the instruction itself (Cefai et al., 2021).

One notable demerit of summative assessment is that if it is used to grade and rank students, the outcome is doubtable and uneven because it does not consider differences in human behaviours and individual learners' specificity. In contrast, formative assessment focus is on improving individual learners' abilities and behaviours towards learning by considering their differences. In achieving this crucial objective, William (2009) has identified three key targets in formative assessment process (Cefai et al., 2021), namely:

- Finding out the stage students are in their learning. That is entry behaviour, or existing knowledge and experience.

- Acknowledging the direction of students' learning. That is what they need to learn.
- Finding out how to get there. That is, strategies and the level of persuasion that are needed to adopt.

Key strategies for approaching these processes are clarifying, sharing, and understanding learning intentions, and criteria for success.

1.3.5. Synthesis of the section

Epistemology is the branch of philosophy that deals with how we gain knowledge and how we get to know something, it is a fundamental of all inquiries into the process of human development and interactions within their environment. The process of the acquisition of knowledge and understanding about a certain phenomenon is otherwise summarised and understood as learning. The relationship between the two can be structured as follow; learning is a process while knowledge is the product derived from engaging in a learning process. Most of the time, this knowledge comes in form of skills, semi-formal, and non-formal.

Learning is an integral part of every individual's life because this is what we do inevitably either consciously or unconsciously to continue to develop as humans. However, there is always a rational motive (either intrinsically or extrinsically) for learning something or acquiring a certain skill, which implies that, all learning is found on certain inclinations and emotions. In this thesis, the learning process is viewed as a derivative activity, being that what is derivable from engaging in a learning process are knowledge and skills, as an indicator of learning achievement.

Through assessment, the acquisition level of knowledge can be determined, followed, and adjusted. Assessment of learning (summative) evaluates the end product of the learning process such as students' performances; grades and scores. Assessment for learning (formative) is what makes assessment a strategic and analytical component of learning as a process. This form of assessment goes along with the learning process by observing an individual's learner and identifying when and where attention and adjustment are needed during the learning process to realise optimised learning outcomes.

CHAPTER 2 - METHODOLOGY

Introduction

Due to the involvement and usefulness of education to human life; in terms of growth and development, educational research should be rigorous and systematic with no deviation from the expected standard. Hence, the comprehensive and scientific research activities that were performed within the research thematic scope, and the data collection exercise. Broadly, this chapter is organised in four sections which consist of: The research design; Data collection tools and procedure, data analysis, and ethics. Each of the sections consists of the detailed discussions of relevant sub-topics concerning the principles and ideas that are adopted for the execution and implementation of the planned activities for the research. The methodology is structured in anticipation of presenting findings that are testable, able to refine and modify, and perhaps to propound a model and theory that will support and contribute to the actualisation of meaningful learning at the secondary education level.

2.1. Research design

This is an arrangement of the essential conditions backed by theories and principles of scientific research towards the descriptions and presentation of the framework of research methods and techniques chosen.

2.1.1. Nature of the study

The nature of this research is empirical and naturalistic. It is empirical,which means that the researcher had direct experience of, and direct observation of the subject under study to gain empirical evidence necessary for analysis and interpretation. Also, it is naturalistic in that, it requires the observation of subjects in their natural environment to understand the framework within which the subject under study interpret their environment and reasons for particular behaviour in humans.

2.1.2. Methodology of the study

Case study and narrative research methodology were adopted because the research requires holistic and in-depth research into the subject under-study in order to proffer and or suggest a solution to the research problem. This methodology was adopted because it is an empirical inquiry and research strategy that is based on an in-depth research of a group, an event and occurrences, or individuals that are concerned to explore the underlying principles and causal-effect relationship. For relevancy check, case study research is defined as the research method in which a phenomenon is investigated in its

real-life context. This definition matched up with the nature, procedure, and activities that are required for this research. Therefore, the research activities include but are not limited to simulation of real-life and plausible events, description of scenarios with illustrations, and clustering of similar observable components that emerge in the research.

2.1.3. Statement of the research problem

With adequate knowledge of the potentiality and the positive influence that technologies and innovations in education could have on learning achievement, I, the researcher, observed the nearly unnoticeable, and or weak impact of digital technology tools for learning and innovation on the academic achievement of senior secondary school students. It was noted that with increasing access to information, and interaction with modern learning resources, the learners (senior secondary students) do not seem to frequently cogitate the knowledge, i.e., they do not appear to be processing the information beyond the textual level to apply the knowledge acquired into real-life practices and behavioural modification.

Further, having been aware of the effectiveness of the Scenario-Based Learning (SBL) approach towards the actualisation of meaningful learning, and its potential of being adoptable as a suitable learning approach to various educational and training needs- both higher institutions of learning and corporate organisations, hence, the motivation to explore its contributions towards improving learning at the secondary education level.

2.1.4. Purpose of the study and aim of the research

The purpose of the research is to explore and understand the scientific and systematic approach to assessing the pedagogical relevancies of SBL approach and social media on learning. The focus in this regard is on the articulation of SBL and social media to support effective learning at the senior secondary education level. This learning approach is usually a students-centred learning model that always enables a more interactive learning environment and a compelling skills-based learning. Further, the purpose of the study is extended to emphasise the invaluable use of the SBL approach in the secondary education pedagogy system.

2.1.5. Specific objectives

After a well-documented literature review has been undertaken and with a thorough search on the internet using relevant keywords, it was found that little or highly insignificant attention and development have been made by educators and concerned elites in making this paradigm (Scenario-

Based Learning approach) an efficient tool for learning at the secondary education level. Most efforts and works on the usage and reviewing of SBL that are documented in the literature and by empirical evidence have been centred on professional and corporate bodies and tertiary education.

Following the knowledge acquired from the literature about scenarios and education, theories of, and the process of learning, and the guiding principles of a technology-enhanced learning environment that is suitable for senior secondary school students to experience meaningful learning, the following four objectives were identified as parameters to check.

- To characterize students' ability to deal with **social and interactive educational media**.
- To identify the aspects of the learning approach that stimulate **learners' motivation** or interest to learn.
- To describe/typify the factors that trigger **learners' engagement** to keep focus and remain attentive during the learning process.
- To illustrate **learners' cognitive experiences** that enable learning gains through critical connections with previous knowledge and with learning relations to the surrounding realities.

2.1.6. The scope of the study

The thematic scope of the research is strictly within the jurisdiction of using storytelling, and simulation of real-life and, or plausible events, as instructional materials to foster the scientific and technical understanding of learning as a continuous process within a technology-enhanced learning environment. Much of the concentration in this regard is on the secondary school pedagogy system in Nigeria and beyond.

2.2. Data collection tools and procedure

This section presents in detail the tools that were used to collect the data, and how those tools were developed and validated. The instruments used for the data collection are:

- The two courseware
- Social media platform; Facebook
- Questionnaires
- Intent letter

- Navigation guide.

Information about the preparation and implementation of these tools are discussed, also, as the justification for choosing the selected social media platform.

2.2.1. The courseware

Two (2) courseware (e-learning courses) namely; 'The Loose elephant' and 'Punctuality' were prepared by simulating real-life events, and a plausible case study respectively. The simulated scenarios consisted of storylines and illustrations that could lead to the enhancement in the cognitive functions of the participants i.e., developing a self-directed and self-corrective skill of analysing facts to form a rational judgment. A non-ambiguous synopsis of the storylines of the scenarios was imperatively considered in this regard to enable a deep understanding of the course contexts and enhance the participants' level of engagement.

These two courses were structured in branching scenarios - an interactive form of e-learning in which the responses and outcome from the courses are the results of actions and decisions taken by the learners as they interact with the courses (Berking, 2016). A challenge was posed to the learners with a variety of choices, and any choice made has a consequence. Also important are the graphics and illustrations that depict the clear formation of ideas in the course, and the simplification of the required tasks. Also, acute consideration is given to major characteristics of e-learning such as exciting, inspiring, actively engaging, focused and simplified content.

These e-learning courses; ***'The Loose Elephant'*** (I) and ***'Punctuality'*** (II) focused on accessing the ability of the learners to think and decide within a qualitative time. That is the attempt and efforts of the participants to actively observe the situations in the scenarios and proffer solutions. At the beginning of each of the courses, a synopsis is introduced to support a clear understanding of the scenarios and the required tasks. Being branching scenarios e-learning courses, the structure allows the learners to try to make decisions and fail without any side effects or whatsoever other than to be notified about the consequences of their actions and if failed, the e-learning courses further allow them to decide on whether to re-attempt the scene or quit the learning process.

Considering the level of education, exposure, and age of the participants, the content in the e-learning courses was simplified to match the comprehension and assimilation levels of the participants. Colourful and simple illustrations, common and regular descriptive signs and connotations, and a

friendly Graphical User Interface were applied to deeply engage the learners throughout the learning process.

These two e-learning courses were crafted with the use of an authoring tool (Berking, 2016); ActivePresenter. Although detailed information about authoring tools, and specifically ActivePresenter have been discussed in the Conceptual Framework chapter, a brief fact about the tool shall be reiterated here. ActivePresenter is an interactive e-Learning authoring tool and a screen recorder software manufactured and being maintained by ATOMI Systems, Inc. in Vietnam. Amongst several features that the tool has in common with other authoring tools in the market, affordability[59] is one important feature that makes it unique from the rest. ActivePresenter enables the formatting of concluded projects into SCORM, HTML5, and or xAPI. Another unique feature of this tool is the similarity of its interface with Microsoft PowerPoint and, functionality to import a project from Microsoft PowerPoint for advanced authoring functionalities of the course material to meet the standard of interactive e-learning courseware.

2.2.1.1. The Loose elephant

Structure

After the synopsis of the course, short videos of real-life scenes of an elephant in the city causing damages are embedded. The videos play automatically immediately after the synopsis slide. These videos were embedded in the e-learning course to actively engage the learners and spark the readiness to handle the task ahead. The entire course consists of fifteen branching scenarios with illustrations and alternatives that are posed as likely solutions to the lingering problem or challenge. From the given alternatives to each task, some are not a solution, one is close to the answer, and one is a pointer to the ideal solution. As stated earlier, the course was structured to give space for trials and error, if a learner choses an option that is not the solution, the next slide will make him aware with an explanation and then provisions to go back or quit.

59 The authoting tool attracts a very low and affordable subscription costs. Despite fact that ActivePresenter performs virtually the same functions and features with other tools in the industry, Articulate 360 cost of ownership and maintainance is friendly and affordable even to a student compare to other authoring tools such as Adobe captivate.

Course properties (The loose elephant)

The long-term aim of this course is to enhance the decision-making skill of the learners towards making informed decisions within qualitative time. In this regard, the successful completion of the course will indicate that the participants:

- Are aware of the consequences of their actions;
- Take proactive steps and are swift while deciding;
- Have learned to develop the courage to face a troublesome situation.

The summary information about the e-learning course is outlined below.

Course abstract: *The presentation of short videos of a scary scenario (real-event) that depict how destructive and inimical a loose dangerous animal could be to a society. Then, the effectiveness of the available person who is pre-supposed to be in the best position to contain the awkward incident is put to test in the scenario.*

Task: Stop the elephant from causing further damages and restore peace in the city.

Objectives: Enhancing decision-making skills.

Specific objective: Swift response to situations that vie for urgent attention, and ability to make wise decisions as quickly as possible.

Keywords: Wild animal, Zoo, Environmental safety, Rapid response, Problem-solving, Decision making.

Topic areas: Civil and patriotic orientation, social worker orientation.

Thematic scope: Education and safety

Educational level: Secondary education, social orientation

Format (output): SCORM, HTML5

Type/methods: Synchronous (Branching scenarios)

Language: English language

Subject headings: Scenario-Based Learning project

Date published: July 2021

2.2.1.2. Punctuality

Structure

This course consists of fourteen branches with illustrations, captions, and graphics that clearly express the storylines and the required tasks. The idea in this course is based on challenging the learners to nurture the ability to meet up with a set goal or expected result and at the same time still be able to attend to new and unexpected rising challenges that equally vie for attention. It will take an average learner approximately 12 minutes to interact through, comprehend and complete the course. Provision is also made for re-attempt assuming the learner fails and wish to interact again.

Course properties (Punctuality)

To enhance the critical thinking skill of the learners and to encourage them to always seek to provide a *permanent or lasting solution* to any identified problem.

Course abstract: *An unexpected challenge is posed as a mild distractor to check the ability of the learners to think deeply on how to solve the newly discovered challenge without jeopardizing the attainment of the already planned objective. More so, both the unexpected challenge and the planned objective are important and vies for attention in a simultaneous event.*

Task: Attend to the rising challenge simultaneously without missing the attainment of the planned objective.

Objectives: Sorting for fixed or long-term solutions to an identified problem instead of a temporary solution.

Specific objective: Critical thinking, and analysis skills before acting.

Keywords: Planning, Discipline, Time management, Critical thinking.

Topic areas: Resource management, Effective planning, Human capacity building and sensitization.

Thematic scope: Strategic thinking and planning

Educational level: Secondary, tertiary, and corporate organisations

Format (output): SCORM, HTML5

Type/methods: Synchronous (Branching scenarios)

Language: English

Subject headings: Scenario-based learning project

Date published: July 2021

2.2.1.3. The importance of the courses for the students

The following gains and objectives are considered achievable for the students/participants that have participated in the activity.

- It will motivate and actively engage the students in learning processes.
- It will instil in the students the mental processes required to comprehend and properly analyse word problems, experiments and understand case studies in sciences, and social science subjects.
- It will foster the development of self-directed and self-corrective skills of analysing facts to form a rational and valued judgment.

The general aim of the two courses

To assess the suitability of SBL approach towards achieving effective learning in secondary school education. Below is the side-to-side comparison of contextual qualities of the two e-learning courses.

Table 7. A quick comparison of the two courses' properties

The Loose elephant	**Punctuality**
A task that requires swift actions towards making a decision	A task that requires analyses of the situation and critical thinking
Problem-based	Planning-based
Video and graphics	Graphics
Existence: Real-life	Existence: Plausible event

After the completion of crafting the two e-learning courses, and having passed the validation process, the courseware materials were uploaded to the LMS in SCORM format, on the Learning Management

System (LMS) hosted by ATOMI Inc. The process of how the participants accessed the courses is explained later in this chapter.

2.2.2. The social media platform: Facebook

The social medial platform adopted for this research is Facebook. Facebook was founded in 2004 by Mark Zuckerberg, an undergraduate at Harvard University with the motive of virtually connecting all the alumni and students of the university (Kaplan & Haenlein, 2010). This concept gained more attention and other communities started registering to share from the service. It gradually became more popular and is now the most popular social media platform.

Apart from being the most popular, other justifications for choosing Facebook as one of the tools for the data collection exercise is that the networking site was invented by a teenager[60] and initially designed to be used within teens and young students' environments. The social networking site is being developed regularly for continuous embedment of features that are understandable and attractive to young students. Also, based on the results published by Pew Research Centre in 2019, Facebook users by age group, it is found that 16 -24 year olds are the highest users of the networking site.

An important feature of the social media platform that gives users the enablement to create a social learning group where various individuals come together to learn is part of the reason for adopting the platform. Given this provision, the researcher created a social learning group named "#SBL approach on Facebook and pasted the hypertext links to the LMS (the courses' location) on the group's timeline. This group serves as an entry node to the location of the courses prepared for this research. How the group was utilised for the exercise and how the selected participants gained access to the courses are explained later in this chapter.

2.2.3. The questionnaire

The questionnaire was the third tool used for the collection of data. It consisted of both open-ended and close-ended questions that were drafted in reference to the two e-learning courses. There are twenty-four questions, nine of the questions were close-ended while the remaining fifteen questions were open-ended. This implies that 37.5% of the questions point towards quantitative data, while 62.5% are qualitative. Hence, the research is more qualitative in nature. The purpose of the questionnaire was to

60 Mark Elliot Zuckerberg is an American computer scientist was 19 years old in 2004 at Harvard University when him and his roommate started the idea of matching students' name with photos.

use it to acquire feedback and direct information from the participants concerning their experiences with the e-learning courses.

2.2.3.1. Instrument validation

Both the preparations and development processes of the tools used for the data collection were done under the full tutelage of the research supervisor. To eliminate objective bias, and improve the reliability rate of the tools, most especially the questionnaire, it was subjected to a review by more knowledgeable persons who are experienced researchers and academics in a similar field of study. Five individuals[61] (three from Portugal, two from Nigeria) of the above-mentioned status voluntarily participated in the reviewing and validation of the tools.

2.2.4. Procedure for data collection

Discussed under this sub-section is the systematic approach of how the data were obtained, which include explanations of the ideology adopted, the processes, and the pattern of relationship that existed between the human and non-human resources that were organised for the data collection exercise.

The geographical location of the exercise

The data collection exercise was carried out within the Nigerian educational context. Nigeria is the most populous nation in Africa, an emerging economy with a budget of USD 33 billion in 2021 and allocated 5.68% to the educational sector (Okeowo, Agunloye, Jolayemi, Adeniyi, & Fatoba, 2021). Nigeria is one of the five West African English-speaking countries that established the West African Examinations Council (WAEC)[62] to conduct the examinations and award certificates for senior secondary school students as a pre-entry requirement to tertiary education.

Out of the thirty-six states in the country, two states were selected from the southwestern part of the country, namely; Oyo and Osun states. One government-owned high school and one privately owned high school were chosen respectively in those two states.

61 The three Individuals from Portugal that participated in the reviewing of the tools are faculty member, and young researchers affiliated with the institute of education Uminho. The remaining two individuals from Nigeria are experienced secondary education teachers.

62 West African Examinations Council was co-founded in 1952 by five west African countries; Nigeria, Ghana, Sierra Leone, Liberia, and the Gambia. Their vision of WAEC is to be a world-class standard examining body that adds value to educational achievement of its stakeholders.

The Intent Letter

Firstly, an intent letter with the consent of the research supervisor was sent to the authorities of the selected secondary schools seeking approval to allow their students and some teachers to participate in the data collection exercise. The intent letter contained a brief introduction about the researcher, a summary of the whole research idea, and the purpose for contacting them; to make their students participants in the data collection exercise.

Sampling technique

In general, the importance of assessing the sample that will represent the population for a particular research should be linked with its reliability's sake. Hence, for this research, the non-probability sampling technique was adopted because the selection of the participants must be done based on selective judgement. There are some criteria that every prospective participant must meet before being eligible to participate in the exercise to ensure the acquisition of relevant information useful to process further recommendations to the research problem.

Selection of the participants

As stated, the participants were selected based on the criterion which is imperative to the validity of the data to be collected in relation to the research aim and objectives. Explanation on how the non-random sampling technique was performed is as follow. At each secondary school, the researcher selected two classrooms of 40 to 45 senior secondary students, making four classrooms altogether consisting of 160 students from the two schools. A brief written interview of five questions with answers 'Yes or No' was administered by distributing paper slips to all the 160 students inquiring about their age, familiarizations with digital technology, and social media. This step is very important, in that, it would enable the researcher to select participants that possess peripheral experience with computers and social media and can give useful and true responses to the questions in the questionnaire.

The five inquiries that were contained in the slip as a pre-entry to participate in the research exercise are;

- How old are you? (16 – 20 years)
- Do you have a smartphone?

- Do you have a Facebook account?
- Do you belong to/ how many groups did you join on Facebook? (At least one)
- Have you used a computer before?

Eighty students; forty from each school that have answered 'Yes' to all the five questions were selected as the participants for the exercise. The justification for this decision is that the researcher believes that, this category of participants has obtained little knowledge and experience about digital technology and the internet. Hence, an indicator that such students have already possessed the entry behaviour or existing knowledge about e-learning and the internet, therefore, should be able to supply useful responses to the questionnaire.

Navigation guide

Eighty participants were successfully selected using the non-random sampling technique out of the one-hundred and sixty students interviewed across the two schools. An instructional guide with clear and simple descriptions of how to navigate to the location of the e-learning courses was distributed to the participants. A verbal explanation of the information on the instructional guide followed the distribution to aid the participants' understandings of the descriptive contents. Below are five steps on how to navigate to the location of the courses as contained in the slip distributed to the participants.

Step 1. On your Facebook account, locate the search bar at the top of the screen and type '#SBL approach' and click the search button or this  icon.

Step 2. Click on the "SBL social learning group" usually the first from the search results.

Step 3. Send a request to join the group. You will be accepted automatically.

Step 4. On the group timeline, the links to the two courses are pasted. Click on each of the links to be redirected to the course location.

Step 5. On the next page, scroll down and click on 'sign in as a guest'.

Then click 'Enter' the course will load, and you can interact with it.

Duration

Considering the possible digital and technical skills that the process requires, two days were given to the participants to interact with the courses. Within this period, the researcher monitored the increasing rate in the numbers of the group members, this being a vital indicator to assess the participants' understanding of the instructional or navigation guide and their willingness to participate in the exercise. The number of member requests and automatic approval of membership on the group increased to 75 members within the first 24 hours of distributing the guide to the participants. At the end of the exercise, that is, after the two days, the group member had risen to 98 members and still counting. It was discovered that the existing members were referring their friends to the group.

2.2.4.1. Questionnaire administration

After the two days that were given to the participants to interact with the two courseware, at each school, the participants were quickly arranged in a classroom through the valuable assistance of their teachers. Hence, the questionnaires were administered to them, an activity that lasted for 30 minutes or thereabout.

2.3. Data analysis

This section contains information about the statistical tools adopted, and the procedure for the analysis of the data presented. The data collected is of a more qualitative nature, open and axial coding systems were adopted for easier categorisations of results. This process of coding was performed manually, but with adequate time and attention devoted. A matrix was designed to illustrate the objective and function of each of the questions in the questionnaire. The matrix shows how the questions are distributed across all the four specific objectives of our research.

2.3.1. Question matrix

Table 8. Question matrix

Specific objectives of the question	Questions	Research specific objective
To understand the pattern of ownership of computers amongst secondary school students in Nigeria	Where do you have access to a computer (Laptop or Desktop)?	To characterise students' ability to deal with **social and interactive educational media**.
To measure the students' familiarity with digital devices	How often do you use a computer?	
To ascertain the purpose (what they usually do online) of having the internet on their devices	What is your main purpose of using the internet on your device?	
To know if the students know the basic and theoretical meaning of e-learning	What is e-learning for you?	
If they have the practical experience and the facilities involved in e-learning	How would you describe the activities and the tools involved in e-learning?	
This question is asked to know if the contents on the Facebook distract their attention. Checking for media activity consistency.	On Facebook, give brief details about your activities after you gained access to the learning group? **Answer**-.....	

To check randomly the most common type of device use to access e-learning both online and offline	Which device did you used to access the courses?	
The question is asked to know if the narrative and storylines in the course attract the student and motivate them to learn	From the given option, how would you describe the *storylines* and *narratives* in each of the courses? **The Loose Elephant** a. Interesting b. Scary c. Engaging d. Confusing e. Bored f. Other? Add your opinion **Punctuality** a. Interesting b. Engaging c. Educative	To identify the aspects of the learning approach that stimulate **learners' motivation** or interest to learn.

	d. Bored e. Other? Add your opinion
To identify the course and context that contribute to desire learning.	How many times, on average, did you visit each of the courses and, which of the courses you understood and preferred the most? Explain why. **Answers**- No of time..... **Name of the preferred course**-.....
To know if the courses displayed correctly on their devices and to check if it caught their attentions	Considering the following options, how would you describe the **structure** of the each of the courses on your device?

The Loose Elephant	**Punctuality**
a. Bad	a. Bad
b. Moderate	b. Moderate
c. Good	c. Good
d. Perfect	d. Perfect

To check if the participants' understandings are advancing as the course proceeds. This is an attempt to check the flow of assimilation	In one sentence, explain how easy or difficult it was for you to understand the task you are required of. **The Loose Elephant:** ..... **Punctuality**:.....	
To check for technology induced multitasking while learning and attention divisive.	What other activities were you performing on your device when the course was still actively displayed on your device's screen? **Answer**-.....	To describe or typify the factors that trigger **learners' engagement** to keep focus and remain attentive during the learning process
This question is asked to know the number of participants that actively completed the course and submitted feedback.	You have completed the courses and you were redirected to the social learning group, what did you do thereafter? **Answer**-.....	
To check if the participants have grasped the specific objectives of the courses	Describe as accurately as possible, the lessons you learned from each of the courses? **The Loose Elephant**-..... **Punctuality**-.....	
This question is on critical thinking and ability to learn and make decision independently.	Did you attend the course alone or with the contributions and assistance of people around you?	

	Answer-.....	
To assess the relevancies of the courses to subjects they learn in school.	For each of the courses, in one sentence can you explain how it is related to any of the subjects in your present studies? **The Loose Elephant**-..... **Punctuality**-.....	To illustrate **learners' cognitive experiences** that enable learning gains through critical connections with previous knowledge and with learning relation to the surroundings reality
Checking the suitability of SBL approach in supporting individual learners' uniqueness and comprehension ability.	How many times did you attempt the courses until you arrived at the correct answer? **The Loose Elephant** a. Just once b. Twice c. More than twice **Punctuality** a. Just once b. Twice c. More than twice	
This question seeks to understand if the participants could easily identify the change in the learning environment.	How do you distinguish e-learning from any other forms of learning you have experienced e.g., classroom learning?	
The relevancies of lessons learned from the	In one sentence, describe how helpful you think the lessons learned	

courseware to daily life activities.

from each of the courses will be when applied to daily life activities.

The Loose Elephant-.....

Punctuality-.....

2.3.2. Data analysis procedure

The arrangement and analysis of research data is largely depending on the nature of data that are collected for such research. Some research data are numerical while some are non-numerical. Numerical data are attributed to quantitative research while non-numerical-data are attributed to qualitative research. Meanwhile, there are situations whereby the data collected during a research exercise are mixed; it consists of both numerical and non-numerical data.

In the case of this research, the data collected are mixed, it's partly quantitative and partly qualitative. But, the fraction of non-numerical data is more than the average of the whole data collected. That is, most of the data collected approximates and characterises certain phenomena. These data were organised and presented as categorical data- that is the data were arranged in categories based on the identified set of codes that characterised the attributes and properties of phenomena under-study.

Having categorised the collected data, the descriptive statistics method was adopted in presenting the emerging pattern of the results. Measures of variability and percentage weight average are the forms of basic statistical tools that were used to analyse the categorical data.

2.3.3. Coding

Two sets of coding systems were used for the data presentation and data analysis. At the results presentation stage, an open coding system was used to categorise the raw data, and during the result analysis, an axial coding system was adopted. In qualitative data presentation and analysis, an open coding is used to organise raw data and make sense of it, while axial coding is used to interconnect and link categories of codes.

2.4. Ethics of research

In efforts to define the conduct norms for this research, concerns about the moral and ethical issues were stressed out. Areas of ethical concerns such as the environment, privacy and safety of the participants, and the supervisor's and other colleagues' intellectual property were adequately acknowledged and respected. Other areas of ethical concerns for the research activities are honesty, the standard of conduct, and freedom of will.

Honesty and integrity

As a claim of original research, all activities that were involved throughout the research were performed with sincerity and honesty. The procedure for data collection was implemented as described, and data reported were original from the primary source; no falsification nor fabrication of data.

Non-participation right

The participants were assured of privacy of their data and were educated and well informed that participating in the exercise was optional and it was completely their right to decide whether to participate in the exercise or not. Hence, those that participated did according to their will, no enticement, and no monetary gift.

Standard of conducts

Anonymity and confidentiality right

The questionnaire did not require the participants to supply personal information before accessing the questions. Only their gender and age are the questions in the questionnaire that are related to their existence, and these were asked for data distribution purposes. Other questions are based on their experiences with the courseware.

Protection and equitable treatment rights

The data collection exercise required the participants to join the social learning group through their individual Facebook account to be able to access the courseware. Initially, they all felt reluctant to do so, with mixed feelings that their social media account would be compromised. Hence, some among them rejected the request but an assurance was made to them that their account and personal information are saved and, that the activity was in no way interfering with their accounts' safety and privacy.

CHAPTER 3 - PRESENTATION OF THE RESULTS

Introduction

This chapter depicts the patterns of results as derived from the collected data. Out of the twenty-four (24) questions in the questionnaire, five (5) questions were filtered out during the data distribution process to eliminate repetition of question objectives. The remaining nineteen (19) most relevant questions were re-distributed correspondingly across the four research specific objectives as shown in table 8 question matrix.

The presentation of the result is done in four dimensions based on the four objectives of our research, and under each dimension are the presentations of the result of questions that correspond to each of the research specific objectives.

3.1. Procedure of the distribution

Participants' responses to each of the questions are clustered and nodes were carefully defined using a synonymised statement to synthesise the common characters that are identified from the responses given by the participants for each question. Having been able to categorise the participants' ideas and feedback into various (up to three) complex statements for each question, the data distributions are performed by matching similar responses with the already defined synthesised statements using an open coding system. Hence, presented in the proceeding pages of this chapter are the descriptive patterns of the results in words and by charts as they have emerged and were extracted from the administered questionnaires.

3.2. Data presentation

3.2.1. Gender proportion and age

Eighty senior secondary school students participated in the exercise, forty-seven (47) are males which is equivalent to 59%, and thirty-three (33) are females representing 41%. The age bracket of the participants ranges from 16 years old to 20 years old. The numeric and percentage proportions of each age category relative to the total number of the participants are analysed as follow: 15 years; 05 (6%), 16 years; 27 (34%)17 years; 19 (24%)18 years 12(15%), 19 years 07(9%), 20 years 10 (12%).

3.2.2. Chart 1: Gender and Age distributions.

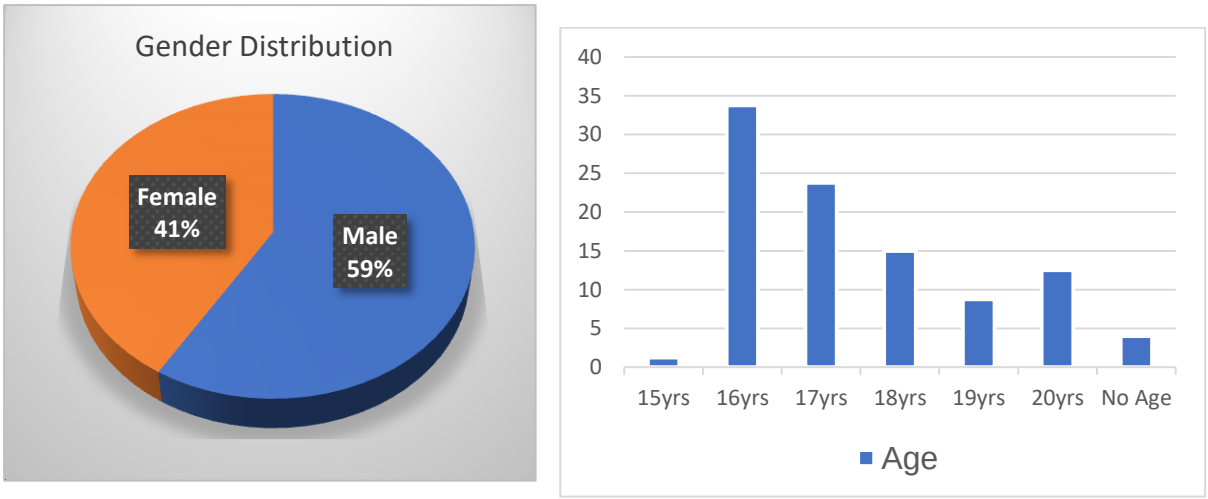


Chart 1. Gender and age distributions.

The Chart depicts the clear distribution patterns of the participants' gender and age. Concerning the disparity in the gender distribution, it is important to reiterate that the sampling technique used for the selection was non-probability sampling. Hence, there was no preferential treatment nor a specific interest in a particular gender during the process. Also, in the aspect of age range, we can assume by the result's pattern that, the average age of senior secondary school students in Nigeria is 17 years old. More students fall in the categories of age 16 and 17 years old.

3.2.3. Social and interactive educational media

Research specific objective one

To characterise students' ability to deal with **social and interactive educational media**.

Ownership of computer.

Q. Where do you have access to a computer (Laptop or Desktop)?

Question's objective: To understand the pattern of ownership of computers amongst secondary school students in Nigeria

For this question, three objective answers were given to the students to select from. The objectives are; School, Home, another place? name it. Forty (50%) students indicated they have access to a computer

in school, thirty (37%) indicated 'Home' while ten (12%) have access to a computer elsewhere other than in school and at home. Places such as café, business centres, religious centres etc.

Chart 2. Access to a computer

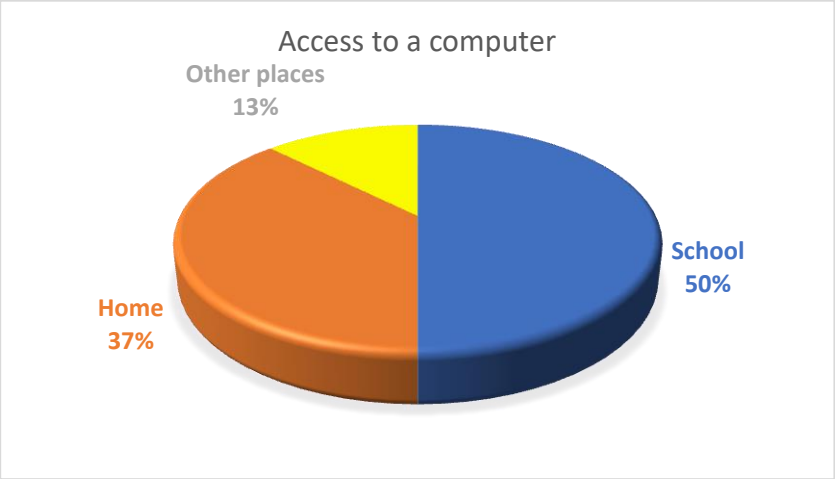
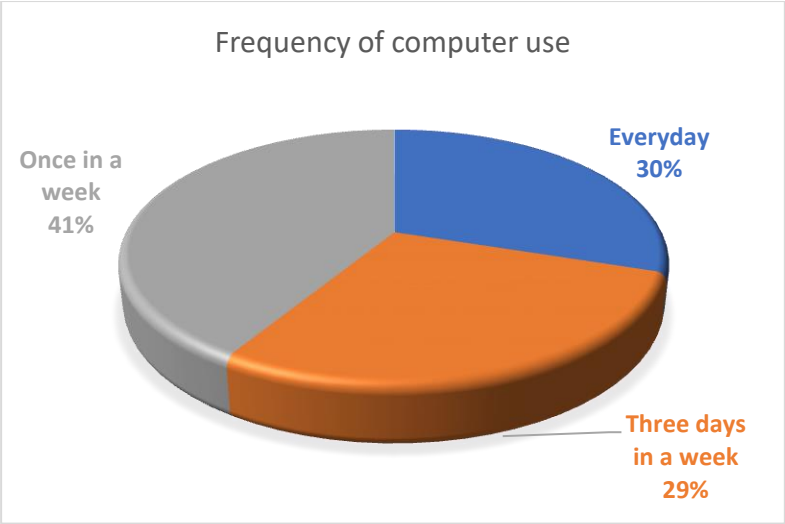


Chart 2 depicts the structure of ownership or access to personal computers among senior secondary school students in Nigeria.

Familiarity with digital devices.
Q. How often do you use a computer?
Question's objective: To measure the students' familiarity with digital devices.

Three objective answers were given to constrain their responses to a pre-defined frequency mode. The given objectives are; Everyday, Three days a week, and Once a week. And, according to the available data twenty-four students, which is equivalent to 30% of the sample, are using computer everyday, twenty-three (29%) use computers three times a week while thirty-three (41%) indicated that they use computers just once a week.

Chart 3. Frequency of computer use



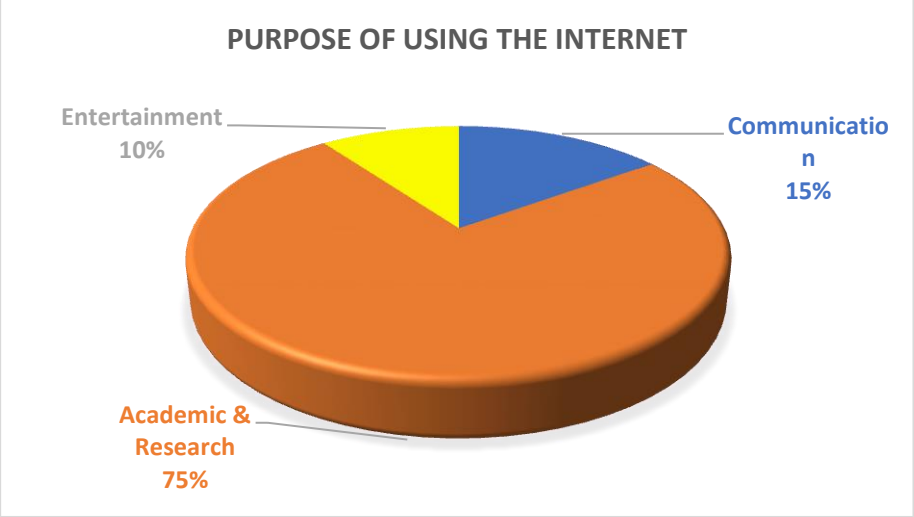
Purpose of the internet on devices

Q. What is your main purpose of using the internet on your device?

Question's objective: To ascertain the purpose (what they usually do online) of having the internet on their devices.

Various responses were given by the participants as their individual's reasons for using the internet on their devices. Common and similar characters in their responses are clustered to generate synthesised statements to enable the data to be distributable. Three answers were generated and are named as follow; Communication, Academic and research, and Entertainment. Twelve (15%) participants indicated they use the internet mainly for communication, sixty (75%) claim they put the internet on their devices mainly to source information, and to do their assignments. While eight (10%) indicated that they use the internet on their devices for entertainment.

Chart 4. Purpose of using the internet



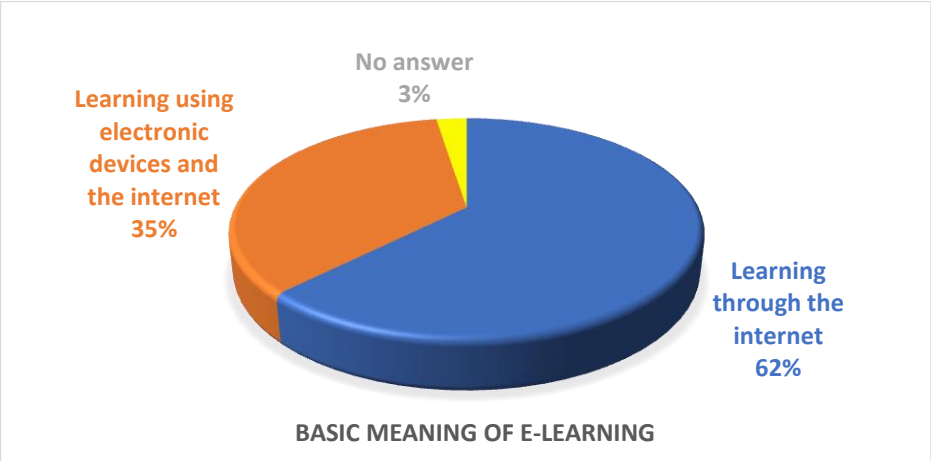
Basic and theoretical meaning of e-learning.

Q. What is e-learning for you?

Question's objective: - To know if the students have the basic knowledge of e-learning.

Fifty participants representing 62% of the total number of participants answered with the descriptions of relating e-learning to the internet alone, while twenty-eight of the participants, equivalent to 35% described e-learning as learning through or with electronic devices, and on the internet. Also, two participants (3%) did not give a response to the question.

Chart 5. Basic and theoretical meaning of e-learning



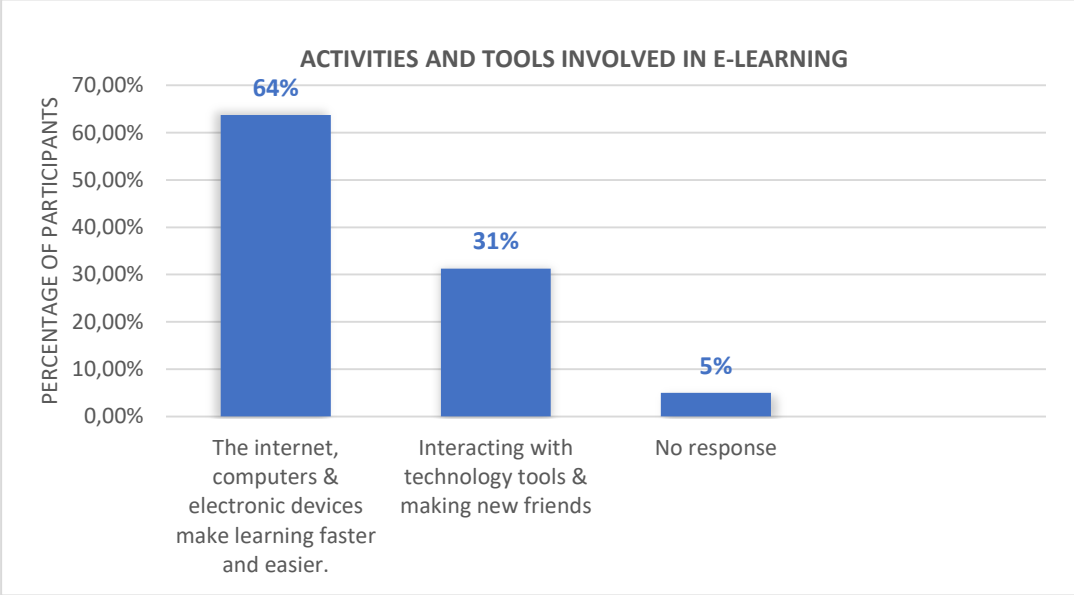
Practical knowledge and the facilities involved in e-learning.

Q. How would you describe the activities and the tools involved in e-learning?

Question's objective: - To know if they have practical experience of e-learning.

Their responses to this question are varied, beingsuch as interesting, makes learning easier and faster, making new friends online, exposure to various digital electronic devices, it encourages learning and easy access to information amongst others. Nodes were created to synthesise the responses into two statements for easy distribution of the data as shown in chart 6.

Chart 6. Practical knowledge and tools involved in e-learning



Having applied the open coding system to categorise the responses into two categories, 64% of the participants demonstrated practical knowledge of e-learning which was characterised by their respective experiences. Also, 31% gave other responses not correlated with the meaning. And, 5% of the participants that did not give any response to the question, and are assumed that they do not have an idea of what e-learning entails in practice.

Media activity consistency.

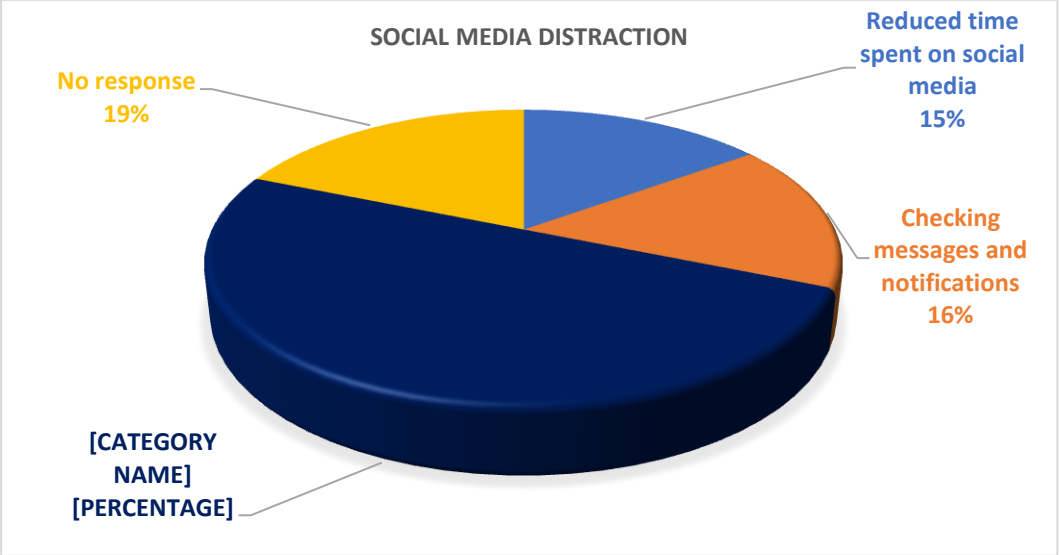
Q. On Facebook, give brief details about your activities after you gained access to the learning group

Question's objective: - To check if the contents on Facebook distract their attention to stay focused on social media.

For this question, twelve participants (15%) revealed that their presence on the social learning group reduced the time they spent on social media, thirteen participants (16%) disclosed that they were

checking their Facebook messages and other notifications as they gained access to the learning group, forty participants (50%) indicated they clicked on the link to the courseware to learn immediately they gained access to the social learning group. However, fifteen of the participants (19%) did not give any response to the question.

Chart 7. Media activity consistency



From the data in chart 7, it can be deduced that up to one-third of the total number of the participants were distracted with Facebook content. The 19 % of the participants that did not give any response can also be considered to be distracted by other unknown factors.

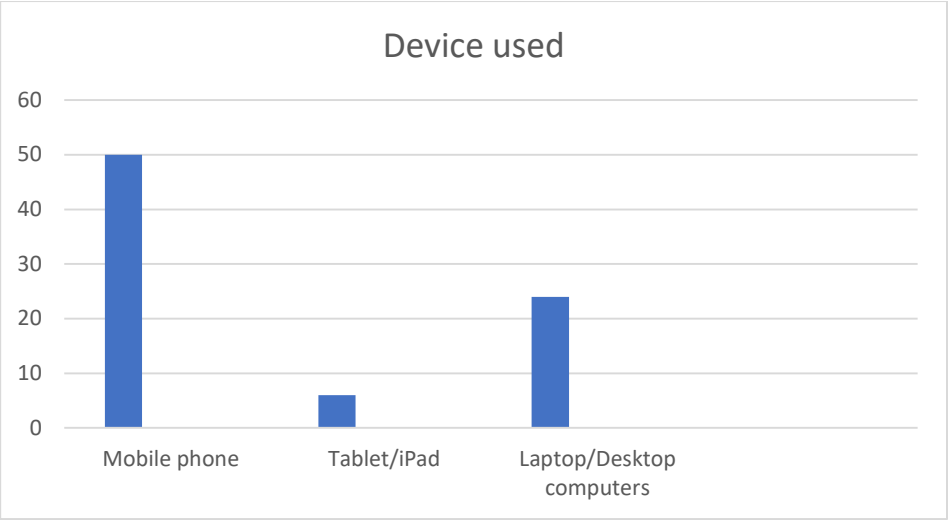
Common type of device used to access e-learning

Q. Which device did you use to access the course?

Question's objective: - To check the most common type of device used to access e-learning courses, both online, and offline.

This question is a close-ended type. Three options were given to the participants to choose from. The options are; Mobile phone, Tablet/iPad, Laptop/Desktop computers. Readings from the available data reveal that fifty participants (62%) indicated mobile phones, six participants (8%) indicated Tablet/iPad, and twenty-four participants (30%) chose Laptop/Desktop computers.

Chart 8. Devices used to access the courses



The data in chart 8 indicates that more than average of the participants used their mobile phones to access the courses. In the next chapter, to analyse the result, mobile phones and Table/iPad would be merged to form 'Mobile Devices'.

3.2.4. Learner' motivation

Research specific objective two.

To identify the aspects of the learning approach that stimulate **learners' motivation** or interest to learn.

Causes of attraction and motivation to learn.

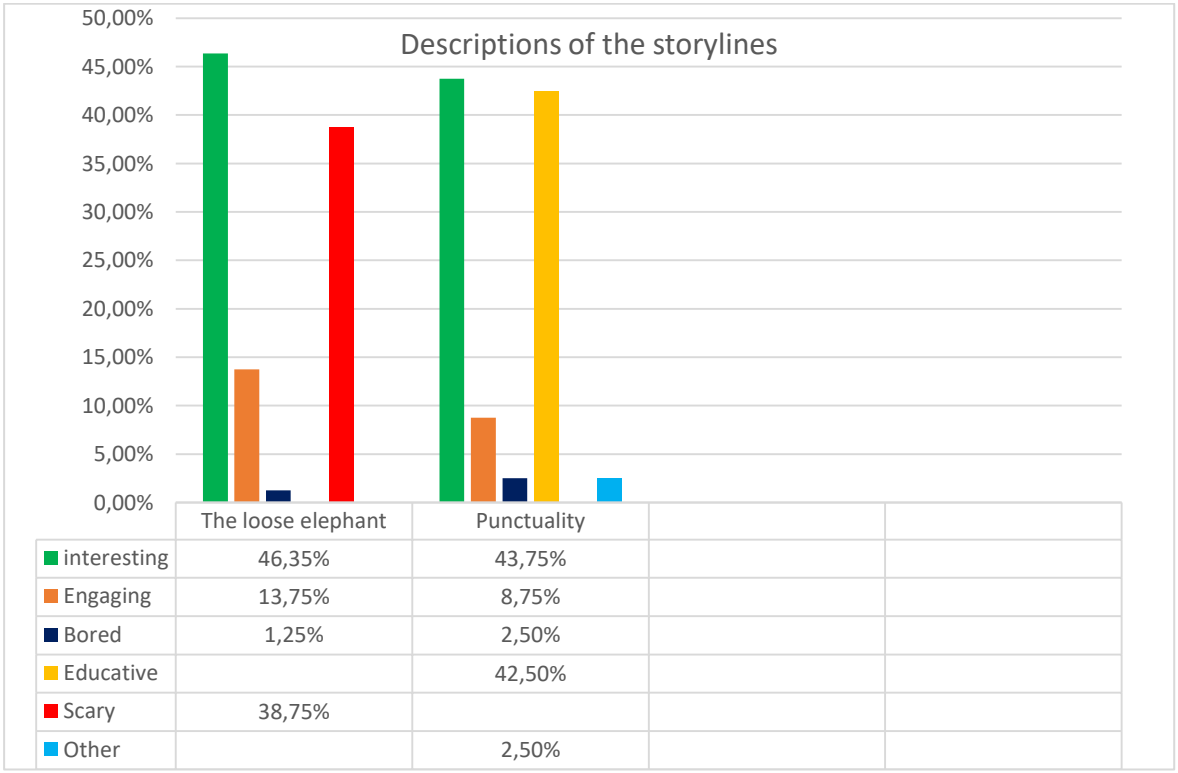
Q. From the given option, how would you describe the *storylines* and *narratives* in each of the courses?

The Loose Elephant	**Punctuality**
Interesting	Interesting
Scary	Engaging
Engaging	Educative
Confusing	Bored
Bored	Other....

Question's objective: - The question is asked to know if the narrative in the course attracts the student and motivates them to learn.

From the available data, under the course "The loose elephant", thirty-seven participants (46%) indicated that the storylines of the course were interesting, thirty-one participants (39%) indicated 'Scary', eleven participants (14%) said the course was engaging, while only one participant (1%) indicated that he felt bored with the course. For the other course "Punctuality", thirty-five participants (44%) said the course was interesting, seven participants (9%) declared it was engaging, while thirty-four participants (42%) indicated that the course storylines were educative, two participants (2.5%) indicated bored, and another two participants (2.5%) did not specify any description.

Chart 9. Descriptions of the storylines



	The loose elephant	Punctuality		
interesting	46,35%	43,75%		
Engaging	13,75%	8,75%		
Bored	1,25%	2,50%		
Educative		42,50%		
Scary	38,75%			
Other		2,50%		

Chart 9 indicates that the storylines and narratives of the two courseware are interesting, which possibly may have inspired the students to learn with the courses. The percentage proportion (39%) of the participants that indicated that one of the two courses was scary needs attention. Less than 5 % of the overall participants indicated that the storylines in the courses were boring.

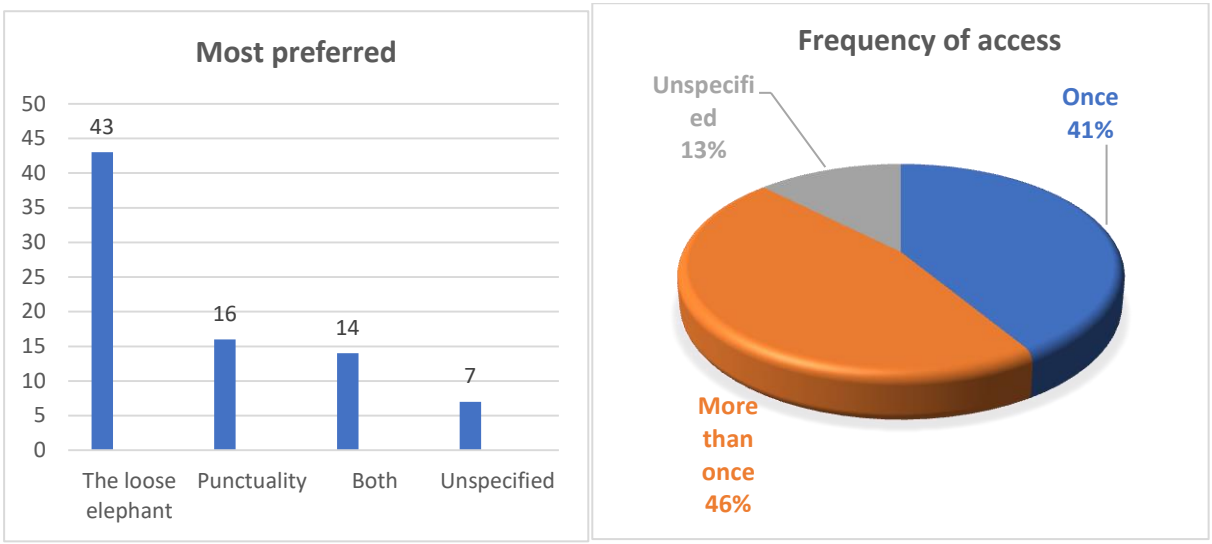
Ascertaining the kind of e-learning illustrations that trigger the desire to learn.

Q. How many times, on average, did you visit each of the courses and, which of the courses did you understand and preferred the most? Explain why.

Question's objective: - To ascertain the context and nature of the e-learning courses that contribute to the student's motivation and desire to learn.

According to the data, thirty-three participants (41%) visited the courses once, while thirty-seven participants (46%) visited the courses more than once, twelve participants (13%) did not respond to the questions. Forty-three participants (54%) preferred the course titled "The loose elephant" while sixteen participants (20%) preferred "Punctuality". Fourteen participants (17%) preferred the two courses, while seven participants (9%) were indifferent in their decisions.

Chart 10. Frequency of access and most preferred course



Participants indicated that they prefer the loose elephant course because it teaches them to do the right thing, how to make an accurate decision, how to identify and analyse danger and to be kind to animals. While those that prefer the course punctuality stated that the context of the course is related to frequent daily activities, and it is clearer, and challenge them to think critically and in a creative manner. Given all these reasons by the participants, however, it is necessary to note that, one of the courses, the loose elephant course, contains short videos that illustrate the scenario as it happened in real life. This may have contributed to the higher number of participants that gave preference to it.

3.2.5. Learners' engagement

Research specific objective three

To describe or typify the factors that trigger **learners' engagement** that cause them to keep focus and remain attentive during the learning process.

Cause for attention.

Q. Considering the following options, how would you describe the structure of each of the courses on your device?

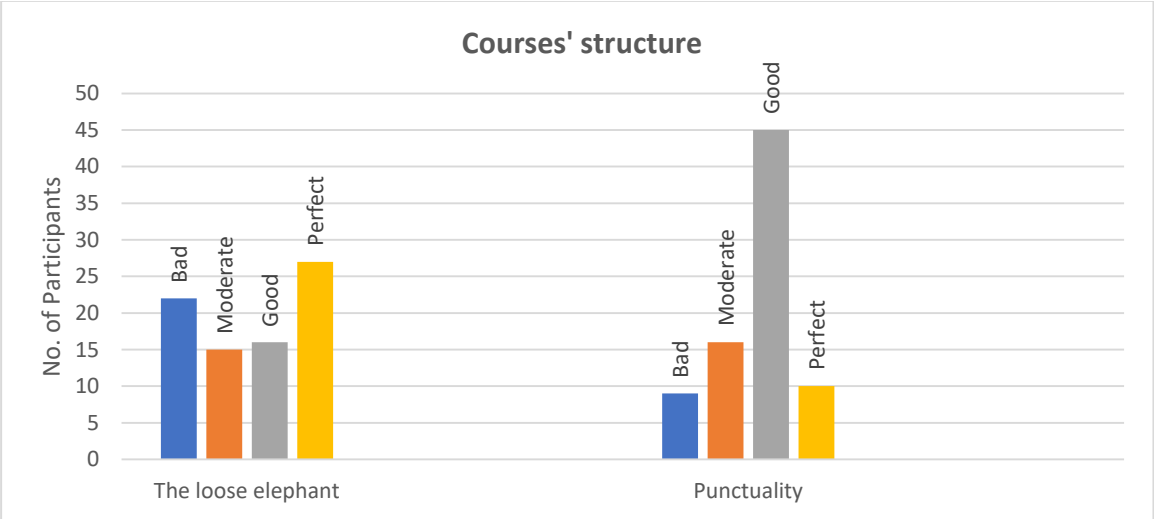
The Loose Elephant	**Punctuality**
Bad	a. Bad
Moderate	b. Moderate
Good	c. Good
Perfect	d. Perfect

Question's objective: - To know if the graphic and the responsiveness feature in the courseware caught the students' attention.

The collected data depicts the reactions of the participants towards the structure of the course as follows; for the "Loose elephant" twenty-two participants (27%) described the structure of the course on their devices as 'Bad', fifteen participants (19%) described it as moderate, sixteen participants (20%) 'Good', and twenty-seven participants (34%) described the course structure as 'Perfect'.

For the second course "Punctuality", nine participants (11%) described the structure of the course as 'Bad', while sixteen participants (20%) said the structure of the course was moderate. Forty-five participants (56%) described it as 'Good', and lastly, ten participants (13%) described the structure as 'Perfect'.

Chart 11. Descriptions of the structure of the courses



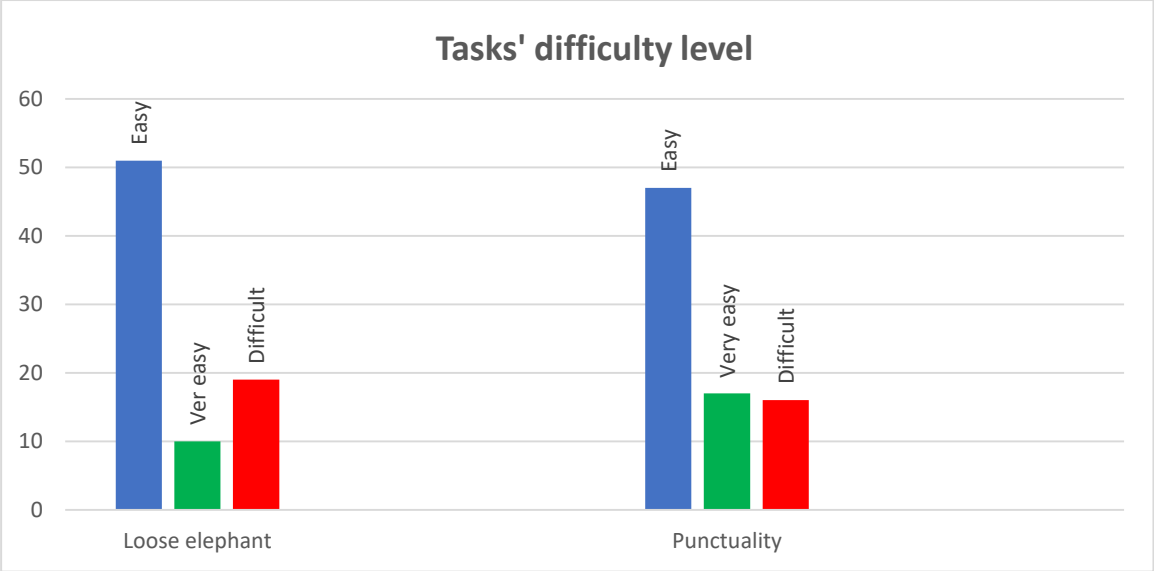
Task difficulty level.

Q. In one sentence, explain how easy or difficult it was for you to understand the task required of you?

Question's objective: - To check if the participants' understandings are advancing as the course proceeds; an attempt to check the flow of assimilation.

This question was structured in a close-ended format and the participants were subjected to three optional difficulty levels. The options are; Easy, Very easy, and Difficult. Under the course "Loose elephant", fifty-one participants (64%) indicated that it was easy to understand the task, ten participants (12%) said the task was very easy to understand, while nineteen participants (24%) claimed it was difficult to understand the task required. For the course Punctuality, forty-seven participants (59%) indicated that the task was easy to understand, seventeen participants (21%) it was a pleasant experience and understanding the task required was very easy, sixteen participants (20%) said understanding the task required was a difficult thing to them.

Chart 12. Tasks' difficulty level



Media multitasking.

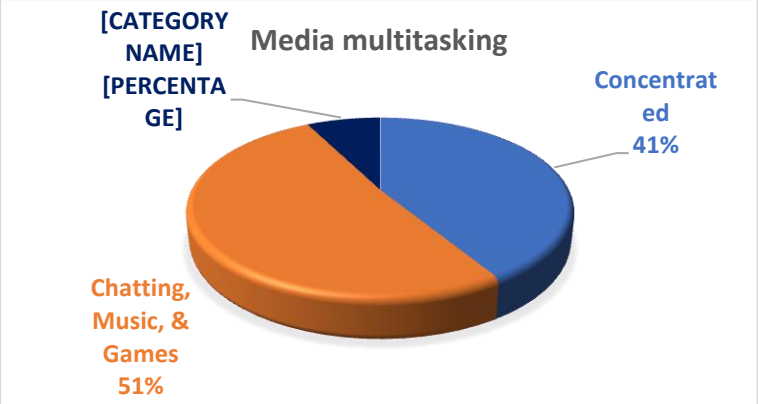
Q. What other activities were you performing on your device when the course was still actively displayed on your device's screen?

Question's objective: - Checking for the attention divisive.

This question is sensitive to the assessment of the quality of attention the participants devoted to the course during the learning process. Being an open-ended question, participants were able to outline the

various activities they were involved in during the learning process. These responses have been summarised in their separate similarities to allow for easy distribution of the data. Thirty-three participants (41%) mentioned that they concentrated on the course, forty-one participants (51%) said they were also involved in other activities such as chatting, playing games, and listening to music, YouTube. However, six participants (8%) did not respond to the question, and it was assumed that this set of participants probably did not understand the question.

Chart 13. Media multitasking



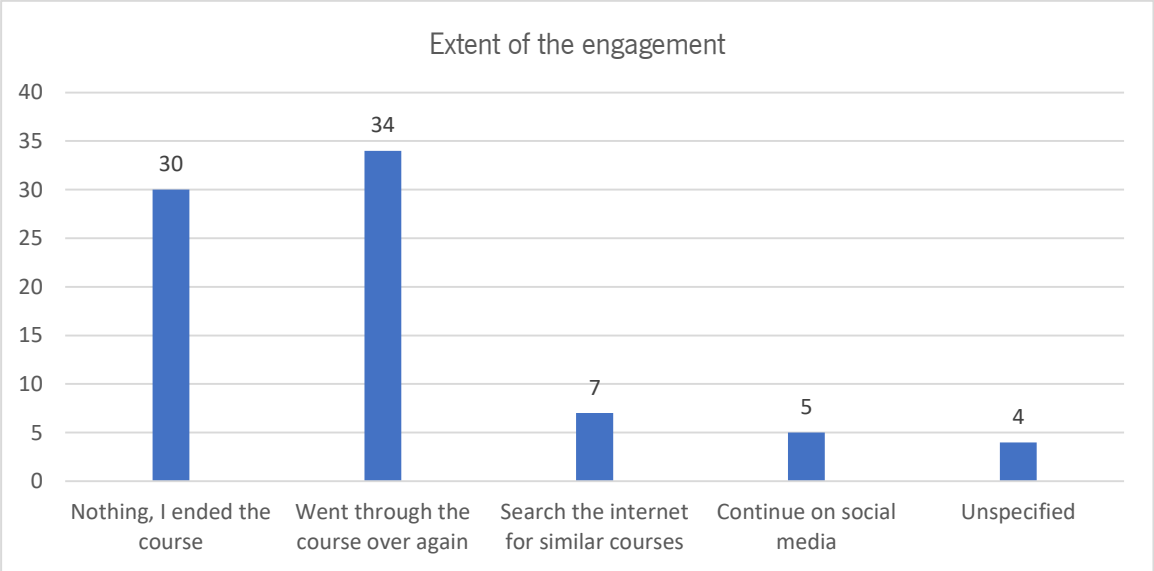
Fully/active engagement.

Q. You have completed the courses and you were redirected to the social learning group, what did you do thereafter?

Question's objective: - Checking the fraction of the participants that were fully engaged in the learning process, completed the courses and left feedback.

Active engagement in a learning process is one of the orientations towards achieving meaningful learning. The information presented as follow indicates the extent to which the courses have engaged the participants. Thirty participants (37%) expressed their actions as doing nothing after the completion of the courses, thirty-four participants (42%) indicated that they went through the courses over and over again, seven other participants (9%) said that after completing the course they searched the internet for similar courses, five participants (6%) said they returned to their activities on social media, while four participants (5%) did not respond to the question.

Chart 14. Extent of engagement



3.2.6. Learners' cognitive experience

Research specific objective three.

To illustrate learners' cognitive experiences that enable learning gains through critical connections with previous knowledge and with learning related to the surrounding realities.

Knowledge of the required task.

Q. Describe as accurately as possible, the lessons you learned from each of the courses.

Questions' objective: - Assessing the participants' grasp of the objectives of the courses.

Being an open-ended question, the participants gave different forms of answers based on their imagination and reasoning, ideas and ability to process knowledge. The responses were clustered to identify nodes. These nodes are used to synthesise statements that represent ideas of similar responses for each of the courses.

Chart 15. Loose elephant: Lesson learned

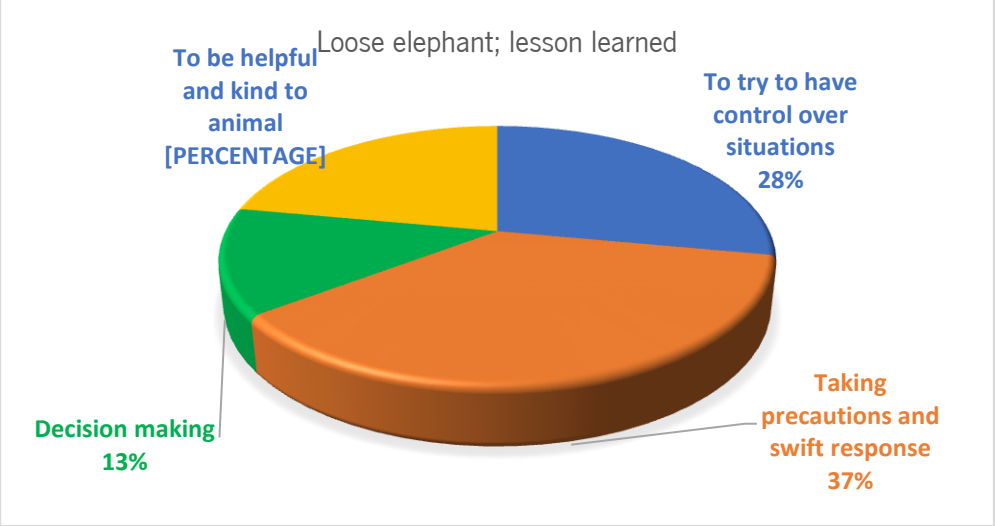
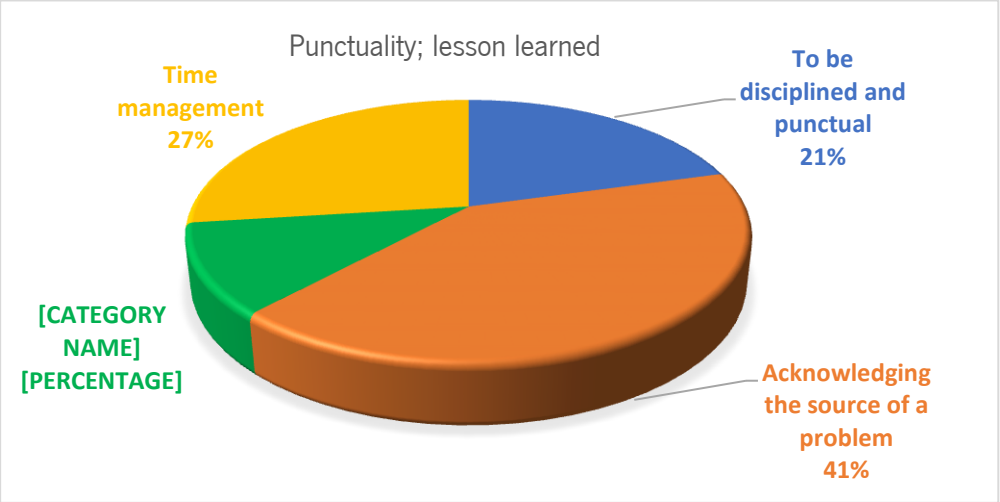


Chart 16. Punctuality: Lesson learned



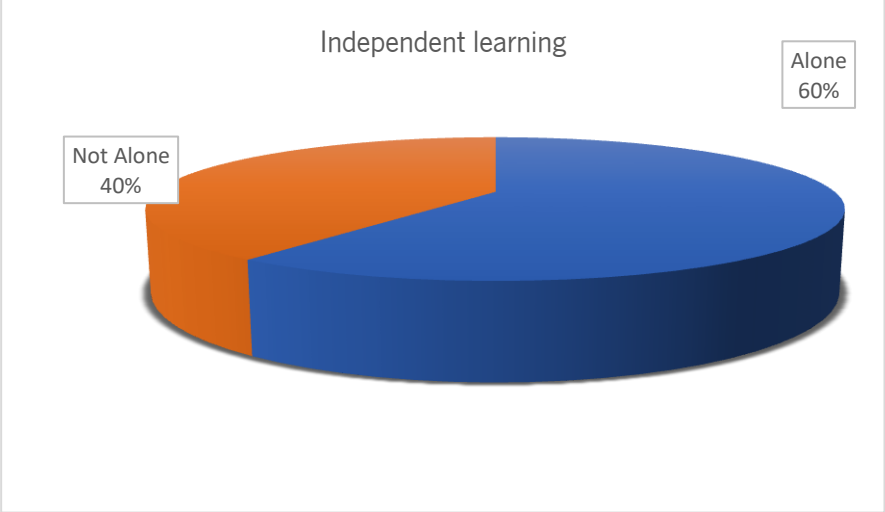
The information indicated in charts 15 and 16 as derived from the available data represents the responses of the participants concerning the descriptions of knowledge gained after their interactions with the courses.

Critical thinking and independent learning skill.

Q. Did you attend the course alone or with the contributions and assistance of people around you?

Question's objective: - To access their critical thinking ability, independent learning, and their attempts to construct knowledge.

Chart 17. Independent learning



As indicated in chart 17, forty-eight participants (60%) claimed that they attended the courses alone, while thirty-two participants (40%) indicated they attended the courses in connection with the people around them. Although, a few numbers out of those that attended the courses alone said it took them some time to get through it.

Impacts of the courseware on classroom learning achievement.

Q. For each of the courses, in one sentence can you explain how it is related to any of the subjects in your present studies?

Question's objective: - To ascertain the relevancies of the courses to subjects learned in school.

For the 'Loose elephant' course, participants were able to relate their experience mostly with subjects like the English language, and Literature in English due to the comprehension passage (synopsis), that is the storylines and narratives of the course. Some participants also linked their experiences with science subjects such as Chemistry, Physics, and Mathematics due to the fact that the course challenge them to think and reasoning, and encourage them to stay and face a problem instead of running away (avoiding) it. Most especially in mathematics; words problem and equations. Some did link their experiences with Biology; ecosystem, human surroundings and animals.

For the second course, Punctuality, most of the participants linked their experiences with subjects like Civic education, they posited that the context of the course is cognate to "Right and Obligation"- a topic under the subject. Other subject areas where participants indicated relevancies of the course to their studies include Chemistry, and Engineering due to management of time and critical thinking, social and

management studies. Some participants said the context of the course is basically related to their daily activities. Those participants that did not respond to the question are marked 'Unspecified' and, it is assumed that such participants in this category could not fix the relativeness of the courses with their studies.

Chart 18. The loose elephant: Relevance to classroom subjects

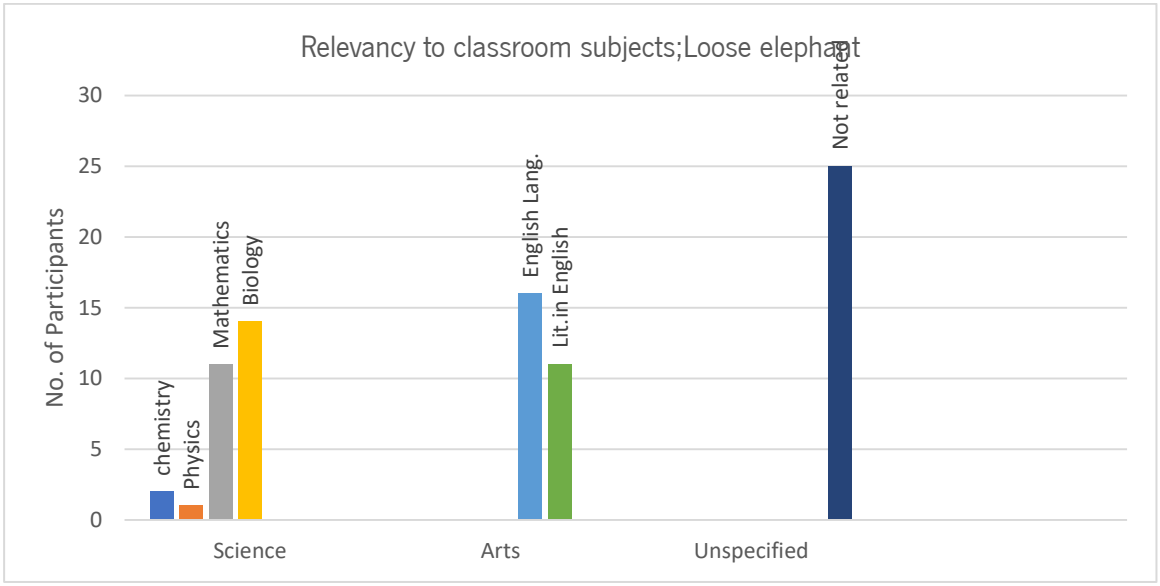
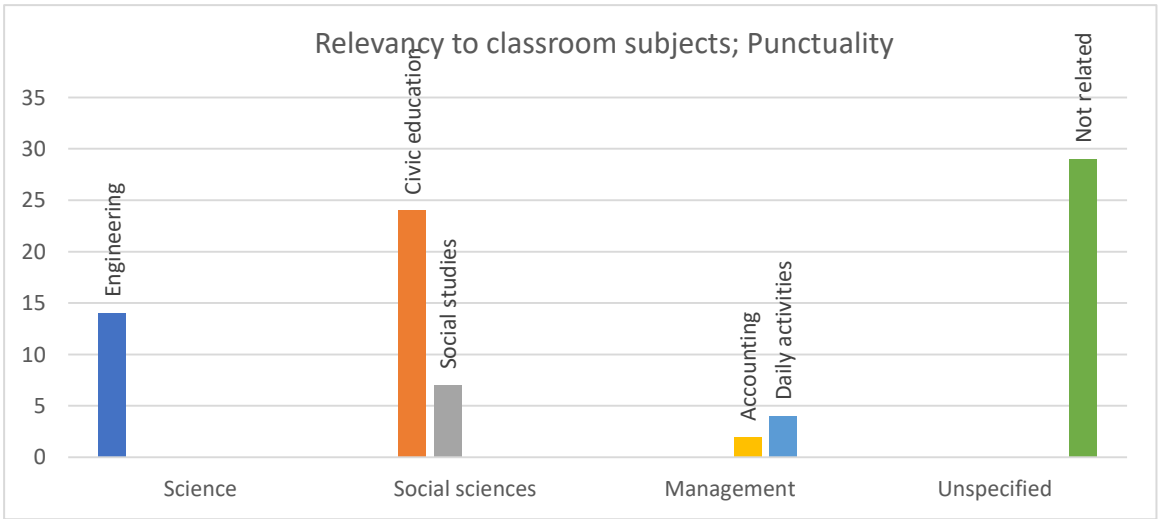


Chart 19. Punctuality: Relevance to classroom subjects



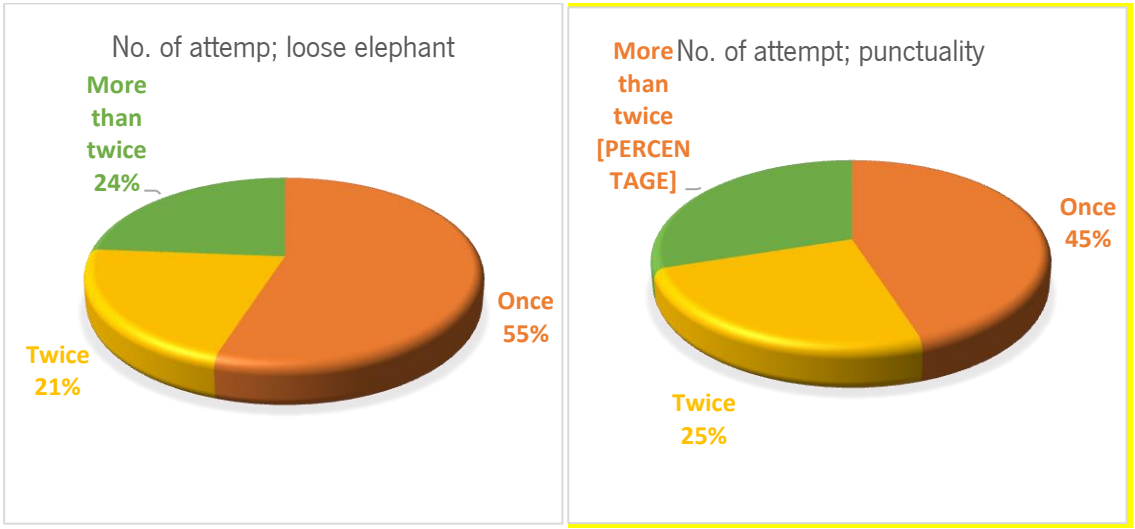
Frequency of attempt

Q. How many times did you attempt each of the courses until you arrived at the correct answer?

Question's objective: - Observing individual learners' uniqueness and comprehension ability.

To generate concise feedback from the participants, this question is asked in closed-ended form.. Options that were supplied as answers are Once, Twice, More than twice. And, according to data gathered, for the course 'Loose elephant' forty-four participants (55%) attempted the course once, seventeen participants (22%) attempted it twice until they got the answer to the required task. Eighteen participants (23%) attempted the course more than twice. Course 'Punctuality' on the other hand, thirty-six participants (45%) indicated they attempted the course once and they got the answer to the required task, while twenty participants (25%) attempted it twice. For the attempt that is more than twice, twenty-four participants (30%) acknowledged response to this.

Chart 20. Numbers of attempt



The information in chart 20 investigates the complexity level of the contexts of the courses. Attempts once and twice can be categorised into a normal complexity level. While an attempt more than twice is understood as a high level of complexity.

Contrasting the forms of learning

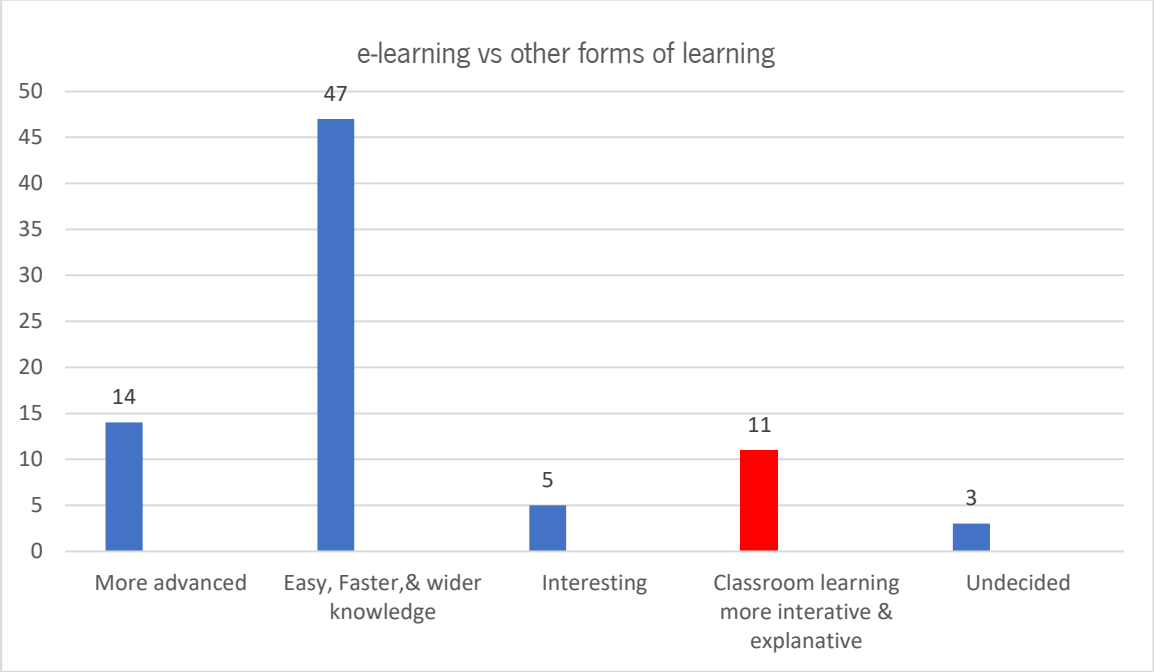
Q. How do you distinguish e-learning from any other forms of learning you have experienced e.g., classroom learning?

Question's objective: - Students' ability to acknowledge or identify the changes in the learning environment.

Participants gave impressive responses that portrayed their real knowledge about e-learning, forms of learning, and the learning environment. To this end, different answers were given, many of them are not relevant, but all are considered useful, most especially when in the recommendation section. As a practice, nodes were collected from the various answers that are available, and relevant statements were synthesised from similar responses. Fourteen of the participants (18%) described e-learning as an advanced form of learning, forty-seven participants (59%) differentiate e-learning with characteristics such as faster, convenient, easy access to information, reliability, and enables wider knowledge. Five of the participants (6%) acknowledged e-learning as an interesting form of learning but they failed to explain how and why it is interesting.

However, eleven participants (14%) threw their supports for classroom learning by citing features such as interactive, explanative, and understandable more than e-learning. Three participants (4%) did not respond to the question.

Chart 21. E-learning versus other forms of learning



Assessing the gap between learning theories and practice.

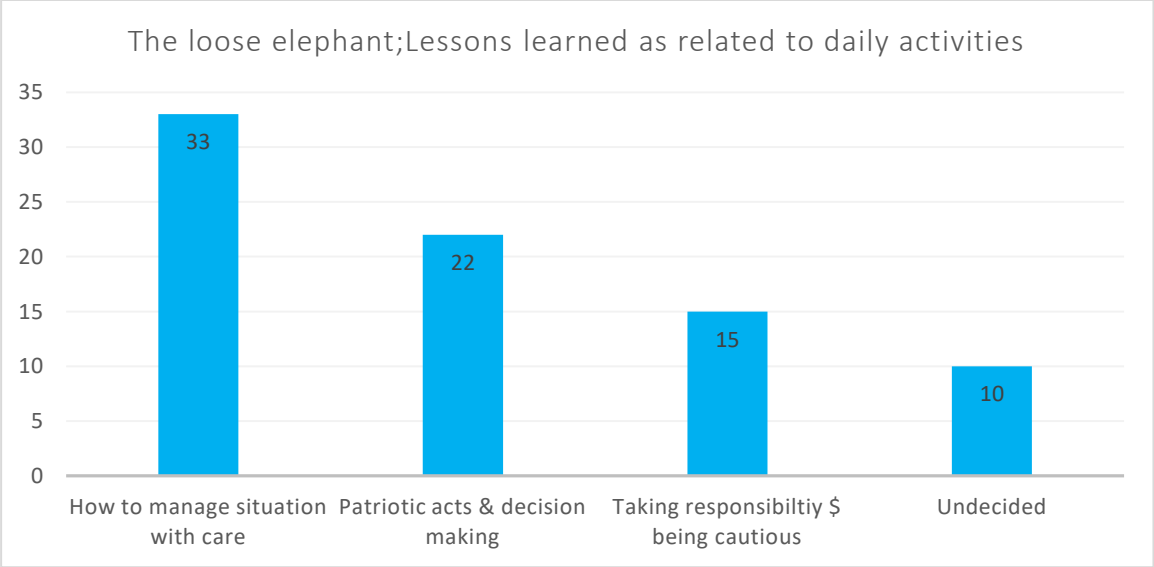
Q. In one sentence, describe how helpful you think the lessons learned from each of the courses will be, when applied to daily life activities.

Question's objective: - The relevance of the lessons learned from the courseware to daily life activities.

The participants tried and explained in their own understanding and abilities the advantages and potential contributions of the knowledge gained from the courses to their daily activities. Various ideas were given depending on how it affects individual learners. Common and similar terms were deducted from the pool of answers given to form synthesised statements of response.

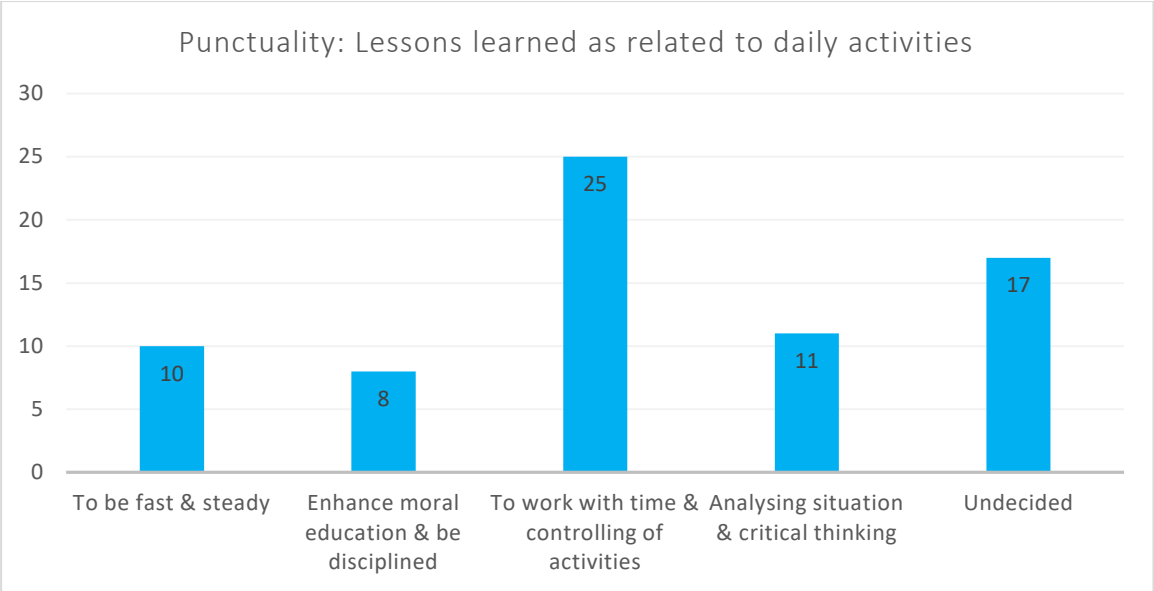
For the loose elephant course, thirty-three participants (41%) described the advantage of the knowledge gained in their daily activities as enabling them to manage situations with care. Twenty-two of the participants (28%) said it would encourage them in participating in patriotic acts in their community and also aid their ability of decision making. Fifteen participants (19%) indicated that the knowledge gained from the course would assist them in taking responsibility and being cautious of their surroundings. Ten participants (13%) did not give any response to the question.

Chart 22. Loose elephant: Lessons learned as related to daily activities



For the course Punctuality, nineteen participants (24%) indicated that the course has taught them to be fast and steady in their dealings, eight participants (10%) attributed the advantage gained from the course to moral education and discipline. Twenty-five participants (31%) claimed that it has taught them how to work with time and controlling their activities, eleven participants (14%) said the course would help them on how to analyse situation and thinking critically. Lastly, seventeen participants did not respond to the question.

Chart 23. Punctuality: Lessons learned as related to daily activities



Summary

The data presented above represents the absolute raw pattern of the information as retrieved from the questionnaires that were administered to the participants. Concerning those values that are presented in percentage, an approximation principle was adopted since these values represent human figures which cannot be presented as ½ or 0.5, but as a whole e.g., 1. For instance, figures like X.25%, and X.75% are approximated back and forward respectively to their nearest whole numbers.

CHAPTER 4 - RESULTS ANALYSIS AND DISCUSSION

Irrespective of the type of research, qualitative or quantitative data collected in any research activity are in themselves nothing more than words and numbers. Analysing the collected data is an effort towards exploring and structuring the data, interpreting, and then presenting the data as useful information. Having outlined the four specific objectives of the research in the Methodology chapter, this chapter contains the explicit analyses, expressions, and interpretations of the data collected. As stated in the methodology chapter, descriptive statistic method, and measures of variability (Salkind, 2007) such as Average Deviation (AD)[63], and Weighted Average (AD) are the basic statistical tools adopted for the analyses. Also, discussions of the findings under each of the specific objectives are established by relating them with relevant theories from the literature.

4.1. Specific objective 1 - social and interactive educational media

Students' ability to deal with **social and interactive educational media**

This section observed the extent to which the senior secondary school students interact with educational media, and understand e-learning. Forty participants which are equal to 50% indicated that they have access to a computer in school, thirty participants which is equivalent to 37% indicated home while the remaining ten (13%) participants indicated elsewhere other than at school and home.

Introducing axial coding, access to a computer and access to a computer at a café or business centre can be categorised. Since the two are different places other than 'Home'. Therefore, the total percentage of the participants that have access to a computer outside their houses 50% + 13% equals 63%, while those participants that have access to a computer at home is 37%. It implies that the majority of senior secondary school students in Nigeria do not have a personal computer. Because, it can be comprehended that, having access to a computer at home implies the possession of the ownership of the computer.

Accessing the participants 'frequency of computer use, twenty-four (30%) use a computer every day, twenty-three (29%) use computer three days a week. While thirty-three (41%) use a computer once a week. Being able to use a computer for three days a week can be understood as equivalent to everyday access. Hence, 30% + 29% = 59% which is more than the average number of the whole participants.

63 Average Deviation (AD): Belongs to the category of measures of variability that emphasises the dispersion between observations and their mean. It is used to calculate average absolute deviation of set of variables.

Therefore, it is interpreted that senior secondary school students in Nigeria are well familiar with digital devices.

To ascertain the main purpose of having the internet on their phone, that is what do they usually do online.

Table 9. Purpose of the internet on devices

Variables	No. of participants (%)
Academic and research purposes	60 (75%)
Entertainment & communication purposes	18 (25%)

Table ?? indicates that the majority of the secondary school students in Nigeria use the internet on their devices for learning and development purposes, and to aid their learning abilities.

Observing the state of knowledge of the participants about e-learning is an important step towards ensuring coherency between the data supplied by the participants and their experiences. Table 10 and 11 depict the information supplied by the participants concerning their basic, theoretical, and empirical knowledge of e-learning.

Table 10. Basic and theoretical meaning of e-learning

Variables	No. of participants (%)
Learning through the internet	50 (62%)
No response	2 (3%)
Learning with electronic devices & the internet	28 (35%)

Table 11. Practical knowledge and the facilities involved in e-learning

variables	No. of participants (%)
The internet, Computers, Making learning faster & easier	51 (64%)
Interacting with technology tools &, Making new friends	25 (31%)
No response	4 (5%)

Based on the data in tables 10 and 11, it is apparent that most secondary school students do not have the basic knowledge of e-learning. But they seem to possess the practical knowledge of the paradigm, Hence, it implies that senior secondary school students in Nigeria do not have the theoretical expression of e-learning, but a significant portion (64%) of them possesses the empirical knowledge of e-learning.

Media activity consistency is explained as the ability of a social media user to stay concentrated on the execution and completion of a task before jumping to another. Due to the availability of numerous competing activities on social media, and with a high tendency of being distracted, checking for consistency is considered important while learning through a social media platform.

Table 12. Media activity consistency

	Variables	No. of participants (%)
i.	Consistent	40 (50%)
ii.	Distracted with content on Facebook	25 (31%)
iii.	No response	15 (19%)

To analyse the data in the table, the values for (ii, and iii) will be merged since it can be understood that the category of participants that could not respond to the question may have possibly been distracted as well. Therefore, data for those that were distracted and those that did not respond to the question equals 50%, while the value for those participants that were consistent was also 50%. Hence, being 50/50, media activity consistency could not be assessed reliably in this research.

Knowing the common type of device used by senior secondary school students to access e-learning courses will be helpful for instructional designers and e-learning developers that are concentrated on enhancing the learning abilities of students within the secondary educational level.

Table 13. Common device used for e-learning

Variables	**No. of participants (%)**
i. Mobile phones	50 (62%)
ii. Tablets / iPads	6 (8%)
iii. Laptop / Desktop computers	24 (30%)

The values in variables (i, and ii) are merged to represent mobile devices. It equals 56 participants (70%), while 24 participants (30%) claimed they access e-learning with laptop/desktop computers. Thus, we agreed that senior secondary school students access e-learning courses with their mobile devices.

To decide on the ability of senior secondary school students to deal with interactive and education media being the first specific objective of this research, Average Deviation (AV) will be computed to cluster, then contrast all the values under this objective against their data point.

Table 14. Average deviation

Variables	**Data**	**Average Deviation X**	**Datapoint**	**Average Deviation Y**	**Data**	**Variables**
Owns a computer	30	**19**	11	**39**	50	Does not own a computer
Familiar with digital devices {Yes}	47	**36**	11	**22**	33	Familiar with digital devices {No}
Internet for learning purpose	60	**49**	11	**09**	20	Internet for entertainment

						purpose
Meaning of e-learning {Yes}	30	**19**	11	**39**	50	Meaning of e-learning {No}
Empirical knowledge of e-learning {Yes}	51	**40**	11	**18**	29	Empirical knowledge of e-learning {No}
Media Activity Consistency {Yes}	40	**29**	11	**29**	40	Media Activity Consistency {No}
Common device for e-learning {Mobiles}	56	**45**	11	**13**	24	Common device for e-learning {Computers}

$$\varepsilon AD_x = 237 \qquad \varepsilon AD_x = 169$$

Hints: calculation of Datapoint: M = $\frac{Total\ number\ of\ participants}{no\ of\ questions}$ $\frac{80}{7}$

Average deviation: D = |d - m| the | |, represent absolute value.

Where 'd' represents the data for each variable.

The decision rule for Average Deviation says the larger the AD the greater the variability in a distribution of scores.

εAD_x=237, while εAD_y=169

4.1.1. Discussion

We found from our research that senior secondary school students do not usually own a personal computer, still they are familiar with digital devices by interacting with these devices within their environments. According to the primary data gathered and analysed, It is also found that most users of the internet that are secondary school students obtain the internet for learning and development.

However, senior secondary school students in Nigeria or beyond do not have the theoretical understanding of e-learning but possesses the empirical knowledge of what constitutes an e-learning environment, and its characteristics. This finding can be attributed to the link between learning environment and learning development. Since it is possible for students to learn at different locations, contexts, time, and cultures other than in the classroom and control their learning, it gives students access to artefacts and enables them to interact with other learning resources and digital devices to

have real encounter that stimulates their practical experience instead of acquiring sole theoretical knowledge from classroom (Papert, 1980b; Siemens et al., 2006; Vygotsky, 1978a).

The available data could not determine whether or not secondary school students possess the ability to stay consistent on activity on social media platforms, the outcome of our research on this subject is indifference. But senior secondary school students mostly use mobile devices to access e-learning courses.

4.2. Specific objective 2 - learners' motivation

Aspects of the learning approach that **stimulate learners' motivation** or interest to learn

Examining the impacts of the narratives and storylines as the factor that inspired the participants to interact with the two e-learning courses. Options to the questions in the questionnaire are; interesting, scary, confusing, educative, boring, and engaging were categorised into 2 namely; encouraging factors, and discouraging factors. Using an axial coding system, we can categorise the options as follow:

Interesting; Engaging; Educative= Encouraging factors

Scary; Confusing; Bored; No specify = Discouraging factors

Table 15. Impacts of storylines on learners' motivation

Variables	Course 1: **The loose elephant**	Course 2: **Punctuality**
Encouraging factors	48 participants (60%)	76 participants (95%)
Discouraging factors	32 participants (40%)	4 participants (5%)

Exploring the wide gaps between the variables in the two courses, both are enriched with clearer synopses and arousing storylines. But, course 1: The loose elephant, has video clips of real-life events embedded in the course which can cause graphic disturbance (scary) to some people, and which was the cause of part of the 32% of the variables accrued to 'Discouraging factors'. Therefore, considering the percentage of each of the variables in table 15, it is settled to claim that clear and arousing narratives and storylines if carefully embedded in a scenario-based e-learning course can motivate or inspire learners to learn.

When the experience gained from participating in a task is pleasant, it can sometimes encourage one to want to do it over and over. Accessing the number of times the participants visited each of the courses, and which of the courses is most preferred is an advanced move towards establishing the influence of good storylines in e-learning courses on motivating the learners. For the two e-learning courses, the data for frequency of access were presented as follow: Once; thirty-three participants (41%), More than once; thirty-seven participants (46%), Unspecified; ten participants (13%). For the analysis purpose, the data will be categorised. Therefore, 'More than once' and 'Unspecified' are categorised because it is easier to assume that the participants in the 'Unspecified' category would have accessed the courses many times and not been able to count them. Thus, equals forty-three participants (54%).

Table 16. Frequency of access

Variables	No. of participants	Percentage
Once	33	41%
More than once	47	59%

Percentage Deviation $\frac{6}{80} * 100 = 7.5\%$

The percentage weight of the participants that have interacted with the courses more than once is 59%, and it denotes that more than the average of the participants were motivated to learn with the courseware.

Table 17. Most preferred course

Variables	No of participants
The loose elephant	42
Punctuality	16
Both	14
Unspecified	7

More participants indicated that they prefer the loose elephant course because it teaches them to do the right thing, how to make a quick decision, how to identify and analyse danger and to be kind to

animals. While those that prefer the course punctuality stated that the context of the course is related to frequent daily activities, and it is clearer, and challenges them to think critically and in a creative manner. Given all these reasons by the participants, however, it is important once again to note that, the course the loose elephant contains short videos that illustrate the real-life event. This may have contributed to the higher number of participants that gave preference to it.

4.2.1. Discussion

A significant number of the participants indicated that the storylines of the two courseware are encouraging, and this was confirmed with the percentage weight of participants that accessed or interacted with the courses mora than once. This correlated with the assertions of some authors in the literature of storytelling and education that, narratives with consistent storylines often serve as an engagement strategy to promote students' learning (Boris, 2017; Rhodes, 2019; Sankey et al., 2010) However, there is a discrepancy when comparing the values of 'Discouraging factors' for 'The loose elephant' with the emerged value for the most preferred course. There supposed to be an indirect or opposite relationship between the two variables; 'Discouraging factors' and 'Most preferred'.

4.3. Specific objective 3 – learners' engagement

Factors that **trigger learners' engagement** to keep focus and remain attentive during the learning process.

Factors that stimulate active engagement during a learning process vary, articulating the determinants for engagement in e-learning courses, can start from observing the structure and responsiveness of an e-learning course on the different devices of learners.

Table 18. Descriptions of the structure (responsiveness) of the courses

variables	The loose elephant	Punctuality	Scale of intensity
Perfect	27	10	1st
Good	16	45	2nd
Moderate	15	16	3rd
Bad	22	9	4th

For proper analysis of the data in table 18 the scale of intensity will be categorised into three states; positive (+), neutral (|), and negative (-). States of 'Perfect' and 'Good' (positive), 'Moderate' (neutral), and 'Bad' (negative).

Table 19. Responsiveness intensity

Course (No. of participants)		**%**		**State of intensity**
The loose elephant (43)	Punctuality (55)	(54%)	(69%)	1st (Positive)
The loose elephant (15)	Punctuality (16)	(19%)	(20%)	2nd (Neutral)
The loose elephant (22)	Punctuality (9)	(27%)	(11%)	3rd (Negative)

Finding the %Weighted Average (WA) of the percentages for each state of intensity.

(Positive) $\frac{54\%+69\%}{2} = 61\%$

(Neutral) $\frac{19\%+20\%}{2} = 20\%$

(Negative) $\frac{27\%+11\%}{2} = 19\%$

The percentage WA for 'Perfect and Good' which were categorised as (positive) is 61% and is the highest among the categories. It denotes that scenario-based e-learning courses with active responsive features can activate engagement in learners and keep them attentive throughout the learning process.

The difficulty level of the required task in a scenario-based e-learning course may determine the extent to which individual learners can pull through during a learning process. Our research investigated the instant effect of task difficulty level on the assimilation progress of the learners. Three stages of difficulty were suggested in the questionnaire, and they are: 'Easy, 'Very easy', and 'Difficult'.

For the analysis, the three stages will be categorised into two whereby, 'Easy and Very easy' will be merged and become 'Easy'. Hence, we have two difficulty stages namely; 'Easy' and 'Difficult'.

Table 20. Task difficulty level

Variables	The loose elephant	Punctuality
Easy	61 (76%)	64 (80%)
Difficult	19 (24%)	16 (20%)

Find the percentage Weight Average for task difficulty level for the two courses.

%WA Easy $\frac{76\% + 80\%}{2} = 78\%$

%WA Difficulty $\frac{24\% + 16\%}{2} = 20\%$

The %WA for 'Easy' is 78% which is far beyond the average percentage. This implies that the participants found the required tasks in the two scenario-based e-learning courses easy, and this may have contributed to their abilities to be fully engaged in the learning process.

Distractions are the elements that cut the flow of concentration or being deeply involved in an activity. And the adverse effect of this practice on productivity is found in the literature (Mccoy, 2013). These distractions can come in different forms and, their effects are severe depending on the complexity and sensitivity level of the task being performed. In the science of learning, multitasking is observed as a threat to an attainment of effective learning. Hence, in our research, the quality of attention that the participants exercised during the learning process was assessed. Using an open coding system, the data derived under this question were categorised as follow: Concentrated; 33 participants (41%), Chatting, music, & games; 41 participants (51%), Unspecified; 6 (8%). For simple analysis, the values for chatting, music, & games, and Unspecified will be merged.

Table 21. Media multitasking

variables	Participant no. (%)
Concentrated	33 (41%)
Chatting, music, & Unspecified	47 (59%)

The percentage value for Chatting, music, & Unspecified is 59% claiming forty-seven out of eighty participants. It indicates that there is a high tendency of multitasking during scenario-based e-learning

learning process. It implies that full concentration is not guaranteed when learning using SBL e-learning approach.

Complete or total engagement during a learning process can be a function of the ability of a learner to complete or follow a learning activity to the end. Our research also investigated the fraction of the participants that completed or followed the learning process till the end. On the last slides or scenes of the courses, a button is supplied, when clicked would bring the learner back to the social learning group on Facebook. Here, they can drop feedback, comments, and or opt-out. Various responses were given, and have been coded into the following five categories of variables;

Table 22. Extent of engagement

	Variables	**No. participants (%)**
i.	Nothing, I ended the course	30 (37%)
ii.	Went through the courses over again	34 (42%)
iii.	Search the internet for similar courses	7 (9%)
iv.	Continue on social media	5 (7%)
v.	Unspecified	4 (5%)

For the purpose of analysis, the data in table 22 are reduced to two categories with the use of an axial coding system. On this note, variables (iii), and (v) are similar and are put together named 'Not completed', while variables (i), (ii), and (iv) are named 'Completed'.

Table 23. Extent of engagement (categorised)

Variables	**No. of participant (%)**
Completed	69 (86%)
Not completed	11 (14%)

The variable 'Completed' has the higher percentage; 86%, which implies that 69 out of the 80 participants have interacted with the courses till the end as a result of being fully engaged with the learning process.

4.3.1. Discussion:

It has been found that a well-structured scenario-based e-learning course can trigger and stimulate learners' engagement. That is e-learning courseware with an active responsiveness feature can stimulate learners to be deeply involved in a learning activity. Because this feature enables the adaptability of the courseware to fit in and function smoothly on all digital devices irrespective of the maker and screen size. It aids a friendly graphical user interface that gives a pleasant digital interactive experience. Also, when the required task for learning is not hard for learners to interpret and digest, this will keep them participating in the learning activities, and going with the flow of the learning process (Csikszentmihalyi, 1990; Pearce, 2005).

However, the pattern of the analysed data shows that scenario-based e-learning courseware can encourage multitasking. Before we applied the Open coding system to categorise the participants' responses, the raw data includes 'listening to music, playing games, 'watching movies' etc. This shows that some elements of distraction cannot be ruled out in such a learning environment., 41% of the participants could concentrate on their learning while the remaining 59% were involved in more activities at the same time other than learning alone. Meanwhile, 86% of the participants indicated they completed the courses, it indicates that the features and factors tested above are significant to learners' engagement.

4.4. Specific objective 4 - learners' cognitive experiences

Learners' cognitive experiences that enable learning gains through critical connections with previous knowledge.

The ability of learners to express or demonstrate the effects of the knowledge acquired after being involved in a learning activity is tremendously one of the purposes of learning. In an attempt to illustrate the possible cognitive experiences that participants may have gained having interacted with the two scenario-based e-learning courses, some variables were tested and are analysed below.

Table 24. Lesson learned

The loose elephant: No. of Participant (%)	**Punctuality: No. of Participant (%)**
i. To be helpful and kind to animal; 15 (22%)	i. Time management; 17 (27%)
ii. To try to have control over situations; 19 (28%)	ii. To be disciplined and punctual; 13 (21%)
iii. Taking precautions, swift responses; 25 (37%)	iii. Acknowledging source of problem; 26 (41%)
iv. Decision making; 9 (13%)	iv. Critical thinking; 7 (11%)

All the responses as categorised and listed in table 24 shows that the two courses have positive impacts on the participants' reasoning abilities. They were able to demonstrate verbally what has been gained or learned from interacting with the courses. Clustering relevant categories of response, category (ii, and iii) for the loose elephant, and category (ii, and iii) of punctuality both correlate with the learning objectives of the courses. This means that 65% and 62% of the participants respectively were able to demonstrate knowledge grasped that are related to the learning objective of each of the courses; the loose elephant and punctuality.

To ascertain the overall proportion of the participants that have gained knowledge corresponding to the learning objectives for the exercise, percentage weighted average for the relevant categories of responses is calculated.

$$\%\text{WA} = \frac{65\%+62\%}{2} = 66\%.$$ This implies that 66% of the participants accurately demonstrated the knowledge gained.

Assessing the ability of the participants to think deeply and take charge of their learning activities during a learning process is also a concern toward the attainment of the research aim. As part of our investigative activities, questions were asked to assess the effectiveness of scenario-based e-learning on the critical thinking ability and independent learning skills of the participants.

Table 25. Critical thinking and independent learning ability

Variables	**No. of participants (%)**
Alone	48 (60%)
Not alone	32 (40%)

The pattern of the data in percentage in table 25 justifies that more than average of the participants were able to learn through the courses alone without any supports or assistance. Also, it can be interpreted to mean that, their ability to think critically and deeply would have helped them in the process.

The focus group in this research are the senior secondary school students. This set of people is young learners whose classroom learning is still very much part of their learning environment. Our research activity is extended to assess the relevancies of scenario-learning e-learning courses on aiding the understanding of classroom subjects the participants learn in their schools.

As expected, individual participants stated with explanations the subject areas in which each of the courses is relevant. Thus, many subjects were listed by the participants, but to simplify the analysis process, those subjects were categorised based on disciplines such as Science, Arts, Social sciences and Management, etc. Also, there are cases where some participants did not identify any classroom subject relevant to their courseware. In these cases, it is termed 'Unspecified'.

Table 26. Relevancies of the courses to classroom subjects

	Sciences	**Soc. Sciences & Management**	**Arts**	**Unspecified**
The loose elephant	28 (35%)	-	27 (34%)	25 (31%)
Punctuality	14 (18%)	37 (46%)	-	29 (36%)

To ascertain the overall impacts of scenario-based e-learning courses on the disciplines listed in table 26 the percentage weighted average for each of the disciplines will be calculated.

%WA for Sciences $\frac{35\%+18\%}{2} = 27\%$

% coefficient for Soc. Sciences & Management = 46%

% coefficient for Arts = 34%

%WA for Unspecified $\frac{31\%+36\%}{2} = 33\%$

Our concern here is the percentage of the 'Unspecified category'. This category represents the group of participants that could not attribute the relevancy of the courseware to any area of their studies. It implies that $^1/_3$ of the whole participants could not relate the contexts of the two scenario-based e-learning courses with any of the subjects they offer in school.

Another reliable method we adopted to measure the complexity level of the context in the courseware about the comprehension rates of the participants is to check the number of attempts each of the participants made to understand the learning objectives.

Table 27. Number of attempts

Variables	**The loose elephants**	**Punctuality**
More than twice	19 (24%)	24 (30%)
Twice	17 (21%)	20 (25%)
Once	44 (55%)	36 (45%)

Indicated in table 27 is the data for the number of attempts as applicable to each of the courseware. To ascertain the entire pattern of behaviour of the participants as regards their comprehension ability, a percentage weighted average will be calculated.

%WA for 'More than twice' $\frac{24\%+30\%}{2} = 27\%$

%WA for 'Twice' $\frac{21\%+25}{2} = 23\%$

%WA for 'Once' $\frac{55\%+45\%}{2} = 50\%$

The pattern of the result is correlate with the outcome for 'Task Difficulty Level' tested earlier. Considering the percentage weighted average for the three variables, those participants that attempted the courses once are 50% which means that up to the average of the participants understood the contexts of the course without much ado.

Learners' ability to distinguish between different learning environments and their characteristics is essential to understand the need to adjust and or improve their behaviours towards learning. We investigated this to further our findings on the learners' empirical knowledge to differentiate between the modern learning environment and the conventional one.

Table 28. E-learning vs. the traditional learning system

	Variables	**No. of participants (%)**
i.	More advanced	14 (17%)
ii.	Easy, faster, and wider knowledge	47 (59%)
iii.	Interesting	5 (6%)
iv.	Classroom learning more attractive and explanative	11 (14%)
v.	Undecided	3 (4%)

Table 28 indicates the levels of participants' knowledge on learning environments and their components. About 86% of the responses exhibited knowledge about the advantages and characteristics of e-learning and the modern learning environment. This implies that the participants are familiar with a modern learning environment. However, the eleven participants (14%) that advocated for the traditional learning system by citing some of its characteristics are worth further research (Baird & Fisher, 2005) Critics of e-learning.

One of the major characteristics of SBL approach is the enablement it gives learners to apply knowledge gained to real-life activities, thus, meaningful learning has taken place.

Table 29. Lesson learned as related to daily activities

The loose elephant	**(%)**	**Punctuality**	**(%)**
How to manage situations with care	41%	To be fast and steady	13%
Patriotic acts and decision making	27%	Enhance moral education & discipline	21%
Taking responsibility and being cautious	19%	Work with time & control of activities	31%
Undecided	13%	Analysing situation and critical thinking	14%
		Undecided	21%

The majority of the participants have been able to demonstrate how the lesson learned from participating in the scenario-based e-learning activity would impact their behaviours and daily activities. But there are a set of participants that could not be identified with any decision and are tagged 'Undecided'. It is important to ascertain the weight of this category in the distribution.

$$\%\text{WA } \frac{13\%+21\%}{2} = 17\%$$

This indicates that 17% of the participants could not find SBL approach useful to their daily activities.

4.4.1. Discussion

The majority of the variables assessed in our efforts to evaluate the participants' cognitive function in connection to their previous experience and their ability to accommodate new knowledge, have proven acceptable, supportive and positive. For instance, more than the average of the participants were able to take charge of their own learning and completed the courses successfully. Another important finding is that due to the none complexity of the contexts in the e-learning courses, participants were able to navigate through it, understood it and, successfully identify areas of their lives where the new knowledge and skills gained are suitable.

However, one-third of the whole participants that could not accommodate the new knowledge with their previous experience calls for adequate attention. Because, according to Piaget, assimilation without the ability to easily accommodate the new knowledge is what is known as learning disequilibrium (Bhattacharjee, 2015). And, at the prevalence of this situation, meaningful learning has not taken

place. Also, about 14% of the participants openly rejected e-learning and the modern learning approach with substantial reasons that could attract adequate attention for future research (Baird & Fisher, 2005). Critics of e-learning.

FINAL CONSIDERATIONS

The process of educational research is expected to follow a well-sketched sequential plan with adequate observations of research ethics and without any academic misconduct. Having followed through with a well-defined plan to carry out the research, the final section of the thesis is presented as outlined below. This section is sub-sectioned into three namely: Limits; Further research; and Conclusion and recommendation. The three sub-sections contain:

(i) the expressions of difficulties and challenges experienced during the investigation which subjected the researcher to certain decisions;

(ii) the details of all relevant and important discoveries that are outside the thematic scope of the research. Also, under this sub-section are the discoveries that are proposed for further research;

(iii) the conclusion of all the discussions of findings for each of the specific objectives as presented in the results analysis chapter, lastly and the recommendations.

Limits

Due to the relevancy and impacts of educational research on human endeavours, growth and development, the characteristics and functionalities that are required for educational research design and methodology have subsequently been determined by some factors. These factors impact and influences the interpretations of research findings. Discussed below are some challenges and subjective conditions that are worth outlining which the researcher faced during the investigation.

Being a full-time research programme, all the required and necessary attentions were devoted to purporting the observation of original research, and to obtaining and presenting concise findings. Out of various challenges experienced, the major one started in the second year of the programme in late 2019 to 2020; the COVID-19 pandemic. An epidemic that affected the smooth running of world economies and all other sectors. Whereby, educational sector across the globe is[64] one of the most affected. During this time, the pedagogy systems at all educational levels, including research activities were adversely affected.

Due to the index of cases of the epidemic in Europe; in Portugal, schools were shut down, physical interactions were discouraged, and for sometimes, deactivated in the public domain. This development

64 The verb "is" deemed appropriate in the sentence because as of the date of writing this section educational sector worldwide is still being affected by the pandemic. But not as severe as it was in the beginning, because effective vaccines have been developed, and humans have learned several ways of managing the epidemic.

deprived me (the researcher) access to secondary school students in Portugal who were the presupposed participants and prospective respondents for data collection for the research. But, in Africa, most especially Western Africa, the situations of things as regards to the pandemic were not so tense nor was it threatening compared to other parts of the world. Hence, to progress in the research, the geographical location for the data collection exercise and focus was shifted to the Nigerian educational context.

This change coupled with the intercontinental movement restrictions law that was enacted during those periods, subjected the operation and coordination of the data collection to be performed from the distance; via the internet. However, it is equally imperative to stress that all activities in the process were monitored and perfectly carried out as it is supposed. The activities are the online administration of courseware through an LMS and the physical administration of the questionnaire. Competent authorities and individuals in academics were appointed to coordinate the questionnaire administration process. Therefore, to re-strategize, and been sure that the data collection activity is carried out as planned, this process and its implementation required more time and resources.

Further research

Questing for a suitable solution to the research problem led to the discovery of more facts about learning and development, and education in general. Some of these discoveries are outside the scope of the research, and due to a limited time, those discoveries are outlined for further exploration and research.

i. Albert Bandura was a dominant behaviourist and cognitive psychologist, he claimed that the causes of change in human behaviour are found not in the organism but environmental forces (Bandura, 1971; Deaton, 2015). This claim is not sufficient as an indispensable component of human learning since those factors are not clearly elaborated. Unlike Vygotsky's social-cultural theory (Lev Vygotsky, 1986; López Abeledo, 2008), which express the scientific impact of social interactions on human learning. Proponents of cognitive development theories are not comfortable with this claim. Since both the behaviourism and cognitivism approaches emphasize the scientific understanding of how humans learn, further research is suggested to clarify this assertion and clear the academic argument.

ii. Having found motivation (i.e., desire) as a component of emotion, and the foremost must accomplish a states of being, and mind (Brewster & Fager, 2000; Chuter, 2019; Parsons &

Parsons, 2014) if the goal of such leaning process is to organise and deliver meaningful learning. Some educators recognise intrinsic motivation as the most suitable for learning because it is not triggered by an external factor. It functions with the innate and constructivist abilities of an individual (Hewitt, 2008; Watkins et al., 2002). Extrinsic motivation on the other hand is attributed to the behaviourist approach of learning which is being influenced by external factors (Bufford, 2016; Jorg et al., 2007). For extrinsic motivation, such desire to learn or participate in a learning activity does not arise from within but determines by compensations and reinforcements. As an educator with an intense interest in learning and development, it is intended as part of my research schedule in the future to explore and merge the constructivist views and behaviourist views of motivation in learning, to understand their impacts, and applications to aid meaningful learning.

iii. Assessment is identified as one of the important components in the process of learning. Moreover, since pedagogy system concentrates on the inter-relationship of the components and elements of teaching-learning activities, then it is of my opinion that, organising and acquisition of meaningful learning within a technology-enhanced learning environment can be more accessible when the teacher or instructor acquires relevant skills and knowledge needed to operate and interact optimally with modern learning resources (digital devices and software for learning). In this environment, teachers' or instructors' function is to guide the learner and tailor them towards achieving their learning objectives. However, if the person that will guide and accompany the students in their learning does not possess sufficient technical skills, the available learning resources (human cognition and digital technologies) might be underutilized. Therefore, attention is needed on sensitisation and capacity building of instructors in this contemporary educational system.

Following are other discoveries that emerged from the presented results but could not be justified based on insufficient facts to back them. These discoveries could not be neglected or omitted because of their importance to didactic. Hence, further research might be necessary.

Media activity consistency: - Collected data could not ascertain the activity behaviour pattern of the participants on social media. We tried to check how consistent are the students' activity performance on social media. That is their ability to start, concentrate on, and complete an activity while on social media before switching to other ones despite the presence of numerous content and distractors on the

platforms. By the result analysed, a decision could not be made due to equal percentages outcome. This aspect is significant to identify the rate at which social media affects concentration, even when learning through any of the platforms.

Critics of e-learning: - The Percentage (14%) of the participants that have acknowledged and preferred classroom learning (conventional) over e-learning should not be neglected. Tangible reasons were listed to justify their choice. This means that conventional learning systems may continue to be relevant in some areas of the world. According to some reasons listed, e-learning environment lacks human connection, and emotion, hence, is devoid of interactions with peers and instructors. However, in the literature, Baird and Fisher (2005) has disputed this claim with the assertion that, effective usage of media technologies can provide e-learning developers and instructional designers with the ability to interject emotion in e-learning environment (Baird & Fisher, 2005).

Learning disequilibrium: - According to Piaget, learning is at equilibrium when a learner can easily fit in the acquired new knowledge with the existing ones. Piaget named this term assimilation and accommodation (Beck, 2016; Lefa, 2014; Selwyn, 2011). According to the analysed results, around $^1/_3$ of the whole participants could not relate the contexts of the two scenario-based e-learning courses with any of the subjects they offer in school. They assimilate but struggles to accommodate the new knowledge with the existing ones.

Conclusion

This aspect consists of the syntheses of all the findings corresponding to the four specific objectives of the research to justify the point or degree to which the research aim has been achieved. Our aim for conducting this research is to explore and understand the systematic and scientific relevancies of scenario-based learning approach and social media to support effective learning for secondary school students.

The conclusions as presented below are strictly based on the key findings after analyses of the results.

In the secondary education context, male students are actively involved in the usage of digital devices than their female counterparts, either for learning or entertainment purposes. And, most of the students in this category do not own a personal computer but acquire basic computer appreciation skills through access to public computers within their environment. It was found that secondary school students use mobile devices as digital tools to browse the internet and to access e-learning courses. According to the finding, students are usually motivated and inspired to learn due to a conducive technology-oriented learning environment that featured the factors highlighted below:

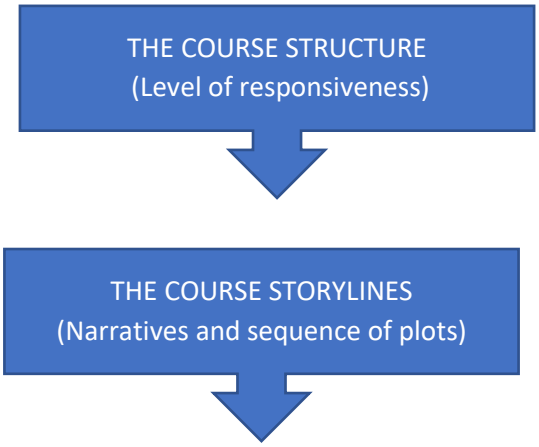
- a learning approach that gives students an enablement to learn independently and process knowledge at their own pace;
- a learning approach that allows to improve learning skills and interact with peers online;
- availability and access to modern digital technologies for learning;
- reliable internet facility and easy access to information;

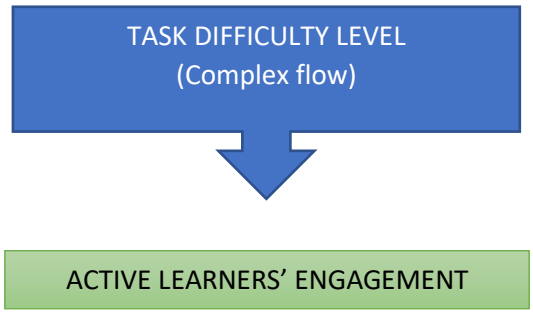
When the learners are already motivated to learn, the next stage in the process is to keep them engaged; this stage is the most sensitive in the process of learning. Learning engagement is a state in a learning process that determines the quality of attention and focus, and the ability to exercise critical thinking skills. Adopting scenario-based learning approach as the learning technique, three important factors have been uncovered that can keep learners actively engaged throughout the learning process. These are the key factors that influence students' engagement while learning with SBL approach:

- The course structure (level of responsiveness)
- The course storylines (Narratives and sequence of plots)
- Task difficulty level (Complex flow).

It is important to note that these three factors should be achieved in precedence order. An omission or disorder of one of it may truncate the optimism level of an achievable learners' engagement during the learning process. Figure 18 illustrates the orderliness of factors that influence learners' engagement in SBL approach based on the research findings.

Figure 18. Factors that influence learners' engagement in SBL approach





Source: *The researcher's idea*[65]

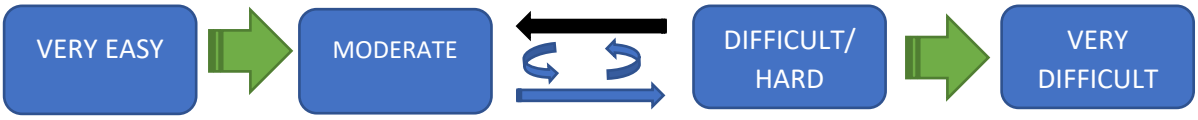
The course structure: The structure of an e-learning course is an outward appearance of the course, and this has a significant impact on learners' behaviour at the very beginning towards their learning. The structure of an e-learning course comprises of the User Interface (UI), and the Responsiveness feature. If the user interface of a scenario-based e-learning course is friendly, and with attractive navigations, it gives learners a pleasant experience. Active responsiveness feature enables e-learning courses to display accurately and fit-to-screen on all digital devices irrespective of their screen sizes and quality. All these features tend to encourage learners to continue participating, and engross them in the learning activities.

The course storylines: Scenario-based learning approach deals with the simulating of real-life occurrences and plausible events as e-learning materials. Storylines of a scenario or an event are the narratives and coherent sequence of plots. The more interesting and understanding the storylines of an SBL courseware the more immersed are the learners in the learning activities. Hence, an increasing level of active engagement.

Task difficulty level: The complexity rate of the required tasks of a scenario-based e-learning course should observe the learning abilities of every learner participating. At the beginning of the course, this task should be presented at a "very easy or easy" level to gain the attention of learners and build their confidence to continue participating. As the learning activities progress, the difficulty level of the required tasks is not expected to stagnate, but to increase slowly at a very consistent rate to keep all the learners in the flow (Csikszentmihalyi, 1990; Pearce, 2005). A model has been developed to illustrate the complex flow of required tasks in a scenario-based e-learning course, and the pattern of behaviours of the learners.

65 Based on active reflection on the data collected and likely relationship that exist among the factors.

Figure 19. Complex flow and behavioural pattern



Source: *The researcher's idea*[66].

In figure 19, the most important stage in the flow is the movement between 'Moderate' and 'Difficult'. At this level, several actions and decisions are taking place between these two stages. In-between these stages, a mechanism of action is usually formed because it is most likely that some learners will not proceed from the 'Easy' stage to the 'Difficult' stage at their first attempt. However, if the course's storylines are interesting and are well comprehended by the learner, this activates their willingness to reattempt from the previous scene or slide after failed attempts. Hence, a cyclical movement until the learner gets it right and can proceed to the next stage. This is one of the characteristics of SBL; it allows learning in a trial-and-error approach in a safe learning environment without any inimical and costly consequence. According to Edward Thorndike, learning is incremental in a trial-and-error situation (Hammond et al., 2001; Woodworth, 1952). This is why it is recommended that the three factors that determine learners' engagement in a scenario-based e-learning environment be achieved orderly as illustrated in figure 19 above.

The point is that the ability of an individual learner to continue analysing every scene/slide/level of a scenario-based e-learning course as the learning proceeds will keep them on track, and engrossed in the learning activity. Also, it is observed that there is a close and direct relationship between active engagement and cognitive functions. When learners are actively engaged and engrossed in a learning process, it enhances their mental abilities which include attention, creative thinking, reasoning and remembering, decision making, and problem-solving.

All the stages in the learning process and factors that have been identified as determinants of learner' engagement have also contributed to the students' cognitive skills functionality. Students were able to comprehend the learning context, and demonstrate knowledge gained because, the storylines and required tasks of the two scenario-based e-learning courses were relevant, and coherent with their emotions. Also, this learning approach encourages independent learning and charged the learners to think critically towards exercising the practical knowledge of whatsoever that has been learned.

66 Based on careful observations of the participants' behaviours and pattern of their activities on the LMS where the two scenario-based e-learning courses were uploaded.

In conclusion, relevant and interesting storylines have positive impacts on secondary school students' learning when learning through SBL approach. Three components of SBL course that determines the levels of learning achievement are; course structure, storylines, and task difficulty level. Therefore, with the increasing availability of modern learning resources, SBL approach and the use of social media in learning is contributing tremendously to students' desire to learn. Secondly, a scenario-based e-learning course that is prepared in accordance with the principles and factors as outlined in our findings is sufficient to;

(i) stimulate active students' engagement;

(ii) enhance cognitive skills functionality;

(iii) charge the learners to exercise the practical knowledge. Hence, meaningful learning.

Considering some of our key findings; most especially the model developed in figure 18 of this thesis, it is recommended that assessment of learning should focus strongly on how to increase the desire to learn, and stimulate active students' engagement.

Based on the consistency of thought and knowledge gathered throughout the research activities, assessment of learning (formative) should be the suitable strategy for assessing scenario-based e-learning impacts on learners. SBL approach is a learning approach that links theory to practice. Considering this important feature, it is opined that there should be a documented procedure (guide or model) of implementing the process of formative assessment as a tool to monitor and develop the impact of SBL on learning. This move can be part of the efforts to formally establish the learning approach as suitable for the secondary pedagogy system. Observing the functionalities and features of LMSs, a strong link can be established between LMS and formative assessment strategy.

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APPENDICES

- Letter of intent
- Supervisor's note
- Brief interview script
- Navigation guide
- Questions and their purpose
- The questionnaire

Appendix 1. The letter of intent.

To: - .....

School.....,

State .....,

Nigeria.

Dated, 12th June 2021

Subject: Letter of intent for data collection

Dear sir,

This is a letter seeking your permission to use your educational facilities and to allow the students to participate in the data collection exercise. My name is Adebayo Adebiyi, 38, an active PhD student of Educational Sciences with a speciality in Educational Technology at the University of Minho, Braga, Portugal. Being a trained teacher, my passion and interest in education are immense most especially in learning. Outlined below is the summary of the doctoral research, contact details and a brief introduction of the research supervision.

The doctoral research project titled; "Scenario-based Learning Approach and Social Media to Support Secondary School Students' Learning" aims to understand the scientific and systematic approaches of assessing the pedagogical relevancies of Scenario-based Learning approach (SBL) and social media on the actualization of meaningful learning. More preference is given to the articulation of SBL and social media towards supporting effective learning among senior secondary school students. For a clearer understanding of the research aim, SBL is defined as a technology-enhanced learning technique and practice that involves the simulation of near facts, real-life past events, and case studies through authoring tools, targeting towards enhancing learners' cognitive skills. This learning approach is usually a students' centred learning model that allows the learners to take active charge of their learning. However, the acquisition of meaningful learning depends largely on the learning environment, resources, and for the instructor to be aware of individual learners' uniqueness. Acknowledging this fact, hence, the investigation.

This is a doctoral project being supervised by Prof Antonio J. Osorio, who has teaching experience in the initial and continuous training of educators and teachers and research experience in educational

telematics, as well as coordinating several national and international research projects in the field of Educational Technology or Information and Communication Technologies in Education. Prof Osorio is also the director of master's degree courses and supervisor of several masters and doctoral projects in these areas of specialization.

Contact details of the supervisor and for the researcher are supplied below. Either of the two persons can be contacted for inquiries and or further clarifications. Also, attached with this document is the formal statement of the supervisor.

The supervisor

E-mail: ajosorio@ie.uminho.pt

+ 351 253 601 203 | Skype: ajosorio | Zoom: https://videoconf-colibri.zoom.us/my/ajosorio

Address: Institute of Education, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.

The researcher

E-mail: adebiyiblessing@outlook.com

Address: Institute of Education, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.

I shall be unquantifiable grateful to the management and authority, the teachers and all the students if my request is considered, along with an atmosphere of professional collaboration.

Regards,

_____

Adebayo Adebiyi

Appendix 2. The supervisor's note

Universidade do Minho
instituto de Educação

Introduction Letter

To whom it may concern.

I hereby declare that I am the supervisor of doctoral student **Adebayo Ibukun Adebiyi**, who was admitted in our doctoral program in Educational Sciences in the specialty of Educational Technology, having presented a project titled "**Scenario-based Approach and Social Media to Support High School Students Learning**".

For his doctoral research, and with a view to collecting data for further treatment and analysis, **Mr. Adebiyi** has designed and planned an educational intervention, to be administered to groups of students from selected Nigerian secondary schools; consequently, he is proposing to select your school as a sample to implement the data collection exercise, and if accepted, this will enable him to completely organise and present his project to the University.

Therefore, I would be grateful if assistance could be given to **Mr. Adebiyi** in this respect, since this collaboration will be essential to the achievement of his relevant project.

Being available for any further clarification that may be proven necessary, I offer my best regards.

António José Meneses Osório

(Professor Associado com Agregação)

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Appendix 3. Brief interview script

Brief oral interview questions to select the participants.

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- How old are you? (16 – 20 years)
- Do you have a smartphone?
- Do you have a Facebook account?
- Do you belong to/ how many groups did you join on Facebook? (At least one)
- Have you used a computer before?

- How old are you? (16 – 20 years)
- Do you have a smartphone?
- Do you have a Facebook account?
- Do you belong to/ how many groups did you join on Facebook? (At least one)
- Have you used a computer before?

Appendix 4. Navigation guide

An instructional guide to access the courses.

- ***Step 1***. On your Facebook account, on the search bar at the top type '**#SBL approach'** and click the search button or this  icon.
- ***Step 2.*** Click on the SBL social learning group / SBL group.
- ***Step 3.*** Send a request to join the group. You will be accepted automatically.
- ***Step 4.*** On the group timeline, the links to the two courses are pasted. Click on each of the links to be redirected to the course location.
- ***Step 5.*** On the next page, scroll down and click on **'sign in as a guest.'**

  Then click 'Enter' the course will load, and you can interact with it.

Thank you for participating.

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Appendix 5. Questions and their purposes

Questions and their purposes

This questionnaire is the second stage in the data collection exercise of the research. It is developed in collaboration with the contexts of the two scenario-based e-learning courses to collect first-hand quality information about the experiences of the participants having interacted with the courses. The goal of the questionnaire is to serve as a tool to truly explore the mind of the participants and foster the acquisition of participants' experiences with the e-learning courses. Experiences in this regard are related to their level of exposure to digital technologies and media interaction, motivation, engagement, relevance to real-life, helpful in learning, reports on learning behaviour, etc.

Questions and their purposes.

i. Where do you have access to a computer?

***This question is asked to understand the pattern of ownership of computers amongst secondary school students in Nigeria*.**

ii. How often do you use a computer?

This question is asked to measure their familiarity with digital devices

iii. Why do you always subscribe to the internet package on your smartphones?

This question is asked to ascertain the purpose (what they usually do online) of having the internet on their devices.

iv. What is e-learning?

This question is asked to know if they have the basic knowledge of what e-learning looks like*.*

v. How will you describe the activities and components involved in e-learning?

This question is asked to know if they have experienced any form of e-learning and if they are aware of it*.*

vi. How will you distinguish e-learning from any other forms of learning you have experienced e.g., classroom learning?

This question seeks to understand if the participants could easily identify the change in the learning environment.

vii. Which device did you use to access the courses?

We asked this question to check randomly the most common type of device used to access e-learning both online and offline.

viii. Choose from the option given, how would you describe the structure and display of the courses on your device?

The question is asked to know if the courseware displayed perfectly on their devices without any issue related to navigation.

ix. From the given options, how would you describe the storylines and illustrations in the courses?
***The question is asked to know if the narratives in the courses caught the attention of the participants. We check for 'motivated' here**.*

x. In one sentence, explain how easy or difficult was it for you to understand what you were required to do and navigate through the courses?
***This question is asked to check if the participants were able to go with the flow of the course context during the learning process**.*

xi. For each of the courses, in one sentence can you explain how it is related to any of the subjects taking in your studies presently?
***This question is asked to ascertain if the courseware has a relative impact on any of the subjects they learn in school and possesses the ability to improve learning achievement**.*

xii. In a simple sentence, can you write the lesson learnt from each of the courses
***This question is asked to check the impact of the courses on their creative thinking abilities**.*

xiii. What was the frequency of the attempt you made until you arrived at the right answer?
This question is asked to compare the comprehension and decision-making skills of the participants. The purpose of checking this is to assist in understanding how quick the participants can make decisions.

xiv. Did you attend the courses alone or with the contributions of people around you?
***This question is on critical thinking and the ability to make a decision independently**.*

xv. What was the challenge or difficulty you encountered during your learning with courses?
***This question seeks to investigate individual learners' uniqueness that needed to be considered while crafting e-learning courses**.*

xvi. On Facebook, what did you do immediately you gained access to the group?
***This question is asked to know if the contents on Facebook distract their attention**.*

xvii. What other activities were you performing on your device when the course was still actively displayed on your device's screen?
***This question is asked to check for technology-induced multitasking while learning**.*

xviii. You have completed the courses and you were redirected to the social learning group what did you do?
***This question is asked to know the number of participants that actively completed the course, and submit feedback**.*

xix. How many times did you visit each of the courses and, which of the courses you understand and preferred the most?
***This question is asked to evaluate the extent of motivation and engagement in the learning process**.*

xx. During the learning process did you discuss the scenarios or attend the course with people around you while deciding on the right choice of an answer?

This question is asked to check for the ability to make a decision, and learn independently.

xxi. What exactly are the lessons you have learnt from each of the courses?

This question is asked to check if the participants have acquired the specific objectives of the courses.

xxii. In one sentence, describe how helpful you think the lessons learnt from each of the courses will be when applied to daily life activities.

This question is asked to check if meaningful learning has taken place.

xxiii. Rated from 1 to 5. 1 being the strongest recommendation and 5 the weakest.

Rate the level at which you will recommend these courses to your mates that did not participate in the exercise.

This question is asked to confirm the effectiveness of the SBL approach in secondary school education.

Appendix 6. The questionnaire

Questionnaire

Note that information supplied in this questionnaire is treated as anonymous.

Gender: M ☐ F ☐

Age: -.....

I. Where do you have access to a computer?

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II. How often do you use a computer?

a. Every day b. Three days a week. c. Once a week

III. What is your main purpose in using the internet on your device?

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IV. What is e-learning for you?

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V. How would you describe the activities and the tools involved in e-learning?

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VI. How would you distinguish e-learning from any other forms of learning you have experienced e.g., classroom learning, collaborative learning, etc.?

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VII. Which device did you use to access the courses?

a. Mobile phone b. Tablet/iPad c. Laptop computer/Desktop computer

VIII. Which device or devices did you use to access other e-learning courses?

a. Mobile phone b. Tablet/iPad c. Laptop computer/Desktop computer

IX. Considering the following options, how would you describe the **structure** of each of the courses on your device?

The Loose Elephant

a. Badb. Moderate c. Good d. Perfect

Punctuality

a. Badb. Moderate c. Good d. Perfect

X. Considering the following options, how would you describe the **display** of each of the courses on your device?

The Loose Elephant

a. Bad b. Moderate c. Good d. Perfect

Punctuality

b. Bad b. Moderate c. Good d. Perfect

XI. From the given option, how would you describe the **storylines** in each of the courses?

The Loose Elephant

a. Interesting b. Scaryc. Engaging d. Confusing e. Bored Other? Add your opinion: -
.....

Punctuality

a. Interesting b. Engaging c. Educative d. Bored e. Other? Give your opinion.....

XII. In one sentence, explain how easy or difficult it was for you to understand the task you are required of.

The Loose Elephant: -

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Punctuality: -

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XIII. For each of the courses, in one sentence can you explain how it is related to any of the subjects in your present studies?

The Loose Elephant: -

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Punctuality: -

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XIV. Can you describe what you learned from each of the courses?

The Loose Elephant: -

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Punctuality: -

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.....

XV. How many times did you attempt the courses until you arrived at the correct answer?

The Loose Elephant

a. Just once b. Twice c. More than twice d. Other? Specify.....

Punctuality

a. Just once b. Twice c. More than twice d. Other? Specify.....

XVI. Did you attend the courses alone or with the contributions and assistance of people around you?

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XVII. What challenges or difficulties did you encounter during your learning experience with the courses?

The Loose Elephant: -

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Punctuality: -

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XVIII. On Facebook, give brief details about your activities after you gained access to the learning group?

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XIX. What other activities were you performing on your device when the course was still actively displayed on your device's screen?

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XX. You have completed the courses and you were redirected to the social learning group on Facebook, what did you do thereafter?

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XXI. How many times, on average, did you visit each of the courses and, which of the courses you understood and preferred the most? Explain why.

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XXII. Describe as accurately as possible, the lessons you learned from each of the courses?

The Loose Elephant: -

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Punctuality: -

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XXIII. In one sentence, describe how helpful you think the lessons learned from each of the courses will be when applied to daily life activities?

The Loose Elephant: -

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Punctuality: -

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.....

XXIV. Rated from 0 to 5.

'0' being no recommendation, '1' the weakest and '5' the strongest. Rate the level at which you will recommend these courses to your mates who did not participate in the exercise.

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