

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
KUMASI - GHANA**

**AN ASSESSMENT OF THE DESIGN OF MULTIMEDIA
INSTRUCTIONS IN MULTIMEDIA LEARNING FOR
DISTANCE LEARNING: A CASE STUDY OF THE INSTITUTE
OF DISTANCE LEARNING - KWAME NKRUMAH UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

by

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partial fulfilment of the requirements for the degree of**

**MASTER OF PHILOSOPHY
in
COMMUNICATION DESIGN**

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CERTIFICATION

I hereby declare that this submission is my own work towards the Master of Philosophy in Communication Design and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

The synergy of technology and education has paved way for e-learning and multimedia learning to become an acceptable method of learning, especially in online distance education. This has resulted in the growth in the use, as well as the need for the design and development of more multimedia instructional content fit for different online learning environments. However, disparities between the theory and practice shows that multimedia online courses are not designed to fully support multimedia learning. This study therefore investigated the design of media content in multimedia learning to explore the contributions of media elements in course for online distant learning, with particular reference to learners in online distance environments. Using a single case study technique, the research explored how the integration of multimedia elements in online course design contributes to learning through a qualitative inquiry. Interviews and documents were used to gather subjective data for analysis. The principles of multimedia learning based on the Cognitive Theory of Multimedia Learning offered the lens through which the impact of media elements on learning was perceived. The analysis result of the collected data suggest that, media elements that are used in multimedia-based resources in distance education programmes are perceived to be significant in maximising learning for students. The study found video media to be preferred as compared to other media elements. Also, the use of other media such as animation, audio and interactive simulation has not been fully explored to be used in supporting learning through multimedia. There were significant understanding of how media elements contribute in creating an interactive environment for learning online and at distance. Thus, the study investigates the characteristics and contribution of multimedia elements in course design for online distant learning.

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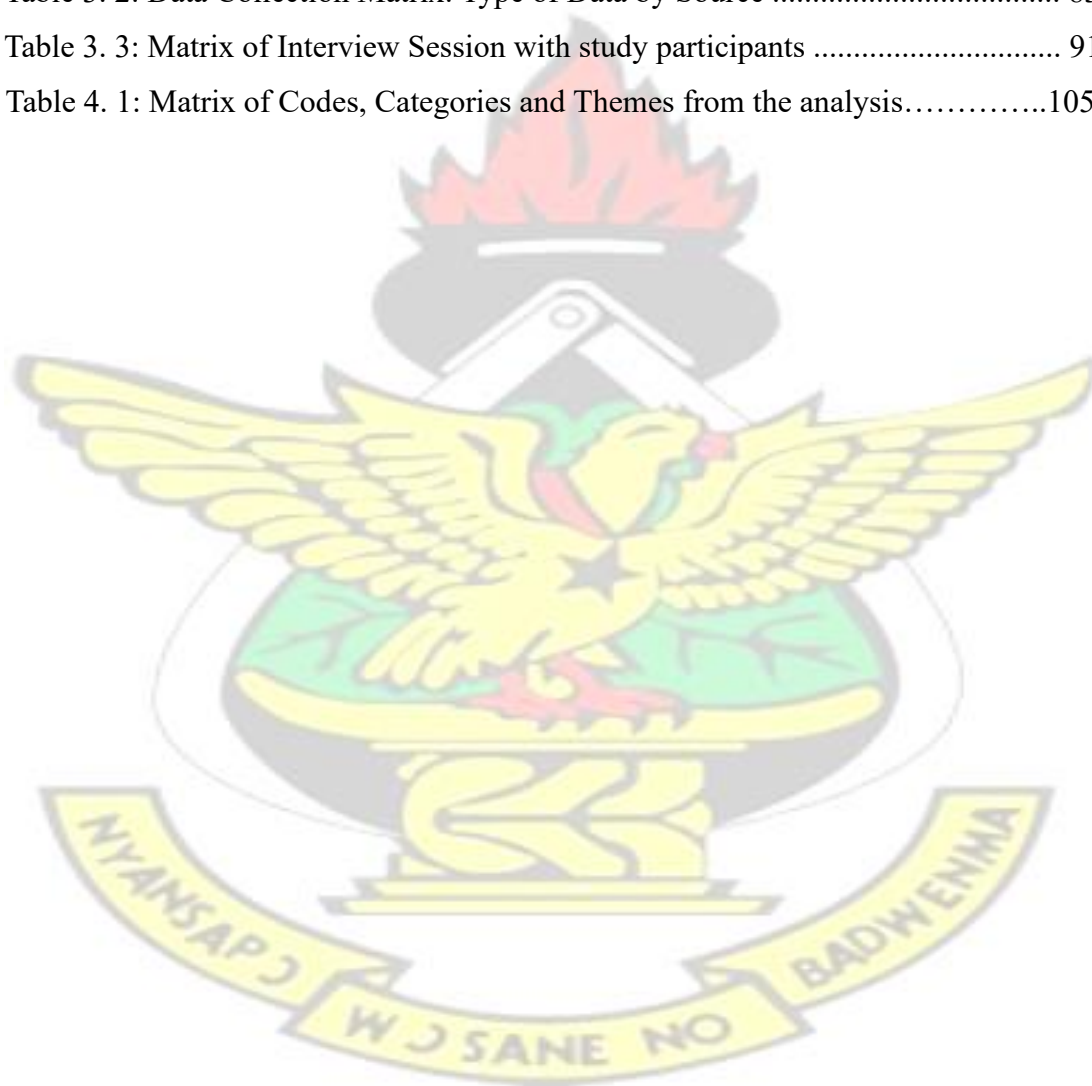
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LIST OF ABBREVIATIONS

3-D	Third Dimension
ACTIONS	Access, Cost, Teaching function, Interactivity, Organizational issues, Novelty and Speed
AECT	Association of Educational Communications and Technology
AIFF	Audio Interchange File Format (wave form for use on MAC)
AI	Artificial Intelligence
ASSURE	Analyze Learners, State Objectives, Select Media and Materials, Utilize Media and Materials, Require Learner Participation, Evaluate and Revise
AVI	Audio/Video Interleave
CAPEODL	Comprehensive Approach to Program Evaluation in Open and Distributed Learning
CD	Compact Disc
CEMCA	Commonwealth Educational Media Asia
CLT	Cognitive Load Theory
CMS	Course Management Systems
CTML	Cognitive Theory of Multimedia Learning
DL	Distant Learning
DVD	Digital Versatile Disc
ESP	Education Sector Plan
F2F	Face-to-Face
FIT	Fluency in Information Technology
FLV	Flash Video
GIMP	GNU Image Manipulation Program
GUI	Graphic User Interface
ICT	Information Communication and Technology
ICT4AD	Information Communication and Technology for Development
IDT	Instructional Design and Technology
ISD	Instructional Systems Design
IT	Information Technology
JPEG	Joint Experts Photographic Group
LMS	Learning Management Systems
MIDI	Musical Instrument Digital Interface
MOV	Apple QuickTime Movie format
MP3	MPEG Audio Layer III
MP4	MPEG-4 Part 14
MPEG	Moving Picture Experts Group
ODL	Open and Distance Learning
OECD	Organisation for Economic Co-operation and Development
OL	Online Learning
PNG	Portable Network Graphics
SWF	Shockwave Files
SWOT	Strengths, Weaknesses, Opportunities and Threats
VLE	Virtual Learning Environments
WBI	Web-based Instructions

WMA
WMV
WWW

Windows Media Audio
Windows Media Video
World Wide Web

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DEDICATION

I dedicate this work to my Mum and Dad,
Adelaide Prempeh and Very Rev. Dr. Sam Prempeh.

God bless you.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

This study explores multimedia learning and how the integration and application of media elements within online courses affect learning objectives in online distance environments. It is without doubt that technology has infiltrated all aspects of our daily lives. One field that has received a major leap is Education. Higher Educational institutions have now placed emphasis on the use of multimedia platforms in instructional delivery (Neo and Neo, 2001). Online learning as a new phenomenon has seen a rapid growth in the use of multimedia within academia. The design, development and delivery of multimedia instructions is one of the key issues in the field of educational technology (Brown, Eaton, Jacobsen, Roy, and Friesen, 2013). Online instructions of high-quality are required for effective learning outcomes in education especially, higher learning in distance education. As such, there has been the need for collaborative instructional design and development strategies that makes space for stakeholders in educational instructional development (Brown et al., 2013; Oblinger and Hawkins, 2006).

With emerging trends in high-end technology, multimedia materials can be easily accessed by students, but the challenge is how to design multimedia-based instructions to maximize learning as well as cover different contexts in distance education (Samaras, Giouvanakis, Bousiou, and Tarabanis, 2006). There is the need to investigate how media elements can be used to make instruction effective in various contexts. As such, collaborative efforts of stakeholders are needed in research, both in theory and

practice. There still exist the challenge to explore methods of building frameworks for learning objects, that would not only focus on quality and methods of delivery but also on factors such as “reusability, generativity, adaptability, and scalability” (Sheybani and Javidi, 2004).

In his extensive research on multimedia learning, Mayer (2005) notes that information processing by learners should be considered when designing multimedia instructions. This underlying principle of multimedia learning debunks the idea of ‘any media necessary’. In order for learners to make meaning from words and pictures, it is important to consider that “not all multimedia presentations are equally effective” (Mayer, 2005).

With a focus on the use of media elements in multimedia learning, the study explores and understands the use of media elements in multimedia learning and how that would impact on learners and educators within the field of distance education. The research design draws upon qualitative methodology using a single case study approach to provide a comprehensive understanding of the phenomenon. The methodology sourced for data from learners enrolled in the distance education environment. This was done through the use of interviews and document analysis of instructional materials. An analysis of collected data provided insightful contributions that is needed in a theoretical as well practical sense.

The introduction of Information and Communication and Technology (ICT) in education has created the learning environments where multimedia instructions, presented through words and pictures are intended to foster meaningful learning (Mayer, 2005). Educational institutions providing learning through multimedia platforms make use of various media elements such as videos, images, audio, animations and interactive simulations that are supposed to be designed in light of how

the human mind works. Educators are faced with the challenge of designing multimedia instructions without load on learners minds (Moreno and Mayer, 2003).

The design and development of instructional materials in distance learning is a complex task because educational developers have to consider the blending of educational paradigms, educational technologies with an electronic learning environments (Martens, Bastiaens, and Kirschner, 2007; Pea, 1991). The design of instructions should be a process that analyse learner needs and develop instructions that fulfil learning (Commonwealth of Learning, 2005) and educational developers have failed to fully consider “systematic design and evaluation”; instead, attention is drawn to what is “technologically possible rather than what is educationally desirable” (Martens et al., 2007).

Within instructional design processes, content developers are mostly geared towards the development and implementation stages and not analysis and evaluation (van Merriënboer and Martens (2002) as cited in Martens et al., 2007). Thus, the issue of assessing media elements to ascertain its impact on learning is significant to educators and researchers. It is therefore expedient to probe this phenomenon in order to gain insight into how the use of media elements impact on learning objectives in the distance learning environments.

1.2 Statement of the Problem

Multimedia has proven to be an effective paradigm in education that could positively impact on learners’ thought and learning processes. Learning from multimedia instructions are more likely to lead to meaningful learning than presentations without it (Clark and Mayer, 2008; Mayer, 2005). When multimedia elements such as graphics, video, animation, interactive simulations, audio, and text are combined and designed

into learning resources, they play a key role in engaging cognitive processes by which learner's construct meaningful learning outcomes.

However, not all multimedia instructions in multimedia learning are able to meet the intended learning objectives by students because they are not designed in light of how people learn (Mayer, 2005). The issue of simply digitizing loads of lecture notes in the traditional text-based format into an online multimedia format without the appropriate selection and mix of media contradicts the promise of multimedia learning. This leads to the difficulty in the use and application of diverse multimedia instructions online (Huang, 2005). Techno-centric efforts to convert text-based formats into online environments often times are not able to fit into online distance learning environments that is required for learner-centeredness (Javidi and Sheybani, 2004).

More so, studies show a strong emphasis on instructional delivery and much less on systematic design or evaluation (Martens et al., 2007; van Merriënboer and Martens, 2002). With this emphasis on delivery methods, educators have failed to fully consider analysis and evaluation for existing multimedia resources to understand its impact on lesson objectives. Thus, evaluation stages within instructional design models are neglected.

With these challenges in designing and developing high quality interactive multimedia instructional resources, there is the need for evaluative assessments on the media elements that are designed to developed multimedia presentations. It is therefore important to explore the impact of media elements within multimedia resources in support of maximized learning for online distance education.

1.3 Aim of the Research

The aim of the research is to understand how media elements in multimedia learning contribute to maximised learning in an online distant learning environment. The focus, in this study is on the use of various media elements in multimedia instructional content by distant learners, with reference to the IDL.

1.4 Research Questions

What are the main features of media elements in multimedia learning and how do they contribute to maximized learning in online distant learning?

Sub questions

1. What media elements are being used in teaching and learning?
2. How are the media elements being implemented in teaching and learning?
3. To what extent has multimedia instructions been implemented to maximise online distant learning?
4. How do the design and development considerations support teaching and learning?

1.5 Objectives of the Study

In addressing the main research question for the study, the researcher would answer the sub-questions through the following objectives:

1. To identify the main characteristics of media elements being used in online distance education
2. To find out how media elements are used in online distant teaching and learning

3. To understand how multimedia instructions are implemented for maximised learning
4. To find out how the design and development process support online distant teaching and learning

1.6 Delineation of the Research

The study would cover an evaluation of multimedia instructions developed for use in teaching and learning. Using a single case study technique, the study would be conducted within a blended learning environment in distance education. As such, the design and development of multimedia-based instructions would be considered and assessed to understand its impact on learners enrolled in the distance education programme.

The study would be conducted in an ecologically valid context, to work with student participants who have enrolled in distance learning course and use multimedia instructions. The assessment would be carried out using a theoretical lens that supports the field of study.

Pedagogical content is delineated for subject matter experts and would not be included in the assessment. The study would only focus on how media elements in multimedia instructions are designed without any appraisal of the pedagogy by content providers.

1.7 Research Design

The researcher would adopt an Interpretivist and descriptive approach as the philosophical assumption in this study. Hence, this would guide and influence the study in its choice of strategies and methods. This provides the framework for interrogating the phenomenon in context. With subjective knowledge as the epistemological stance, the study would utilise the qualitative research methodology. Qualitative inquiry would

be used to explore the impact of media elements on learning objectives in multimedia learning through the collection and analysis of data. This focused primarily on learners in the distance learning environment; as well as facilitators and documents. An in-depth understanding of the role, as well as the influence of media elements in multimedia instructional content for learning in distance education is necessary. Hence a qualitative exploration would be required to provide an in-depth understanding from an emic perspective (Babbie and Mouton, 2001).

The study would adopt the Cognitive Theory of Multimedia Learning (CTML) as a theoretical lens through which the assessment would be conducted (Figure 1). This also includes the grounded design principles that guides in the design of multimedia presentations. The theory, based on years of empirical research, makes the proposition that “people can learn more deeply from words and pictures than from words alone. (Mayer, 2005)” As the stated hypothesis for multimedia learning, it focuses on how learners can apply cognitive strategies to process visual and verbal information to create and promote meaningful learning. As such the design of instructions needed for transformative learning needs to be design according to the requirement of human cognitive architecture processes, making active learning possible. Thus, this would help to achieve the promise of multimedia learning (Mayer, 2003; Paas, Renkl, and Sweller, 2003).

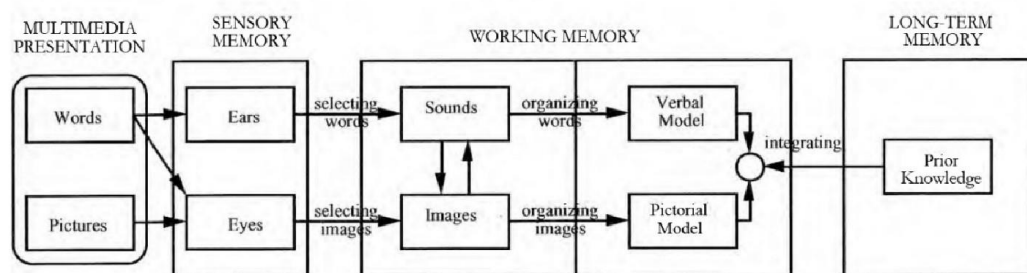


Figure 1: Cognitive Theory of Multimedia Learning (CTML) (Adopted from Mayer, 2005)

The research method for this study would be a case study. The case study method allows researchers to retain the “holistic and meaningful characteristics of real-life events” (Yin, 2003). This would provide the opportunity for the researcher to interact with the participants for a deeper understanding needed for the study. In this research, a single case study would be used. The case site would be the Institute of Distance Learning (IDL) at the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi.

1.7.1 Population of the Study

The population of the study would include post-graduate students enrolled in distance learning programmes in Institute of Distance Learning, KNUST. This includes staff who are employed as facilitators and support staff. Lastly, online multimedia-based courses would be included to be analysed.

1.7.2 Sampling

Purposive and Snowball Sampling methods would be utilized. Qualitative research uses non-probability sampling with the objective to identify a “statistically representative sample or draw statistical inference” (Wilmot, 2005). With a purposive non-random sample the focus would be on the characteristics of individuals to reflect the diversity and breadth of the sample population and not on the number (Wilmot, 2005). To source for key facilitating staff needed for the study, the snowball technique would prove effective.

1.7.3 Data Collection

In order to explore the perception of stakeholders in the distance education environment. The study would require the use of research data collection instruments in order to gather data. Data collection for the study would be by the following:

1.7.3.1 Interviews

Semi-structured Interview would be conducted to give room for flexibility. Interviews would be face-to-face or one on one (Creswell, 2003). This helps researchers to collect information in cases when participant cannot be observed directly.

1.7.3.2 Documents

Document analysis of multimedia instructional materials would be conducted. Zhang and Wildemuth (2009) states, “Qualitative content analysis goes beyond merely counting words or extracting objective content from texts to examine meanings, themes and patterns that may be manifest or latent in a particular text”. This would enable the researcher to obtain relevant data regarding media elements in multimedia instructions. Also the nature of online resources would permit the researcher to access them and thus, allowing for a first-hand experience with the materials.

1.7.4 Data Analysis

Collected data would be analysed using thematic data analysis (Babbie and Mouton, 2001). Raw data would be coded, categorized and themes to provide clear and descriptive patterns that may exist within the collected data. According to Cassell and Symon (1994), qualitative research gives

a focus on interpretation rather than quantification; an emphasis on subjectivity rather than objectivity; flexibility in the process of conducting research; an orientation towards process rather than outcome; a concern with context-regarding behaviour and situation as inextricably linked in forming experience; and finally, an explicit recognition of the impact of the research process on the research situation (p.7).

Hence, data analysis for the study would be based on a philosophy which aims at categorizing data, individuals and events and attributes that characterize them (Schatzman and Strauss (1973) as cited in Creswell 2003). Using a case study provides thick descriptions with the "opportunity for a holistic view of a process" (Patton and Appelbaum, 2003) therefore thematic analysis seeks to unearth patterns and relationships with an emic focus that is from the participant's point of view (Schutt, 2009). This type of data analysis is best fit for case study research making meaning for complex social phenomena (Kohlbacher, 2006). Triangulation would be achieved through a combination of interviews and documents, and further verified through the review literature.

1.8 Significance of the Study

The significance of the study has both theoretical and practical implications. The outcome of the study will provide important contributions in the following areas:

1. It will identify knowledge gaps in the design and use of multimedia instructional content for online distance education.
2. It will provide an appraisal of the use of multimedia instructions in teaching and learning processes in online distance education.
3. The result of the study will contribute as guidelines in the design of multimedia instructional content needed for online distance education.

1.9 Organisation of the Thesis

Chapter One

Chapter one introduces and explains the background to the study. It identifies the research problem, objectives and purpose for conducting the study. It further describes in brief, the design of the research.

Chapter Two

Chapter two of the study gives a review of relevant related literature and the theoretical framework of the Cognitive Theory of Multimedida Learning. Major dicussions in this chapter are on ICT, multimedia technology, instructional design and online distance learning. The adopted theortical framework and its principles are further elaborated as they relate to the study.

Chapter Three

The third chapter presents the blue print for conducting the study. This looks at the research design and methodology. It outlines the research paradigm and strategies used. Procedures for data collection and analysis are also shown.

Chapter Four

In chapter four the findings from the analysed data are presented. It discusses the qualitative responses from participants as well as the examination of documents. A summary of discussions as they relate to literature is provided to provide further understanding.

Chapter Five

Chapter five concludes the study with a summary of the various chapters. It further discusses the aim of the study in relation to the questions and objectives raised for the study. Finally it gives recommendations concerning various stakeholders involved in the study.

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CHAPTER TWO

LITERATURE

2.1 Introduction

This chapter presents and discusses the findings from relevant literature for the study. For a meaningful exploration of the field of study, it is important to review relevant literature that points to important issues and provides a good understanding on the topic. As addressed by Hart (1998), reviewing literature would provide the researcher with a comprehensive summary and analysis of the relevant research available on the topic being studied.

The advancement and ubiquitous use of multimedia technology in higher education presents many benefits as well as some setbacks. In the light of this, it would be prudent to understand how the use of fundamental elements of multimedia impacts on learning in online distance environments. Thus the main question being asked is: what are the main features of media elements in multimedia learning and how do they contribute to maximized learning in online distance learning? Major themes around which the discussion is centred include Information and Communication Technology (ICT), Multimedia Learning, Instructional Design, Online and Distance Learning.

The review begins with the impact of ICT and its relationship to education; hence, how multimedia in ICT impact on the learner at the heart of educational programmes. An understanding of the field of multimedia; the media elements as well as issues concerning its selection, utilization and management in designing course materials for online distance education to be specific is probed. This chapter would also examine

theoretical literature that underpins the fields of cognition in multimedia learning and the design of instructions. Major contributions on principles of multimedia learning; content design in the context of online distance learning; instructional design models, role and competencies which are significant to the study are discussed. This would help to maintain the focus of the study.

The review summarises and concludes on the findings of various thoughts and arguments to facilitate a valuable understanding of the field of multimedia technology in general and its use in online distance learning environments. Through selected literature, this chapter addresses the major research question bearing in the mind the intended objectives of the study. The researcher seeks to partly answer the sub-questions listed below:

1. What media elements are being used in teaching and learning?
2. How are the media elements being implemented in teaching and learning?
3. To what extent has multimedia instructions been implemented to maximise online distant learning?
4. How do the design and development considerations support teaching and learning?

2.2 Information and Communication Technology (ICT)

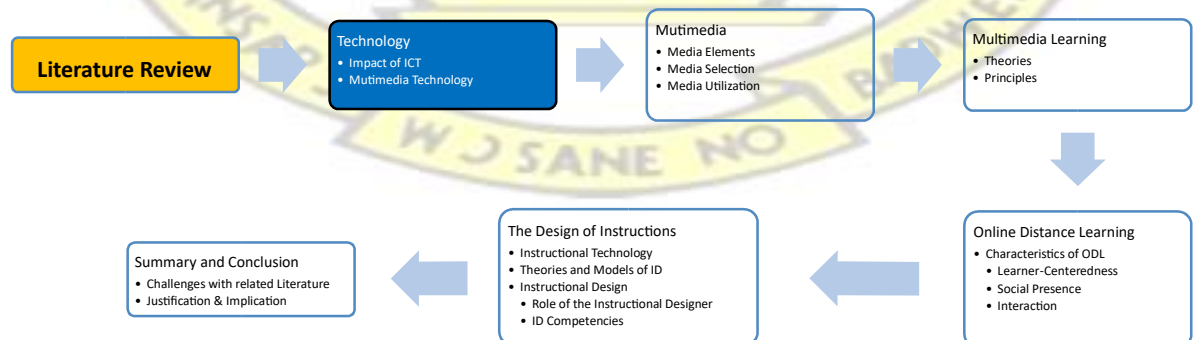


Figure 2. 1: Diagram of the approach to the review on the impact ICT

2.2.1 Impact of Information and Communication Technology on Multimedia in Education

The emergence of Information and Communication Technologies (ICT) has paved way for great possibilities in all spheres of daily life. The world is being built on a platform where digital technologies can be used to provide a rich environment for innovation, accessibility and the transfer of information to enhance productivity. With technology being an integral part of many educational systems in the world today, it has offered opportunities that has moved beyond the traditional methods of educational delivery.

Accordingly, Dede (2005) states, “rapid advances in information technology are reshaping the learning styles of many students in higher education”. Thus, the role of technology in the 21st century can be seen as a significant opportunity for leveraging efficiency and transformative change and innovation in educational systems. Dede (2007) outlines three observational future impacts of ICT on society. It is important to note that these observations which were projected to be feasible, have proven to be true over the years. Firstly, there has been an expansion in the capabilities of technological devices since its inception and this has paved way for a much more broadened communication channels. This was seen through the introduction of educational, entertainment and social media tools that offered users a personal touch to their interaction. This change was not limited to personal usage only but also to institutions which made use of ICT for administrative purposes. However, ICT is yet to make use of its full potentials for life in the 21st Century. Secondly, there has been an advanced distribution in the process by which information is processed; that is, cognition. As noted, “the process of individual and collective thought in civilization is increasingly dispersed symbolically, socially, and physically” (Dede, 2007).

Information communication is no longer limited by physical location. Hence, this generation is seen to be highly interactive and “electronic nomads wandering among virtual campfires” as stated by Mitchell (2003) in (Dede, 2007). As a result, ICT should be able to condition learners through its application in formal education, for the world of work in this “emerging, novel, intellectual and psychosocial context, avoiding its weaknesses and traps while maximizing its strengths and opportunities” (Dede, 2007).

Thirdly, the nature of human work to a large extent is hinged on cognitive processes whereby computers have created the needed environment for more jobs. It is observed that human and machine work involves the processing of information. Levy and Murnane (2004) identify the advantages of both humans and computers; and with human capacity outweighing that of computers, the introduction of ICT tools have largely expanded human capabilities to undertake or perform tasks. This is an advantage of ICT, as it has been observed that, the evolution of ICT on society puts the human in a higher order thinking capacity in “mastering complex mental performances” valued in the future workplace” (Dede, 2007).

Building on these thoughts, the introduction and integration of ICT has unveiled immense possibilities for capacity building in all context of social systems. Hence, it is important for stakeholders to rethink education and training for people to prepare them for the future. With technology on the move, there is a dire need for strategies that match-up to the dramatic shift in and beyond the 21st century. Ghana’s Education Sector Plan (ESP) 2010-2020, under the Educational theme, places among its policy objective, the need to “improve quality of teaching and learning (MoE, 2010). The objective of Thematic Area 5 on Content Development, is to develop appropriate content for open, distance and e-Learning, citing that, “multimedia digital content can facilitate effective learning” (MoE, 2008). Strategies projected to be used to

accomplish the objectives are through the use of ICT in supporting educational programmes across all levels, improving 21st century competencies and the quality of educational resources.

Researcher's predictions of the change with technology is characterized by a forecast of rapid growth in product and service innovation, new economic and industrial environments and business operations and processes. Realising the need for these changes in the education system, Ghana would have to quickly address these objectives for a successful accomplishment of targets. With this radical evolution in the global economy, developments in ICT would continue to influence the workforce and result in the increase in economic development. Hence, current educational strategies which prepare learners for the future would have to be transformed to support the current and next generation.

Multimedia technology has become an integral part of 21st century education especially in developing countries. Key factors that project technology as a key component for systemic educational change, and act as fundamental reasons for stakeholders in education to contemplate its growing relevance and implications are outlined by (OECD, 2010):

1. Technology functions in change processes and innovation in customised education and training of learners.
2. Andragogy is hinged to literacy in technology. Learners must adapt in order to survive in this information age.
3. Technology is essential in building 21st Century Skills. Higher-order competencies are required for productivity.

In agreement with Groff (2013), the synergy of computing and education is creating a diversified terrain in educational technology through new and emerging trends that focuses on transformation and innovation.

2.2.2 Multimedia Technology in Education

Dempsey, et al. (2002) predicted the possibility of continuous transformation of online multimedia distance learning through hardware and software technologies a decade ago. Their assertion followed the rapid growth in the use of multimedia during the late 1980s and 1990s. This was a result of improved technologies which promoted efficiency and connection speed in data compression, graphics, memory, and image generation with multiple file formats (Jalobeanu, 2003). More so, the 21st century learner is in high expectation of pertinent and engaging learning experiences and needs, which is considered as a promissory note of higher education (Garrison and Vaughan, 2008). Hence, more and more educational institutions have adhered to the use of multimedia technology in the design, delivery and distribution of instructions in all modes of education (Donaldson and Knupfer, 2002; Rogers, 2001).

Multimedia technology in its application makes use of interactive computer elements, such as graphics, text, video, sound, and animation to communicate. This gives space to the thoughts on the design, development and delivery of such elements. Jalobeanu (2003) records that software and hardware revolutions advanced at the same pace with storage capabilities. This made the implementation of multimedia formats possible on various hardware through software use (Heinich, et al., 1996). Without doubt, multimedia application has saturated education, making it inseparable from the process

of designing learning to delivery of instructions. It is worth finding out how we can redesign processes and structures to take advantage of the power of technology to improve learning. Underlining these concerns and confines of existing multimedia technology in education, the promising alternatives for using multimedia technology in education has been discussed by various researchers. The following discussions will cover the theme of multimedia and media elements as presented by various literature.

2.3 Multimedia

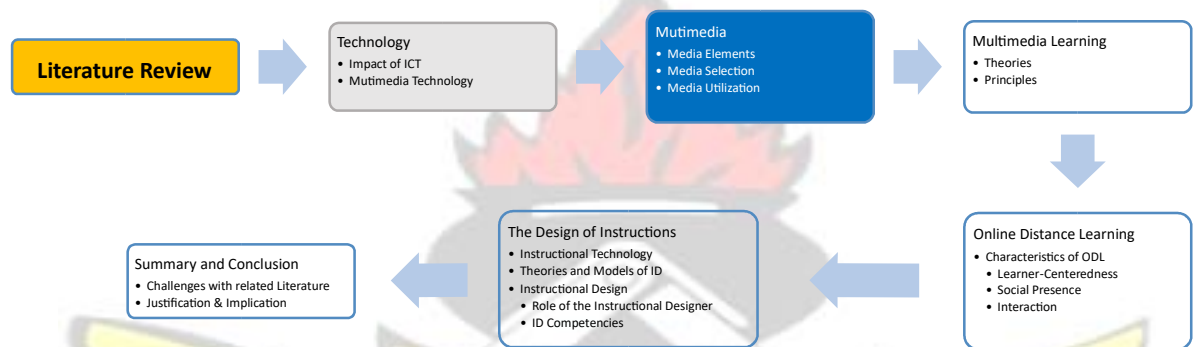


Figure 2. 2: Diagram of the approach to the review: Multimedia

Multimedia

Various literature provides a variety of definitions for the term multimedia. The concept of ‘multimedia’ is noted to have surfaced in the 1950s and commonly referred to a method that combined at least two media formats such as text and video or audio at one time to derive a more complete, but not necessarily educational effect (Heinich, Molenda, Russell, and Smaldino, 1996). This tool has overlapped into academia, considering its usefulness to teaching and learning.

Bagui (1998) defines multimedia as the use of text, graphics, animation, pictures, videos and sound to communicate. Jonassen (2000) adds his view to say, “one commonality among all multi-media definitions involves the integration of more than one media” (p.207). Porter (2004) in his study gives the definition as, “media providing

multisensory experiences, such as sound, visuals, animation and interaction with the media”. Basically, multimedia is mostly a combination of two or more of graphics, animation, text, audio and video components to convey an information. Mayer (2005) provides definitions of the term from Table 2.1. Other uses of the term multimedia is also captured by Mayer.

Table 2. 1: Definitions of multimedia, multimedia learning and multimedia instruction

Term	Definition
Multimedia	Presenting words (such as printed text or spoken text) and pictures (such as illustrations, photos, animation, or video)
Multimedia learning	Building Mental representations from words and pictures
Multimedia instruction	Presenting words and pictures that are intended to promote learning

Adopted from (Mayer, 2005)

The combination of visuals with text is the very norm of most platform for teaching and learning as well as in other arenas of society. The concept of multimedia, which is ‘multi’ in multimedia embraces the opportunities to deliver information though several channels, the ‘media’. In line with learning through multimedia, the use of text or words include both printed words to be read and spoken words in the form of narrations. Pictures comprise simple static graphics in the form of illustrations or photographs and a more complex graphical elements such as animation, video and some interactive simulations (Mayer, 2005). Media elements are also noted to be audio and visual techniques used to convey information. They include illustrations and they incorporate text, narration, music, still graphics, photographs, and animation (Clark

and Mayer, 2008). These elements are at the core of this technology and are used to deliver instructions with the hope to advance learning.

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2.3.1 Discussion on the challenges and debates about media use in learning

Mayer (2003) made the statement that, “simply adding pictures to words does not guarantee an improvement in learning that is, all multimedia presentations are not equally effective” (p .31). More so, there has been academic debates on whether media can influence learning (Clark, 1983; Kozma, 1991, 1994). Kozma (1994) discusses Clark’s (Clark, 1983) conclusion of his study which was that "media do not influence learning under any conditions" (p.445). He also discusses the contribution of other research which suggests that, integrating multimedia learning is highly feasible and effective. Kozma (1994) concluded by rephrasing the question, "Do media influence learning?" and rather asks, "In what ways can we use the capabilities of media to influence learning for particular students, tasks, and situations?" (p.18).

Thus, the intent to determine the factors under which adding multimedia promotes deep learning calls for an assessment of media elements in multimedia learning. Moving beyond the debates and discussions, efforts to understand the role of media in learning is supported by models and theories which guides in the creation of multimedia learning resources. As Berge (2002) noted, evaluation is one of the essential components of interactivity in e-learning, in order to ensure “accuracy of content acquisition, performance, and understanding”. (Figure 2.2).

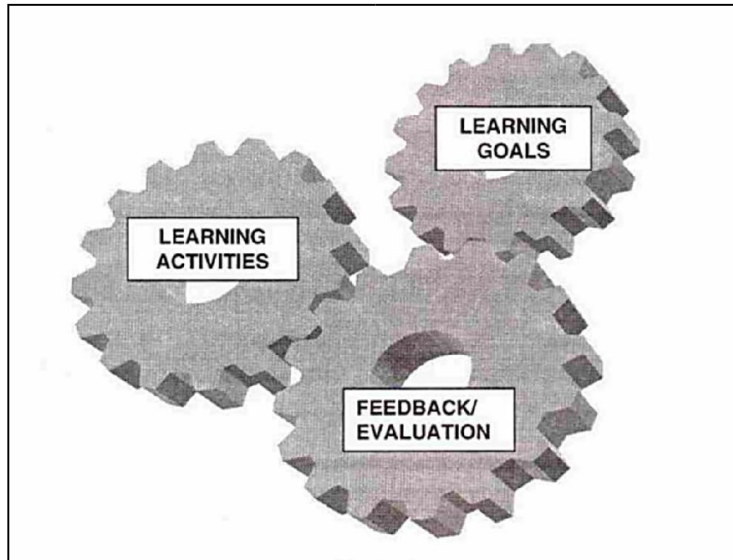


Figure 2. 3: Secret of Designing Learning: Aligning Learning Goals, Activities and Feedback (adopted form (Berge, 2002, p. 182))

Other literature on the design of instructions suggest the use of media richness theory, which carries the idea of promoting effective communication, through the reduction of “uncertainty and equivocality” of the information (Sun and Cheng, 2007). With regard to information processing capabilities, a media rich instruction should possess the capability to change understanding within a time interval (Dennis and Valacich, 1999). Hence the research poses these questions, what media elements are being used in teaching and learning? How are the media elements being implemented in teaching and learning?

2.3.2 Media Elements (Characteristics)

The creation, storage and dissemination of diverse information for learning and teaching have been made possible through Information and Communication Technology (ICT). This includes different core elements that may be combined or used as standalones into a learning resources (Bates, 2005). Multimedia denote the integration of multiple forms of media that is, the words ‘multi’ and ‘media’ or

‘medium’. Basically, it places focus on several methods of conveying information or communication between agents. The primary characteristics of multimedia as a conduit for communication is beneficial, especially in learning environments. Researchers agree on these type of elements to include, but not limited to print, audio, video, graphics and illustrations, animations, interactive simulations, electronic databases, search engines, and online libraries (Clark and Lyons, 2004; Clark and Mayer, 2008b; Naidu, 2006; Cohen, 2006) Figure 2.3. Among these diverse media available, Bates (2005) contends that five forms, that is “direct human contact (face-to-face), text (including still graphics), audio, video, digital multimedia (incorporating text, audio and video) are the most significant.

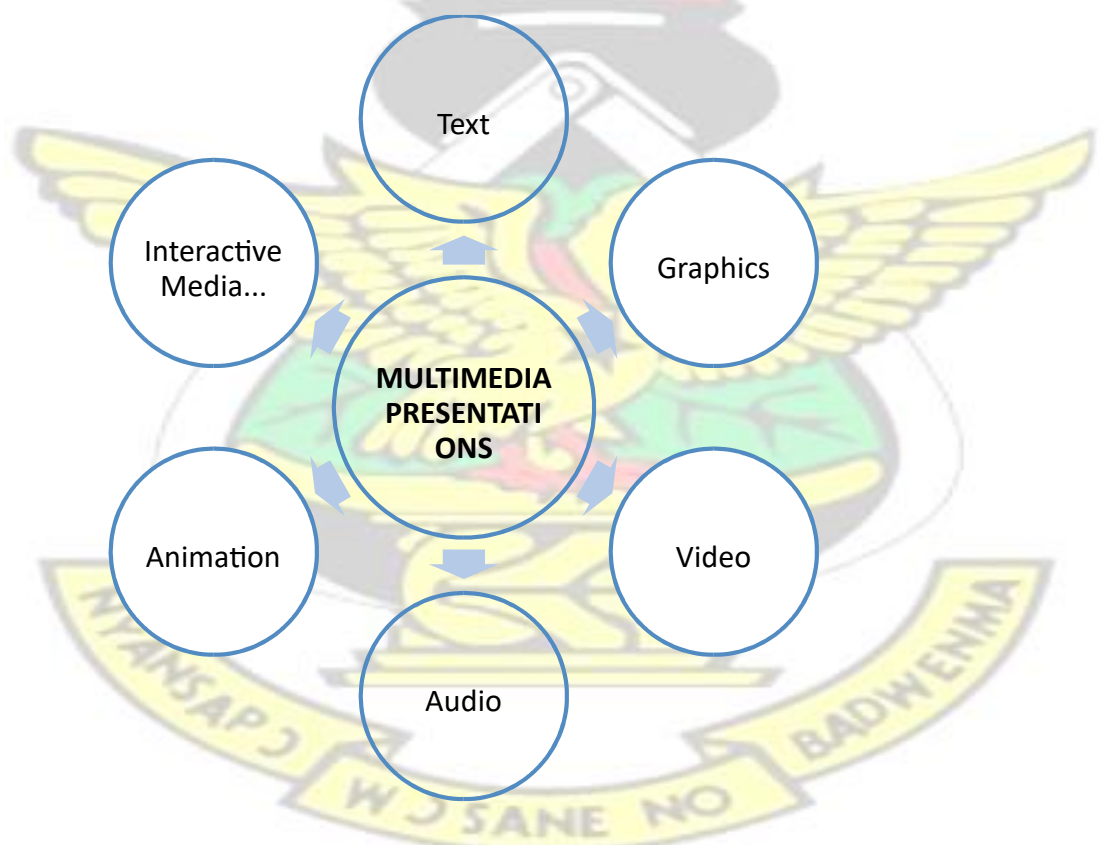


Figure 2. 4: Diagram of the basic components of a multimedia presentation

As the preferred option for 21st century distance learning, Ali (2000) notes that, the internet, integrated with a diverse selection of media has lured many distant students.

Recognizing the potential of this technological tool, the possibility of delivering instructions through multiple media cannot be underrated. Perhaps, the thought that these elements help learners to engage their cognitive process for active learning to occur, makes them worthy of scrutiny. On one hand, the appropriate use of media in a presentation has the capability to improve or enhance the learning process of students. The flip side to the same coin is that, an improper application of these elements within the same presentation can actually depress learning.

It is imperative therefore to inquire; how these media elements are selected and integrated into online course materials and how they are managed to make a positive impact on the learning objectives. Having answers to these questions would be pertinent if educators seek to improve learning among distant learners. It is therefore important to look at the features of media elements in multimedia presentations.

2.3.2.1 Text Media

Text is by far the most common element within presentations. Most multimedia applications can be observed to be designed with a basic integration of text (written or spoken) and other elements. Researchers note several advantages in the use of text or print media. This include easy access, portability, low costs of production and distribution. Print or text media is particularly valuable for specific target groups, such as learners in remote or rural areas, learners in developing countries, learners with literacy but not computer skills, and the poor or socially disadvantaged (Bates, 2005).

Within online multimedia presentations, text is the basic element commonly utilised to convey information. It remains ubiquitous from the history of distance learning to current its applications. Dochev, Koprinska and Pavlov (2000) gives two stances by which an instructional developer's use of text should be formatted. They recommend a minimal use of text well constructed for clarity by learners; this is in terms of font

style, colour and size. Secondly, interactivity; that helps in leading to further explanations should be present. Hyperlinks, or perhaps hypertext is encouraged when developing instructional materials.

2.3.2.2 Image Media

Images or graphics created into a digital format are also included in multimedia presentations. These are mostly in the form of visual graphics which accompany text within a course material or as part of the Graphic User Interface (GUI) (Smith, n.d.). Clark and Lyons (2004) explain graphics as static art, covering illustrations, photographic and modeled imagery; and dynamic art which include animation, video and virtual reality. Images as discussed, refers to still or static visuals. Images for multimedia presentations are known to have communicative functions and are used as decorative, representational, mnemonic, organizational, relational, transformational and interpretive elements. The same have psychological functions to “support attention, activate or build prior knowledge, minimize cognitive load, build mental models, support transfer of learning and support motivation” (Clark and Lyons, 2004). These functions supports Mayer (2005) studies on multimedia learning, through the combination of pictures and text to maximize learning. Hence, images support cognitive processes making them an important addition to online course materials. Instructional Designers make use of graphic design software with notable output formats like JPEG and PNG, with the ability to reduce image file size and maintain quality.

2.3.2.3 Audio Media

Audio media may take the form of music, sound effects and narration. Some audio formats used in presentations include MP3, Wave, AIFF, WMA and MIDI. Cohen (2006) cites several researchers on the role and advantages of audio for learning. This

includes suitability for learners with poor reading skills, effectiveness in teaching verbal information (Reiser and Gagne, 1983) and usefulness in the cognitive domain when music recognition is being taught (Reynolds and Anderson, 1992). Smaldino, Russell, Heinich, and Molenda (2005) identify the repeatability feature of audio media that makes it functional for self-paced learning. Thus, integrating audio into a presentation enables learners to make use of their verbal or auditory processing channel with its cognitive advantage over graphics or text alone.

2.3.2.4 Video Media

Digital video appears in many multimedia applications and are predominantly preferred over other media in online learning. They may be integrated as live or real time and pre-recorded or delayed lecture videos via synchronous and asynchronous technologies. This include educational video documentaries, instructional television, video-conferencing, video cassettes, DVDs, digital video clips; and video streaming via the internet (Bates, 2005). Common digital video formats supported by the web include Flash, MPEG, AVI, WMV and QuickTime (MOV). Compression and decompression techniques are needed to process video data through software and hardware, in order to keep them to video formats and standards (Dochev et al., 2000; Smith, n.d.).

Emerging technologies currently allow delivery platforms and software to fully host video media. Provision has been made for most Virtual Learning Environments (VLE) and Learning Management Systems (LMS) to support video clips as well as other multimedia elements (Cardoso, 2007; Clark and Mayer, 2008b). Digital video is considered to be an advantageous media element for education that brings dynamism and interactivity within the course design. They are functional in depicting procedures (Bates, 2005; Smaldino, Russell, Heinich, and Molenda, 2005). However, new

methods of designing video for delivery in a flexible, integrated and user-friendly manner are needed in order to exploit the educational potential of new digital technologies.

Cohen (2006) stressed the need for individual assessment of online video resources, in order to ensure that learners' needs are met. This is as a result of some technicalities in delivering video media online (Cohen, 2006).

2.3.2.5 Animation Media

Animated elements are common within web-based multimedia platforms and refers to a "simulated motion picture depicting movement of drawn (or simulated) objects" (Mayer and Moreno, 2002). Animations are dynamic materials which include cartoons and interactive effects which allow users to interact with learning objects. The main features of an animation include the visual representation, movement and simulation of a drawing. This contrasts the features of videos and static graphical elements (Mayer and Moreno, 2002).

Creating animations for the web is through software such as Adobe Creative Suite programmes (Flash, After Effects and Premiere Pro) and exported into formats such as SWF, FLV and MP4. Advanced Flash animation is also created with ActionScript code to produce interactive effects (Smith, n.d.). Chittaro and Ranon (2007) comment on the possibilities of introducing 3-D video support (Web3d), as well as Artificial Intelligence (AI) techniques, Semantic Web13 and Web 2.0 technologies to augment teaching and learning that mimic face-to-face classroom environments. These media is likely to engage educators to provide interactive and representative online learning environments for distant learners. Citing examples of animated multimedia instructional messages on the process of lightning formation, (Mayer and

Moreno, 2002) and how pumps and car brakes work (Clark, Nguyen, and Sweller, 2006; Mayer and Anderson, 1992), the objective of the studies were to test learner understanding on the effectiveness of animation as an element that promotes learning. Mayer and Moreno (2002) express that, “animation is a potentially powerful tool for multimedia designers, but its use should be based on cognitive theory and empirical research”. Animation as an element has great potential to explain entire processes in instructional materials. Schnotz and Lowe (2003) give their notion of animation possesses technical, semiotic and psychological characteristics. With its characteristic dynamic format, animations can reduce cognitive load on learners within online distant environments.

2.3.3 Instructional Delivery Media: Influence, Strengths and Weaknesses

Instructional media elements may be combined or applied as individual elements to compliment teaching and learning processes within online distance or blended learning environments. Research proves that instructional media elements used to create blended and online learning courses possess various strengths and weakness. The appropriateness of selected media may depend on its strengths as used in various learning environments. One media may be suitable in its usage over the other or better as a stand-alone or in combination with other media.

Holden, Westfall, and Gamor (2010) assert that, fundamentally no single medium is better or worse than any other medium; perhaps noting and agreeing with Clark (1983) that media simply convey information. These researchers discussed the selection of media and concluded that the appropriateness of media elements is grounded on the characteristics of each particular medium whiles giving attention to the context in which it is used (Holden et al., 2010).

2.3.4 Online Media Content

Sims, Dobbs, and Hand (2002) identify that most online learning strategies place emphasis on converting a plethora of traditional text-based content into digital formats for online learners to access in various formats. They however agree with Malone and Lepper (1987) and Sims (2000) on what defines “online learning”; that is, regardless of the fact that these digitized resources exist and are accessed ‘online’, the absence of an appropriate mix of motivation and engagement defeats the purpose of online learning. Hence, this is a “misrepresentation of the capabilities and benefits of the technology” (Sims et al., 2002, p .138). It is within the integration of the various media elements in online courses that educators could engage and motivate distant learners. Nash (2004) as cited in (Brown and Voltz, 2005) states, “online courses are much more than the posting of traditional in class materials on the Web” (para. 6). This supports Gee (2003) on the assertion that, “learners participate in extended engagement (lots of effort and practice) . . . in relation to a virtual world that they find compelling”. This can be achieved when multiple media elements such as text, images, audio, video and animations are employed to convey online instructions. This makes spaces for interactivity, engagement and motivation for online learners with different learning styles. Online content needs to present in a constructive manner, which allows for interpretation by learners with the facilitating presence of the tutor.

The online environment as characterized by Sims et al. (2002) deliver content through an array of structures that moves from static to dynamic elements (Table 2.2). This classification paves way for the online content to be “sourced, repurposed, constructed and enabled by and for all participants in the learning process”. Within this categorization, common examples that allow the teacher and the learner to make inputs in the course material are identified (Sims et al., 2002). This perhaps should be the

ideal online environment that is needed for learner-centeredness. Using instructional design, multimedia online content has to be designed and delivered with the intention to be effective. Six thematic areas, “activity, scenario, feedback, delivery, context, and impact”, addressed by Brown and Voltz (2005) is intended to provide guidance to educational developers.

Table 2. 2: Options affecting online content

Static				Dynamic
Predetermined and presented	Teacher contributed	Learner contributed	Captured dialogue (interactivity)	Constructed
Content defined and prescribed by the teacher, and does not change during the delivery cycle	Content defined and prescribed, but additions or modifications made by teacher if and when required	Content defined and prescribed, but learner additions and contributions enhance the resource base	Through collaborative endeavours, content material is added to the overall resource base for the program	Content defined through research by participants and subsequent interpretation and construction

Adapted from Sims et al. (2002, p. 138)

However, Brown and Voltz (2005) cites Brennan (2003) to say that, constructive learning environments currently have a gap through its poor delivery; this can be bridged through the consideration of fundamental elements within e-learning design processes in order to create the need learner expectation in online learning (Brown and Voltz, 2005).

2.3.5 Media Selection and Utilization

Various alternatives are available to educators when it comes to the selection of media for online distant learning. There exist enough instructional media that is able to engage learners for enhanced learning; this process of selecting the appropriate media lies within the confines of educators to be used to enrich classroom teaching.

The plethora of media offers instructors considerable opportunities to make their teaching more effective and efficient. Effective selection of these media for the context of online learning could lead to the achievement of instructional goals and objectives. As such, efficiency in the utilization of the selected media is also crucial in attaining instructional objectives. Generally, media are categorized as print, nonprint, audio, audio-visual electronics, non-electronics, and so on. Some instructional media elements are considered to be effective in their application as compared to the others. This propels the researcher to inquire, what drives the process of selecting and utilizing media for course design?

According to Reiser and Gagne (1983), media selection should not become a "burning question", as consideration must be made for needs, context and resource. Their study on the 'Selecting Media for Instruction' evaluated several media selection models and noted the differences in the models. The use of the models is however influenced by categories of media and factors in media selection. With technology evolving within educational settings, the preference to select an appropriate instructional media, however becomes a complex task. Criteria for media selection should not be based only on what is technologically capable but that which engages the learner (Fahy, 2002). Bourdeau and Bates (1996) list media selection as part of the significant entities in the design process for distance learning at the macro level. Two approaches to the media selection process are identified as theoretical, for higher order thinking at educational settings; and pragmatic, which is found in most schools, colleges and distance teaching institutions and intuitively employed by teachers, decision-makers, and professional media producers in decision making (Bourdeau and Bates, 1996).

Holden and Westfall (2009) assert that the process of selecting instructional media for online distant environments follows a systematic approach based upon the instructional systems design (ISD) model. Educators are to consider selecting instructional media based on how each media influence the other. Holden and Westfall (2009) raise a number of influential issues pertaining to the selection of instructional media, namely, “identification of knowledge and skill gaps, effective assessment and measurement tools, level of interaction (didactic versus dialectic), and instructional strategies, complexity of content and rate of content change”.

On the issue of delivery, audience size, distribution and cost are noted. A matrix for distance learning instructional media selection that serves to guide designers on how to select appropriate media for learning are offered. These researchers conclude that, an instructional objectives, that results to an enhanced performance is the distinct consideration in media selection (Holden et al., 2010). Romiszowski (1997) also outlines three factors that may influence the selection of media as “task factors, learner factors and economics/availability factors” (p.57).

Criteria for Media Selection and Utilization

Research points to the underpinnings of theoretical models in the selection and use of media in online course design. Five criteria considered for the selection of media elements are: learning outcomes, instructional strategy, learner characteristics, instructional setting and cost (Martin, 2011). These criteria were sourced based on research undertaken to understand the effectiveness of the various types of media used in various instructional contexts. An alternative model for the selection and application

of the appropriate technology in designing online courses, as well as other learning environments is the ACTIONS framework (Bates, 2005). This framework is suggested to have five characteristic features which makes it feasible in various learning contexts. These features permit decision making at instruction-wide and instructional levels; identify media and technology disparities; enable media mix; level out the consideration given to instructional and operational issues; and support innovative technological developments (Bates, 2005). The ACTIONS framework as suggested, makes inquiry from some given factors regardless of the type of institution or instructional mode. The selection and utilization of the appropriate media and technologies is provided as a result of the answers given by this framework. Answers derived from the ACTIONS Framework is based on the context within which the questions were asked (Bates, 2005).

Also, educators can consider the use of the ASSURE model (Seels and Richey, 1995) to guide in designing and implementing teaching strategies. This model as noted by Gustafson and Branch (2002) and Smaldino et al. (2005) enables the design and delivering of instruction and is adapted towards application in the classroom. This six step model unfolds to stand for Analyze learners, State objectives, Select media and materials, Utilize materials, Require learner performance, Evaluate/Revise. It focuses on instructions that fulfil different learning styles and learner interaction in a constructivist learning environment.

Media mix is considered to be an effective combination of media elements such as video, audio, graphics, animations and others into the course design in order to engage learners to have an optimum learning experience (CEMCA, 2011). The concept of media mix considers how suitable the media is to the content, how the media can be

integrated for easy accessibility and how the various media can be combined to provide maximum learning.

These are among many thoughts on the selection and utilization of the right mix media for designing online courses. It is, however, important that designing is done in context in order to provide the appropriate learning needs for learners. Clark and Lyons (2004) is of the view that, the process of design or selecting visuals for effective learning for all contexts has no fixed method. Accordingly, the impact of learning from the choice of media selected and utilized depends on three interactive elements that includes, “properties of the visual itself, including its surface features, communication functions and psychological functions, the goal of the instruction, and lastly differences in prior knowledge of the learners”. With such options available in selecting and implementing media elements in online courses, management of such tools becomes essential. Educator now consider systems which offer extensive course management possibilities. Such systems, with various functionalities which include organisation of instructions and administrative services, are referred to as Learning Management Systems (LMS) or Course Management Systems (CMS).

2.3.6 Multimedia Management: Learning Management Tools in Education

The basic concept of Learning Management Systems (LMS) or Virtual Learning Environments (VLE) is that, learning is “organized and managed within an integrated system” (Dalsgaard, 2006). As denoted by Downes (2005), learning management systems basically organizes the learner’s materials into a standardized format, to include segmented course units with assessments and discussions. Some widely known examples of LMS which provide the needed access to multimedia with features for synchronous and asynchronous learning are WebCT, Moodle, Blackboard, Aculearn,

TopClass, Desire2Learn and LearnLink. These management systems facilitate multimedia integration of videoconferencing, online chat, screen captures, polling, voice messaging, digital whiteboard, feedback; with video, audio, graphics and animation import; presentations with voice narration, interactive quizzes as well as threaded discussions (Downes, 2005; Siemens, 2004). The functional features of an Education Learning Management Systems (ELMS) highlights communication and collaboration, which enables the instructor to design course content and interact with learners (Mcintosh, 2015). Such course management systems streamlines the course design process for instructors and allows them to author, re-use or re-purpose content effectively with little competencies. In addition, they provide the virtual spaces for learner interaction.

Among the challenges that educators face in implementing LMS to manage online course is the issue of cost. As such, some institutions opt for free and open source LMS that are efficient in its functions (Aydin and Tirkes, 2010; Fryer, 2002; Gonsalves, 2003). According to Okmen (2008), the pros and cons of open source software (OSS) are under the categories of cost, other financial and forensic themes. Major benefits have to do with the flexibility to redesign the source code to increase quality and user assurance, to make updates that echoes the needs of the user and the developer, to create space for innovative design and development and to give a higher level and control of native security features which is not permissible with some commercial software (Okmen, 2008 as cited in Aydin and Tirkes, 2010).

Siemens (2004) argues that learning environments must have certain characteristics which accommodate learner expression, space for interactivity for content (via LMS) and between learners and instructors as well as the space to discourse with industry

experts. The needed engagement and interaction can be sustained by using educational social software and LMS to create the needed learning ecology for online distance learning. Within the context of distance education, Anderson (2005, p.4) as cited in Dalsgaard (2006) introduces and provides the definition of educational social software as, “*networked tools that support and encourage individuals to learn together while retaining individual control over their time, space, presence, activity, identity and relationship*”.

These include tools such as chats, e-mails, wikis, RSS feeds, weblogs, discussion forums, file sharing and social bookmarking” among many others (Dalsgaard and Mathiasen, 2008). These tools should be used to facilitate learning and teaching strategies. Course developers are to consider the teaching approach in order to be able to create the suitable learning resources for students.

However, some researchers are of the view that educators in distance environments are over hyping online courses by repeating the mistakes which occurred during the revolution of web-based learning. The integration of media elements in web-based courses, through the use of LMS should be based on learning philosophies as well as learning outcomes and online learning characteristics. Thus, a good knowledge of learning or course management systems is needed to increase learning experience (Koszalka and Ganesan, 2004).

2.4 Multimedia Learning

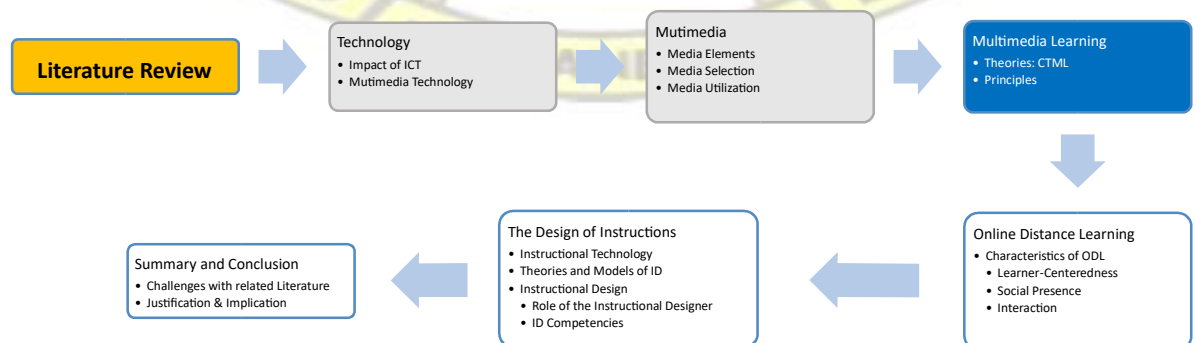


Figure 2. 5: Diagram of the approach to the review: Multimedia Learning

2.4.1 Theoretical Research on Learning with Multimedia: CTML

Among the theories which support learning processes, this study looks at a theory which is essential to guide educators in understanding how learning takes place. Various researchers have supported this field of study in various ways, however, the cognitive theory of multimedia learning is attributed to the research by Richard E. Mayer and his colleagues. This theory, based on years of empirical research and accredited to Professor Richard E. Mayer, makes the proposition that “people can learn more deeply from words and pictures than from words alone” (Mayer, 2005). As the stated hypothesis for multimedia learning, it focuses on how learners can apply cognitive strategies to process visual and verbal information to create and promote meaningful learning. Mayer's theory is linked to the cognitive load theory (CLT) of Sweller (1999) and is based on three assumptions suggested by research on cognition (Mayer and Moreno, 2002b). These are the dual-channel, the limited capacity and active processing assumptions (Mayer, 2005). From extended research, various scholars have sought to understand how these entities influence the way people learn. This study cover these assumptions as they apply to issues of learning and cognition.

2.4.1.1 Dual-Channel Assumption

Dual-Channel assumption holds that the human information processing system comprises dual channels for pictorial/visual and verbal/auditory processing (Paivio, 1986; Clark and Paivio, 1991). This provides an insight into the processes by which information is managed by learners. With information being channelled through separate channels, Sweller, van Merriënboer, and Paas (1998) contend that the use of

dual modes in processing information reduces the load placed on the mind. Thus, the use of both the separate visual and auditory channels in learning strategies can accelerate learning.

2.4.1.2 Limited Capacity Assumption

The limited capacity assumption holds that the visual and auditory working memory systems are highly limited in its processing capacity (Baddeley, 1992; Chandler and Sweller, 1991). The implication of its limitations in capacity and time points out that, learners are only able to process a specified amount of information within a given period. Hence, studies prove that too much information within any presentation is likely to result in cognitive load (Moreno and Mayer, 2003).

2.4.1.3 Active Processing Assumption

This assumption asserts that for meaningful learning to occur, there should be an active cognitive processing of selecting and organizing relevant information into a clear representation, and connecting visual and verbal representations and prior knowledge (Mayer, 1996; Wittrock, 1989). This assumption involves the processes of recalling materials into the working memory and organising and integrating selected materials with prior knowledge in the long-term memory (Mayer, 2005).

Based on these assumptions, instructional designers could build constructive learnercentred instructions that are media rich for multimedia learning to take place. The theory serves as guide by which multimedia instructional messages can be designed in a way that is consistent with how the human mind processes information. This, according to Mayer (2005), facilitates meaningful learning. Mayer (2005) identifies the five cognitive process that learners must engage. Learners must select relevant words for processing in verbal working memory, select relevant images for processing in visual working memory, organize selected words into a verbal model,

organize selected images into a pictorial model and integrate the verbal and pictorial representations with each other and with prior knowledge (Mayer, 2005).

2.4.2 Principles of Multimedia Learning

Much has been studied and written about the principles of multimedia. Most of the published studies have been of short duration and were specifically designed for research analysis, but have demonstrated the reliability of these principles (Austin, 2009; Clark and Mayer, 2008b; Moreno and Mayer, 1999, 2000; Sorden, 2005). However, emergent research on these principles, when applied in classrooms, has had mixed, albeit positive, results. Empirical research on the cognitive theory of multimedia learning with findings obtained from several experiments has steered our understanding of effective methods of integrating multimedia for enhanced learning (Mayer (2001). Mayer (2001) formulated several principles that should be used to maximise learning by reducing load on learner's minds during the processing of multimedia presentations (Issa et al., 2011; Mayer and Varnelis, 2003; Moreno and Mayer, 1999). In other studies, Aloraini (2012) comments on multimedia elements as integrated into an instructional presentation for effective learning; the objective was to stimulate the different senses of the learners in various syllabi (Hadmin, 2000 as cited in Aloraini, 2012). This study runs on the belief that the use of multimedia within distance learning presents a good case in educational practices. It has been proven to be effective in supporting online learning through multiple senses based on guided principles. Therefore, it is crucial to investigate what goes into the designing of online courses being guided by grounded design principles.

2.4.3 The Design Principles of Multimedia Learning

The design principles, based on CTML serves as a guide for educators in creating resources that help people learn more deeply from words and graphics than from words alone, as proposed by Mayer (2009). The designing of effective multimedia instructions, (instructions combining text and graphics) should be based on application of these design principles (Mayer, 2009). The following ten (10) principles are provided in summary based on the research done by various researchers (Mayer and Moreno, 1998a, 1998b, 2002a; Mayer and Varnelis, 2003; Mayer, 2005; Moreno and Mayer, 1999).

First of all, the multimedia principle present calls for a combination of words and pictures rather than only in words in a presentation. This enhances recall in students. Temporal and spatial contiguity principles addresses the placement of media elements within a presentation in order for learners to build constructive knowledge.

The exclusion of extraneous materials from a presentation help learners to focus on key content; this is referred to as the coherence principle.

In order to guide learners to organise their hierarchy of learning, the signalling principle requires designers to add cue which highlight key points in an instruction. The modality principle makes space for narrated audio rather than on-screen text in order to release the load on the visual channel. Also, when a multimedia presentation is in conversational rather than formal style, it helps to create a social environment for an engagement of cognitive process that is supportive of learning, this defines the personalization principle.

Including too many media in a presentation, such as graphics, narrated audio, and onscreen words creates a split attention on learners and negatively affects processing

capacity. Also, the process of adding an instructor's image in a multimedia presentation does not necessarily achieve learning. Lastly, segmenting multimedia message allows learners to learn at their own paced. The segmentation principle allows learners to completely go through a process step by step for easy comprehension.

2.5 Context of Online Distance Learning

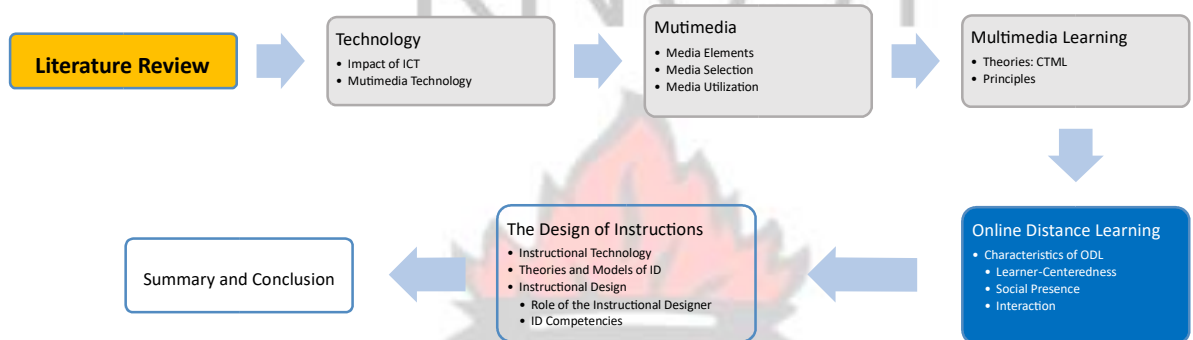


Figure 2. 6: Diagram of the approach to the review on Online Distance Learning

The advancement of ICT has enabled innovative methods in education, whereby traditional classroom methods have been projected beyond the norm of Face-to-Face (F2F) learning to new paradigms of Online Learning (OL) and Distance Learning (DL). A growing number of higher learning institutions have and continue to adopt this stance as a method for delivering education to learners near and far. This is in addition to its application as a supplementary tool for traditional classroom or a blend of both methods. Online learning, also referred to as e-learning or web-based instruction (WBI), is believed to demand a high increasing application of ICT where instruction media can be accessed via the web at a distance or as a complementary tool in a classroom setting (Ali, 2000; Holmes, 2000).

Within the heart of the convergence of education and technology is distributed learning. Distance Learning (DL), as a subset of distributed learning, places emphasis on learners who may be separated in time and space from their peers and the instructor (Clark and Mayer, 2008a). Kearsley and Moore (2012) state a basic concept of distance education as “teachers and students are in different places for all or most of the time that they teach and learn”. This idea stems from the differences in location of both teachers and learners and their reliance on technology for interactions. Pitman’s Shorthand training program is noted to have been the initiation of distance education in the 1850s (Casey, 2008). Its application as an instructional medium was also harnessed through television and radio broadcast. A global acceptance of this system of instructional delivery was realised through the advancement of computer, satellite and the world wide web (www) technologies (Casey, 2008). People who for some reason cannot enrol in a traditional Face-to-Face (F2F) educational institution now have the same learning opportunities through delivery methods online and at a distance.

Hiltz and Turoff (2005) gives their view on online learning as “a new social process that is beginning to act as a complete substitute for both distance learning and the traditional face-to-face class” (p.60). They further submit that, there is a shift from face-to-face (F2F) courses based on objectivism and teacher-centered pedagogies to a constructivist and collaborative blend of learner-centered pedagogy for online and hybrid courses delivered via digital technologies. Online learning can be synchronous or asynchronous. Among the factors that account for a higher patronage by workers with or without families include: flexibility, effective learning, instructor presence, administrative support, quality online instruction. (Hiltz and Turoff, 2005). Within the merge of distance and traditional face-to-face learning, we are presented with a current

trend of blended learning methods. Garrison and Kanuka (2004) are of the view that blended learning, an effective and low-risk method is realized when traditional face-to-face (F2F) learning are complemented with web-based materials. As such, blended learning approach has been noted to be increasing with an expected upward growth within higher educational institutions.

Studies already show a greater number of institutions providing blended learning services (Arabasz and Baker, 2003; Bonk and Graham, 2006; Bonk, Kim, and Zeng, 2006). With the support of a good Learning Management Systems (LMS), the application of blended learning within a class is effective and is able to engage learners, create the needed interactivity synchronously and asynchronously, broadens the scope of learning possibilities and result in achieved learning objectives. According to Garrison and Vaughan (2008) blended learning redesign is a proven approach that can enhance and expand, and ultimately transform, both the effectiveness and efficiency of the teaching and learning experience in higher education.

Studies by López-Pérez, Pérez-López, and Rodríguez-Ariza (2011) portray a positive impact on students learning based on their final assessment. Their study agrees with Lei (2010) on the findings that blended learning strengthens comprehension of the subject by students to provide a meaning learning experience.

2.5.1 Characteristics of Online Learning

This paradigm shift from traditional F2F to online learning conveys some innovative qualities and specific skills that affect pedagogy, the learning environment, the instructional delivery technologies, as well as the teacher and learner community at a distance among other issues. Stevens (2009) outlines a number of aspects which is believed to affect the trend of education being practiced. They include pedagogy,

networking, literacy, heuristics, formality, transfer, directionality, ownership, sharing and classification.

These issues are pertinent to all stakeholders in online and distance communities and must be addressed to ensure a successful online learning environment (Salmon, 2000).

Among these characteristics, the issue of communicating instruction to learners through media also stand to be reviewed. Sheybani and Javidi, (2004) believe the issues of design, accessibility, and the pedagogy of distance learning, interactivity, and educational outcomes are of concerns to the learner and the instructor. As such, the use of innovative technology and media in creating a good platform for pedagogical variety, virtual learning spaces and favouring autonomous learning is significant, while taking cognisance of the characteristics of online learning (Moore 2003). Among these characteristics, three factors that influence the success of online learning as they relate to multimedia design principles are discussed.

2.5.1.1 Learner-Centeredness

The environment presented in current online learning indicates a change from teacher-centered to a learner-centered or student-centered and constructive learning environment in the field of distance education (Beldarrain, 2006). This is a result of the key role played by technology in instructional delivery. This has enabled communication among teachers, learners and content within synchronous and asynchronous learning environments which is “engaging, interactive, affordable, efficient, effective, easily accessible and flexible” (Khan and Granato, 2008). This concept puts learning within the power of learners. The thought of Moore (1993) on learner autonomy is understood as "the extent to which in the teaching/learning relationship it is the learner rather than the teacher who determines the goals, the learning experiences, and the evaluation decisions of the learning program.

Following the tradition of cognitive-constructivist philosophy which is centered on personal construction of knowledge, Anderson and Dron (2011) assert that the social-constructivist approach redefines the function of the teacher. Within the learning environment the teacher assumes the role of a guide and moulds the learning experience, rather than being an instructor as in a behaviorist environment. According to Beldarrain (2006), learners construct knowledge through role-playing and learner-to-content and learner-to-learner interaction in problem solving. Within online distance education, technology can facilitate the integration of multimedia elements to create web-based learning environments in which there is communication and interaction that supports a constructive learning theory.

2.5.1.2 Social Presence

Mandernach (2009) is of the view that the application of personalization principle of multimedia learning which is allied to social presence, fosters learning whiles reducing load on cognition. However, personalizing learning does not only stop at cognitive learning theories but should address interaction in the teaching and learning environments. Kehrwald (2008) states, “mediation is a key consideration in learners’ experiences of online learning”, and this is a feature of learning online that is important to learners. This is perceived in the way instructors facilitate online discussion. It is important that tutors keep the learners engaged and motivated as they participate in learning. As defined by Anderson, Rourke, Garrison, and Archer (2001), the teaching or facilitating presence cover “the design, facilitation, and direction of cognitive and social processes for the realization of personally meaningful and educationally worthwhile learning outcomes”. Verkroost, Meijerink, Lintsent, and Veen (2008) are of the view that, a blended approach should create a sense of community among learners and invoke the learner-teacher relationship that is akin within face-to-face

environments. Social presence on the side of learners also is important to the success of online distance learning. Richardson and Swan (2003) reported progressive relationships between students' social presence scores and learning performance as well as between views on instructor presence and students' social presence scores. In view of these, Mandernach (2009) contends that, increase in student engagement is achievable through the use of personalized multimedia learning content.

2.5.1.3 Interaction

Another important component in an online distance learning environment is interaction owing to the issue of isolation of learner and facilitators. "Vygostky considered social environment to be critical for learning and thought that social interactions transformed learning experiences" (Schunk, 2009). More so, efficiency in online learning also depends on interaction as a vital component for engaging students in their learning process (Dunlap, Sobel, and Sands, 2007). Ustati (2013) places learner interaction under three domains for distance learning programmes. They are "instructor-learner interaction, learner-learner interaction and learner-content interaction". These interactions are recognised within online community discussions, where multimedia elements are well integrated into the course content.

Effective mix of media presents a constructive learning environment where interactions could be fostered to develop the relationships among the three domains.

Learner-instructor interaction

The interaction that occurs between learners and instructors is essential with online learning as it replaces the interaction of face-to-face pedagogy. Moore and Kearsley (1996) note that this is basically "the interaction between the learner and the expert who prepared the subject material". Sharp and Huett (2006) gives three primary

functions required of the instructor as, “to stimulate interest and motivation; to organize the application of student learning; and to counsel, support, and encourage each learner”. Also, Kearsley and Shneiderman (1999) argue that, the instructor has the responsibility to maximize student interaction. In a learner-centred learning environment, the role of the facilitator should be “responsive to student needs and set a generally positive and friendly tone that invites them to be candid about the way the course is proceeding” (Bonk, 2000). This can be achieved through a humane and an encouraging approach to foster social relations by providing “welcoming statements, thank you notices, invitations, apologies, discussion of one’s own online experiences and humor” (Bonk, 2000). Learner-instructor interaction is highly recommended for online distance education to be successful. A report by the University of Illinois faculty states, “high quality online instruction can occur. . . if professors take the time and effort to maintain the human touch of attentiveness” (University of Illinois (1999), as cited in Sammons, 2003).

Learner-learner interaction

Peer-to-Peer (P2P) interactions which is demonstrated in effective communication in many other fields must be provided within higher education, especially in online distance. This domain of interaction which exist amongst learners at a distance is believed to offer a positive learning experience (Curtis and Lawson, 2001). Moore and Kearsley (1996) observe that this is “the interaction between one learner and other learners, alone or in group settings, with or without the real-time presence of an instructor”. Hannon and Adkins (2002) identify learners as an active part of online learning communities who create their personalities in relation to other participants of the community; thus leading to an increased learning experience. For online distance education, it can be said to be an essential “two-way reciprocal communication

between or among learners who exchange information, knowledge, thoughts, or ideas regarding course content, with or without the presence of an instructor” (Moore and Kearsley, 1996).

Learner-content Interaction

This form of interaction exists between the learner or student and the subject matter being studied. Although it denotes an interaction, only “the learner is directly involved in learner-content interaction” unlike the other two domains (Moore and Kearsley, 1996). Moore and Kearsley (1996) explain the learner-content interaction to involve “a process of individual learners elaborating and reflecting on the subject matter or the course content”. Sharp and Huett (2006) is of the view that, when a learner interacts with the course content, it results in the knowledge construction which is generated from a transformation in the learner’s perception. Perhaps, this domain needs an intense examination of how multimedia course content could be integrated to maximise learning among online distant students. Practical implications for this domain stands on the fact that appropriate media is needed to engage learners as they interact with course content. Sims (2003) however reported that, educators have failed to consider interactivity that enables a constructive approach to learning from the content. Hence, it is important for course designers and educators to consider the value of media selection and utilization within the design process in order to create an environment for learner-content interaction.

2.5.2 Designing for the context of online distance environments

Every online distance environment possess a unique space for its course designers and learners through which online distant learners can stimulate learning though the mix of media in their courses (Aloraini, 2005). Ali (2000) reports that, students’ misapplication of technology in learning, where by multimedia elements are over used

leads to a deficit in learning. This places a challenge on educators on the appropriate choice of method to utilize in the design and development of online courses. Spector (2000) asserts that, “Context is relevant for learning and the construction of meaning. Therefore, context must be taken into explicit consideration when planning instruction”. His concept of learning acknowledges a “change in abilities, attitudes, beliefs, capabilities, knowledge, mental models, and patterns of interaction or skills”. Furthermore, he argues that, distinguishing and surveying these ideas will broaden the instructional design perspectives. More so, Mayer (2003) cautions instructional designers and course developers concerning the degree at which interactivity in online course design is integrated via multimedia technologies. An over application of multimedia elements would defeat the purpose of maximised learning.

Since the mid-nineties, there has been a considerable increase in delivering instruction at a distance and with this increase, the implications for the design of online distance learning courses is discussed by literature (Bassi and Van Buren, 1999). Instructional designers possess the prospect and obligation to manage an instructional design model or process in such a way that meet the learning needs of heterogeneous students. Hawkrigde (2002) as cited in Akbulut (2002) is of the view that, the design process for online distance learning materials should be accomplished by competent designers with knowledge of grounded theory and principles that reinforces instructional design. This is where we see the pivotal role of the instructional designer, facilitator and learner in the design process as asserted by some researchers (Sims and Hedberg, 2006; Sims and Jones, 2003). However, Hawkrigde (2002) contend of the low number of instructional designers and technologists available to be employed in the practice. Within various pedagogic domains, designing in context requires learners and

facilitators at a distance to be adequately equipped to make the right choices of both instruction and media (Anderson and Dron, 2011).

Although educators in distant learning environments cannot ignore instructional design as process that guides development of online courses, there is the need to reexamine the existing methods of online course design and development in the light of the promises of learning through multimedia platforms. If indeed research has given the green light on the possibility of maximising learning through a combination of pictures and words (Clark and Mayer, 2008; Mayer and Moreno, 1998; Mayer, 2003), then it is laudable for online distant courses to make use of this to their benefit. Designing online courses in context therefore requires a critical view on what the learner needs as well as the theories that underpins the designing of instructions for online distant environments.

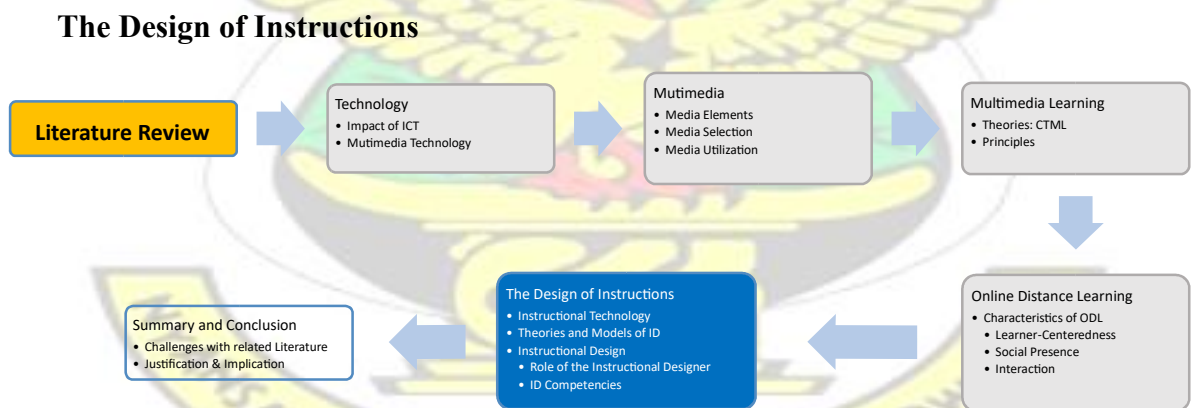


Figure 2. 7: Diagram of the approach to the review on the design of Instructions

2.6 Instructional Technology

A look at field of instructional technology suggest an emerging trend that makes it difficult for researchers to easily define this ever transforming discipline. Through new and innovative ideas, the practices within this field is widening and

professionals in the field attempt to define it through an extensive variety of different views. As argued by Seels and Richey (1994) instructional technology seek to “affect and effect learning”. The definition of instructional technology as given by the Association of Educational Communications and Technology (AECT) is, “*the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning*” (AECT), 2001, para. 4).

This definition covers a broad terrain of terminologies which provides a base for understanding instructional design theories and models as well as the role of instructional designers. The knowledge base for the field is divided into five interconnected spheres: design, development, utilization, management, and evaluation (Figure 2.7). (Seels and Richey, 1994). A later definition by AECT (2007), of instructional technology saw a change in terminology. “Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources” (AECT, 2007).

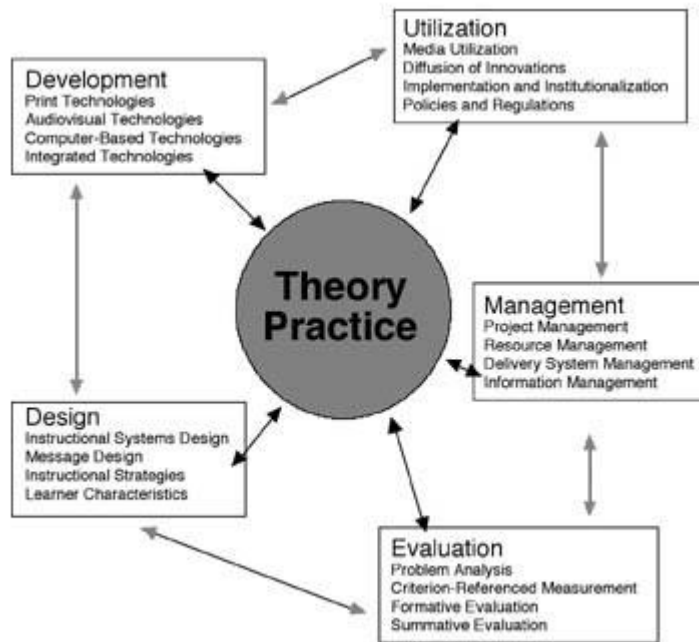


Figure 2. 8: The 1994 Domains within the Field of Instructional Technology and the Relationship between Domains (adapted from Seels and Richey, 1994) – Adopted by AECT

In approving these opinions as they apply to the design of instructions, it stands to reason that the ability to design online multimedia resources for learning needs is hinged on the application of certain principles. As grounded by years of empirical research, they will rest on the premise that such principles are the foundation of the results of the outcome. Whereas effective multimedia instructional design might rest on the theory and principles of Mayer's research on CTML, what facilitators and designers are producing currently might not be the direct result of such principles. Probably a better enforcement of these principles will be needed to compensate for what is happening in the field.

2.6.1 Instructional Design: Theories and Models

2.6.1.1 ID Theories

The theories behind the design of instruction has become a bedrock on which educators stand to design, develop and deliver high quality instructions based on learning needs.

One fundamental view is that for effective instructions, instructional methods and the media elements that deliver them must guide learners to effectively process and adapt new knowledge and skill (Clark and Mayer, 2008). Instructional design has changed undoubtedly from its earlier form in the mid-nineties to a more current paradigm in the 21st century within education as well as other fields. The ever increasing competences of digital technology tools have advanced the possibility of designing and developing effective and quality learning resources across various learning and teaching platforms. With philosophical underpinnings supporting Instructional System Design (ISD), there is a high potential for boosting the efficacy of design. Based on learning theories, a good understanding of how learners process information is needed to determine which instructional design method is suitable (Reigeluth and Carr-Chellman, 2009). Thus, many computerbased strategies in education that have proved successful are hinged on the synergy of technology and education, where Instructional Design Theory (IDT) has been applied with learning theories in developing curriculum. However, Mcleod (2001) remarks that such theoretical frameworks do not readily solve the design problems, however, they provide “clarity, direction and focus throughout the instructional design process” (p.35).

Professionals who have contributed much to the knowledge of this changing profession (Dijkstra, 2000; Jonassen, 1997; Reigeluth, 1999, 2009; Silber, 2007) echo the message that instructional design is a form of problem solving. Within educational context, ID exists to guide content developers through a systematic design process to develop instruction for learners. The theories and practices in this field led to the realization of several definitions with a key set of elements, which are relevant to the understanding of this important field. Gustafson and Branch (2002) add to these views in stating that,

"Instructional design (ID) is a system of procedures for developing education and training programs in a consistent and reliable fashion" .

With Learning theory being “descriptive theory rather than design theory” according to Reigeluth and Carr-Chellman (2009, p.10), what Instructional System Design (ISD) Theory as “goal oriented and normative” targets is an enabling environment of events and processes that results in the design and development of appropriate instructions (Reigeluth and Carr-Chellman, 2009). Instructional design can then be seen as a process of designing instructional materials in a way that supports effective learning. Hence, ISD provides a model or guide that educators as well as instructional designers can follow to design and develop instructions.

2.6.1.2 ID Models

Morrison, Ross, and Kemp (2004) express the view that the systematic approach to adapt instructional design processes in the context of education is offered through Instructional design models. Acknowledged as a complex process, the purpose of instructional design models is well perceived within the context of instructional or in problem-solving settings (Branch and Kopcha, 2014; Gustafson and Branch, 2002; Ryder, 2014; Siemens, 2002). Years of practice and research by professionals in the field has led to a refinement of the scope of ID models. This has helped in its current definitions. (Gustafson and Branch, 2002) ID models are “systematic guidelines instructional designers follow in order to create a workshop, a course, a curriculum, an instructional program, or a training session” according to (McGriff, 2001). Also, it is "the systematic process of translating principles of learning and instruction into plans for instructional materials and activities" (Smith and Ragan, 1993, p.12). By these definitions, researchers have sought to lay down practical frameworks that guide in the design of instructions.

Notable among the myriads of models are Merrill's First Principles of Instruction, ADDIE Model, ARCS Model, Dick and Carey Model, Kemp's Instructional Design Model, Gagné's Nine Events of Instruction, Bloom's Learning Taxonomy, Kirkpatrick's 4 Levels of Training Evaluation and Cathy Moore's Action Mapping (Culatta, 2013). A summary of the ADDIE, Dick and Carey and the Kemp models gives a clear picture of what educators can use in their design processes.

2.6.1.3 ADDIE Model

Studies (Gustafson and Branch, 2002) report that there has been a variety of ID models in existence as far back as 1970. The characteristics of most models is based on the central idea of the systematic approach to product development; the ADDIE instructional model. ADDIE is the generic term that represents the systematic process to analyze, design, develop, implement, and evaluate a product or instruction. (Figure 2.8).

However, ADDIE in itself is not well explicated as an ID model. It is considered as template from which a number of models assume a common underlying structure (Branch and Merrill, 2012). Molenda (2008) notes the development of this model as handed down orally without a formal outlook by several authors. A further contention is that the traditional ADDIE has become a “colloquial term” which designates instructional design approach (Molenda, 2008 as cited in Branch and Merrill, 2012).

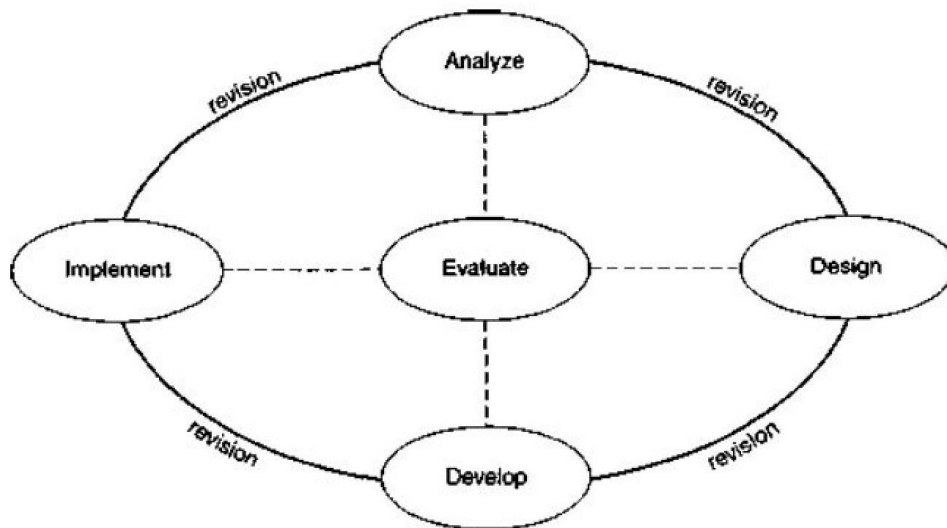


Figure 2. 9: The ADDIE model. Adapted from Branch and Merrill (2012)

Wang, Brown, and Ng (2012) asserts ADDIE to be the best and widely used model for designing e-Learning resources. This is seen in its appliance to designing learning activities and content for learning. It is however thought to require much time and labour in its processes. Current research however present a modified version of the ADDIE model. (Branch and Merrill, 2012) depict the ADDIE in a non-linear and reformed process with its characteristic “iterative and self-correcting nature” to be its profound assets. Despite its usage in the development of instructions over decades of instructional design and development, known limitations and weaknesses of this model makes it unpopular in current practice. Cullata (2013) outlines seven weaknesses affiliated to the traditional ADDIE Model due to its iterative and linear features.

2.6.1.4 The Dick and Carey Instructional Systems Design (ISD)

Dick and Carey Systems Approach Model (systems-oriented), recognised among systematic design models, follows an iterative process that can be used in various contexts (Figure 2.9). Gustafson and Branch (2002) affirm it to be “the standard to which all other ID models (and alternative approaches to design and development of instruction) are compared”.

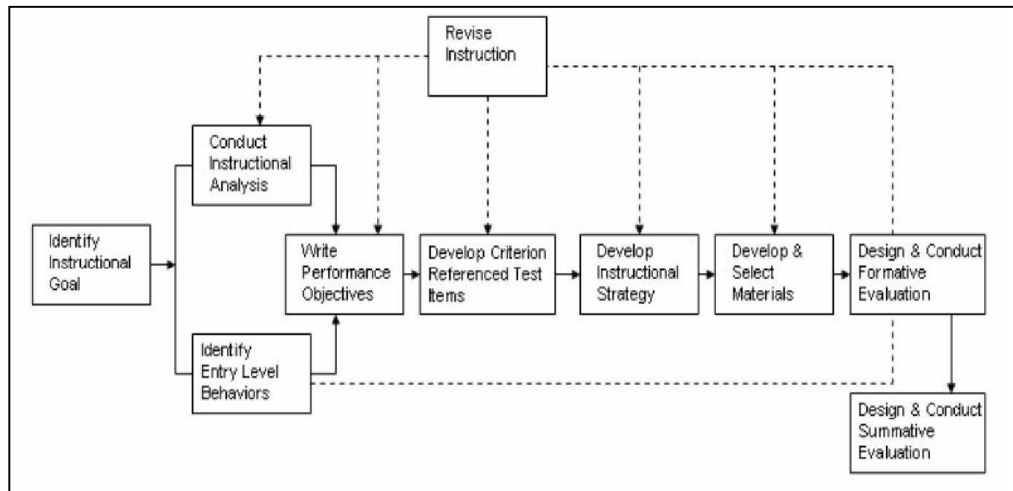


Figure 2. 10: Dick and Carey ID Model. (Dick, Carey, and Carey, 2009).

This model is underpinned by an instructional theory which states that “there is a predictable and reliable link between a stimulus (instructional materials) and the response that it produces in a learner (learning of the materials)” (McGriff, 2001). The model recognises the essence and interrelationship of the instructor, learner, content as well as the learning environment in achieving successful learning outcomes (Dick, Carey, & Carey, 2009).

2.6.1.5 The Kemp Instructional Design Model

The Morris, Ross, and Kemp Model, commonly referred to as the Kemp Model is an ID model that highlights the adoption of a continuous implementation and evaluation throughout its design process (Morrison, Ross, and Kemp, 2004). The Kemp model is a nine step instructional design model (Figure 2.10), which places six questions before an instructional designer who engages this model. They involve the following:

- “required level of learner readiness;
- instructional strategies and media that are the most appropriate for the content and the target population;
- appropriate media

- level of learner support required;
- measurement of achievement; and
- strategies for formative and summative evaluation” (Morrison, Ross, and Kemp, 2001).

Remley (2002) studies the model to assert that, based on the task to be completed some of the elements would be optional (Kruse, 2004). Gustafson and Branch (2002) believe that this model affords educators to manoeuvre through the process with little instructional design skill to create resources. Also, designers could engage the process in creating simple resources that require little or no formative evaluation using the Kemp model (Gustafson and Branch, 2002).



Figure 2. 11: The Kemp ID Model. (Dick et al., 2009).

Table 2. 3: Summary of selected ID Models

ADDIE, Dick and Carey and the Kemp Models		
1. Analyse needs	1. Identify instructional goal(s)	1. Identify instructional problems, and specify goals for designing an instructional program

2. Design intervention	2. Conduct instructional analysis	2. Examine learner characteristics that should receive attention during planning
3. Develop prototype	3. Analyze learners and contexts	3. Identify subject content, and analyze task components related to stated goals and purposes
4. Implement plan	4. Write performance objectives.	4. State instructional objectives for the learner
5. Evaluate	5. Develop assessment instruments	5. Sequence content within each instructional unit for logical learning
	6. Develop instructional strategy	6. Design instructional strategies so that each learner can master the objectives
	7. Develop and select instructional materials	7. Plan the instructional message and delivery
	8. Design and conduct formative evaluation of instruction	
	9. Revise instruction	
	10. Design and conduct summative evaluation	

Despite their differences, each model contains certain vital stages in the design process.

In summary, this include: analysis of needs in context, the content, and the learners; identification of instructional goals; design of the right mix of media; the development of the instructions, as well as evaluation (formative and summative).

2.6.2 Evaluation and Assessment of Multimedia Instructions

Within the field of instructional design, a lot of research has been conducted on the processes that guide the design of resources for learning. Models for instructional design have been given thorough scrutiny to develop new and efficient ones. One key stage in every model is the evaluation stage. Evaluation within instructional design models involves the planning to consider approaches to review instructional materials in order to ascertain its efficiency and to recommend necessary alterations (Khan and Granato, 2008; Smith and Ragan, 1999). This covers learner's assessment and evaluation of instructional materials (Smith and Ragan, 1999) and learning

environments (Khan and Granato, 2008). Smith and Ragan, (1999) differentiate between the two forms by making use of term ‘assessment’ for student evaluation and ‘evaluation’ for the context of evaluating the instructional materials. Evaluation comprises the terms formative evaluation and summative evaluation. Formative evaluation addresses issues during the design and development stages for improvements to be effected; while summative evaluation is conducted after implementation of a learning product for the needed feedback in order to make revisions. Clark (2010) projects summative evaluation as method used to value of programs in its summation, focusing on the end result.

Khan and Granato (2008) provides a sample review criteria for the evaluation stage from Comprehensive Approach to Program Evaluation in Open and Distributed Learning (CAPEODL) model in the table below:

Table 2. 4: Performance Criteria for Evaluation Stage

Pedagogical	How well are the course contents presented for meaningful learning activities?
Interface	Technological How good is the Learning Management System (LMS) in managing and delivering the online content?
Design	How satisfied are the learners with the look and feel of online content?
Evaluation	How do learners feel about what they learned from a real world perspective?
Management	How well are various learning materials maintained and managed?
Resource	How well are various support services provided?
Support Ethical	How well are various ethical issues addressed in the learning materials?
Institutional	How well do the course contents maintain academic quality of the institution?

Product and the CAPEODL Performance Criteria for Evaluation Stage.
Adapted from (Khan and Granato, 2008, p. 7)

With these evaluative tools available to educators and designers of online learning environments, it is possible to determine the needs of learners and adequately develop learning that is effective and satisfy the learner-centeredness at a distance. However, Frydenberg (2002) is of the view that very little developed programs have been able to

conduct summative evaluations in design processes. Despite the increase in technological capabilities, research still point to the fact that, “educational developers have failed to fully consider “systematic design and evaluation”; instead, attention is drawn to what is “technologically possible rather than what is educationally desirable” (Martens, Bastiaens, and Kirschner, 2007; van Merrienboer and Martens, 2002). It is important to look at how the field of Instructional design, as well as its role and other related concerns are faring.

2.6.3 Instructional Design

Smith and Ragan (1999) define Instructional Design (ID) as the “systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation”. As distance learners are heterogeneous, the role of the Instructional designer in education is immensely important with regards to designing and developing instructional content for use in different learning environments. This idea projects that there are different learners with their unique learning types and strategies (McLeod, 2001). As Meyer (2002) noted, it is important for designers and developers to have “a sharper understanding of the role of instructional design and its application to the students and materials presented”. The Instructional designer is to work with media, or with tasks associated with systematic ID procedures (Reiser, 2001) to create instructions that support learning. As such, Instructional Designers analyse and convey material in a format that is interactive, engaging, and motivating. Instructional Designers build instructional materials that are designed and developed for different learners rather than a ‘one size first all’ resource. Huang (2005) suggests that a team with the

“appropriate skills, and teamwork as the keys to the success of creating a multimedia module”.

2.6.4 Role of Instructional Designer in Distance Learning

With the ever changing landscape of the field of instructional design, the responsibilities of creating online courses that are able to satisfy today’s learners is undoubtedly essential to educators. Reigeluth (1999) stated that "an instructional design theory... offers explicit guidance on how to help people learn and develop". According to Visscher-Voerman and Gustafson (2004), the instructional designer, *“invents, conceptualizes or creates concrete products or materials for instructional or educational purposes; is responsible for the educational, instructional, or pedagogical aspects of the product; is able to reflect on his or her work”*.

Being required to undertake such a complex task, how then can educators design and develop courses that support learners’ cognitive process to maximize learning? The suggestion of a “clear design and a reduction of apparent complexity” is given in order to engage the learner whiles reducing cognitive load (Hedberg and Metros, 2006). Also, a person with instructional design competencies (Sims and Koszalka, 2008) should be guided by instructional design theories in order to achieve this task. Sims and Koszalka (2008) submit that, the challenges with competencies in instructional design includes certifying that individuals are well equipped with the necessary proficiencies to create the needed learning spaces for learners.

2.6.5 ID Competencies

Chapman (2008) deliberating on the ‘Tools for Design and Development of Online Instruction’ acknowledges the integration of instructional design tools in some development procedures but considers extensive research that caters for instructional systems that allows educators to create online learning courses without much

instructional expertise.

Concerning the professional development of instructional designers, such educators may fit the description of “designer by assignment” (Merrill, 2002 as cited in Irlbeck, 2011); being the designation of a content expert who is tasked to design and develop learning resources within a specified context. Irlbeck (2011) confirms these designers to be knowledgeable in their respective fields but are limited by what they can do in course design and development. Irlbeck (2011) reinforced the need for “various levels of instructional design expertise and practice” in order for educators or designers to progress in the field of instructional design.

The success of learning at a distant for both students and educators alike is partly supported by a good design and implementation of quality learning, empowered through 21st century technology. Instructional designers or course facilitators are key stakeholders who bring to bear the synergy of education and computer technology to learners. Brown and Voltz (2005) contends that awareness of the “understandings in education, multimedia content, resource publication, and electronic technologies” are mandatory in designing e-learning courses. They approve collaborative efforts rather than individual role; calling on a “participatory design and implementation approach” with interactions between designers and users in order to perform such complex tasks (Brown and Voltz, 2005).

The challenges of online learning in regards to drop out rates, learner resistance, and poor learner output can be tackled through the systematic process of designing instructions based on grounded principles, models and theories. This would lead to the realization of transformational teaching and learning, especially in online distance environments.

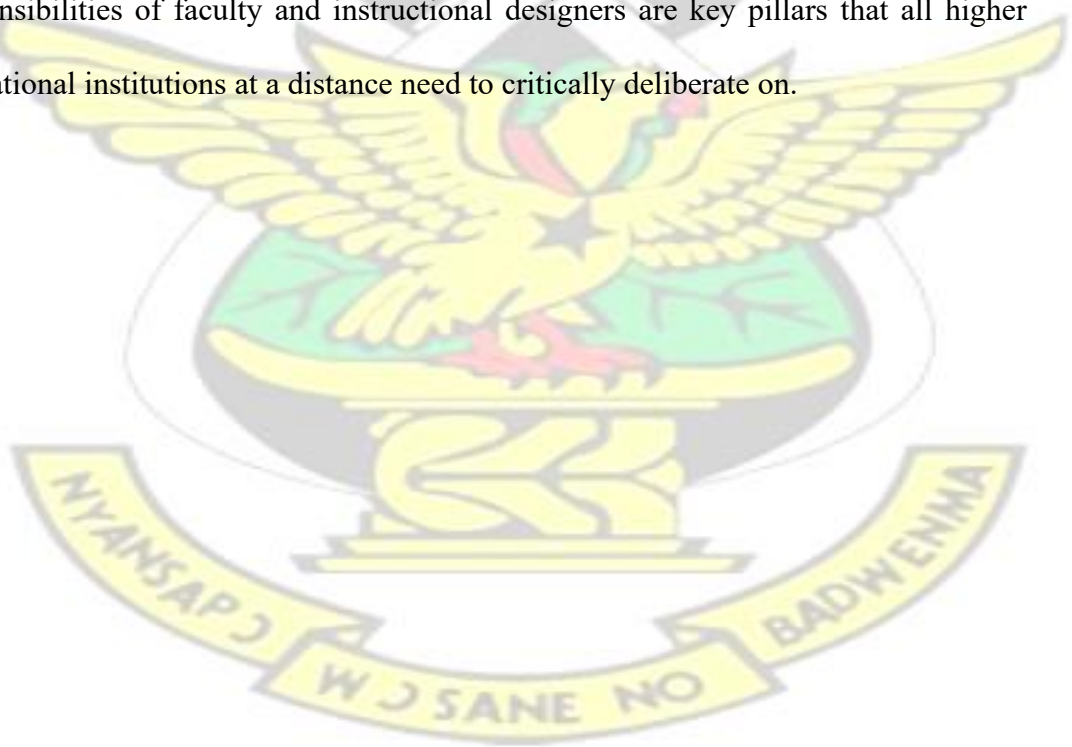
2.6.6 Multimedia Instructional Design for Online Distance Education by Facilitators

Facilitators within online distance environment being required to develop their own instructional resources are challenged to do so in through a systematic process that combines clear learning objectives with pedagogical models. As such facilitators would need to understand the fundamental components an online learning environment. Where e-learning projects fails to achieve its full benefits can be attributed to the non-adherence to basic instructional goals and objectives. This is the case where content developers lack the basic training in instructional design principles (Ismail, 2002). Sims and Koszalka (2008) also affirm that, "... the next generation of designers, instructors, and educators needs to develop competencies that expand upon or even replace those that have been considered essential (Richey, Fields, and Foxon, 2001).

Moore, Moore, and Fowler (2005) discourse on fluency in information technology (FIT) by the National Research Council as a critical factor in faculty development. They identify three categories of knowledge required of faculty, especially for facilitators in an online distance environment. These are contemporary skills, foundational concepts and intellectual capabilities. Faculty should possess the ability to leverage computer applications for communication at their workplace whiles developing current skills. Secondly, facilitators should understand fundamental technological concepts, drawing on the Strengths, Weaknesses, Opportunities and Threats (SWOT) of this advancing tool. Lastly, the skill to utilize ICT in solving complex problems through the control of the technology (Moore et al., 2005). This calls for institutional measures which should address issues of *"awareness of students' needs and approaches to meet them through the available technologies; the enablement through professional faculty development required for effecting*

transformation... and the integration of pedagogy, learning space design, technology, support, policies to enable successful learning” (Moore et al., 2005, pp. 11.3–11.4).

Professional faculty development strategies have to be reviewed continuously, especially with the force at which technology as well as student expectation of 21st century online learning is progressing. Badu-Nyarko (2013) recommends sufficient tutoring for support staff to understand distance education programmes as well as a continual appraisal within each academic semester to provide the needed reinforcements. Educators must strive to keep in step with this rapid change in order deliver an optimal and effective support for online distance learning. The responsibilities of faculty and instructional designers are key pillars that all higher educational institutions at a distance need to critically deliberate on.



2.7 Summary and Conclusions

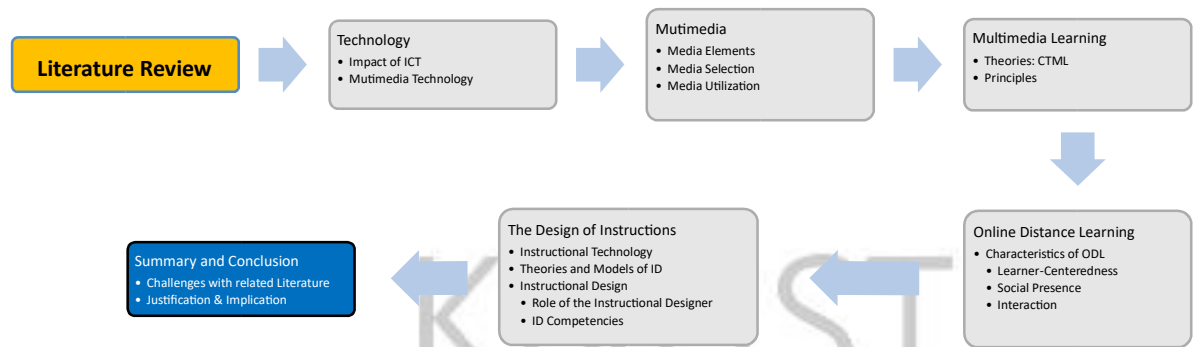


Figure 2. 12: Diagram of the approach to the review on the summary and conclusions

Educators constantly explore ways in which learning can be maximised. Technology has, and continues to influence trends in instructional delivery and pedagogical methods in education. The rate at which technology is impacting on online distance education calls for the need to revisit strategies that support higher learning through multimedia. However, the issue is not solely to sink our feet into the myriads of technological inputs but also a look at how learners process information through the lens of theoretical underpinnings. As such, Beldarrain (2006) calls on educators to “revise delivery structures and rethink pedagogical practices that were once appropriate”.

Researchers such as Sweller (1999) and Mayer (2001) have presented literature on the cognitive load theory and multimedia learning theory as a base on which instructional design and the processing of multimedia instruction by the human cognitive architecture, is supported (Tabbers, Martens, and Merrie, 2004). This can be a way by which educators could make use of multimedia instructions, that is, in terms of better learning results or less mental effort spent, thereby leading to deeper learning by students. A review of 436 educational websites reported a predominantly text-based environment which points to the fact that educators have not been able to fully utilise

technology to impact pedagogical methods (Kanuka, 2002). This point to the view that, Education in Universities still remain untransformed, bearing traditional appearances. If multimedia learning holds the promise that, a combination of pictures with words, will be able to promote deeper learning for a learner, when they are designed based on how the learner learns (Mayer, 2003), then designing for the context of online distance environments needs to be pitched along these theories that support learning at a distance.

2.7.1 Challenges with related literature (Identified Knowledge Gaps)

Despite the plethora of studies in the fields reviewed, current literature still indicate a divide between theories that underpins educational application designing and that which support the application of technology in classrooms (Offer and Bos, 2009), and the lack of a converging orientation that intersects technology, curriculum and pedagogy (Mumtaz, 2000; Robin, 2008 as cite in Moradmand, Datta, and Oakley, 2014). There is still a call for exploration into the efficacy of different media elements needed to inform instructional strategies for efficient learning (Lou, Bernard, and Abrami, 2006). Educators still have the challenge to fully identify and equip instructors as well as learners in online distance education with skill and competencies needed to keep up with advancing technology (Ananiadou and Claro, 2009). With distance education considered as a viable alternate to traditional learning systems, the researcher agrees that more study is needed to understand how the integration of media elements within online distance courses impact on students' learning.

2.7.2 Justification and implication for the study

The researcher's intent was to investigate current and relevant views of multimedia instructional design and its impact on learning. Theories which support learning as well as the design of instructions show the possibility of creating learning spaces that meet

the needs of the 21st century online distant learner. The objective of the review was to confirm how multimedia technology in education can facilitate the efficiency in creating media-rich resources needed to maximise learning. This review depicted the views on the use of some selected instructional design models and their characteristics in relation to designing instructions. Positioning online learning within a constructive domain, the learning process has also identified as subjective amidst the backdrop of heterogeneous distant learners. Within the complexity of instructional design processes, there exist no embalmed formulas that cover the broad range of learning contexts. Scholars however admonish on the use of ID models as guide for educator and designers; and designing to be tackled in an appropriate context determined.

With literature supporting the influx of technology in education, instructional designing has become more extensive and requires collaborative efforts in planning instructions that will increase and maximize learning (Callison, 2002). It was also evident that the divergence of theory and practice of multimedia learning needs to be consciously revised to blend current pedagogy and the application of media technology. Educators are encouraged to consider instructional paradigms that fit into their context of learning. This would encourage constructive learning that can be harnessed through Information and Communication Technology. Faculty developmental support as a method of increasing competencies among online facilitators is also crucial. “Successful multimedia learning systems require wellplanned and skillfully written contents, attractive and functional graphic design, and rapid implementation at a reasonable and affordable cost (Low, Low, and Koo, 2003).

This chapter addresses in part the objectives set out by the study. The ensuing chapter begins with the research paradigm, methodology and design within which the study

was situated. It also reports on the data collection and analysis methods used which provides understanding into how the study was conducted.

KNUST



CHAPTER THREE

METHODOLOGY

3.1 Introduction

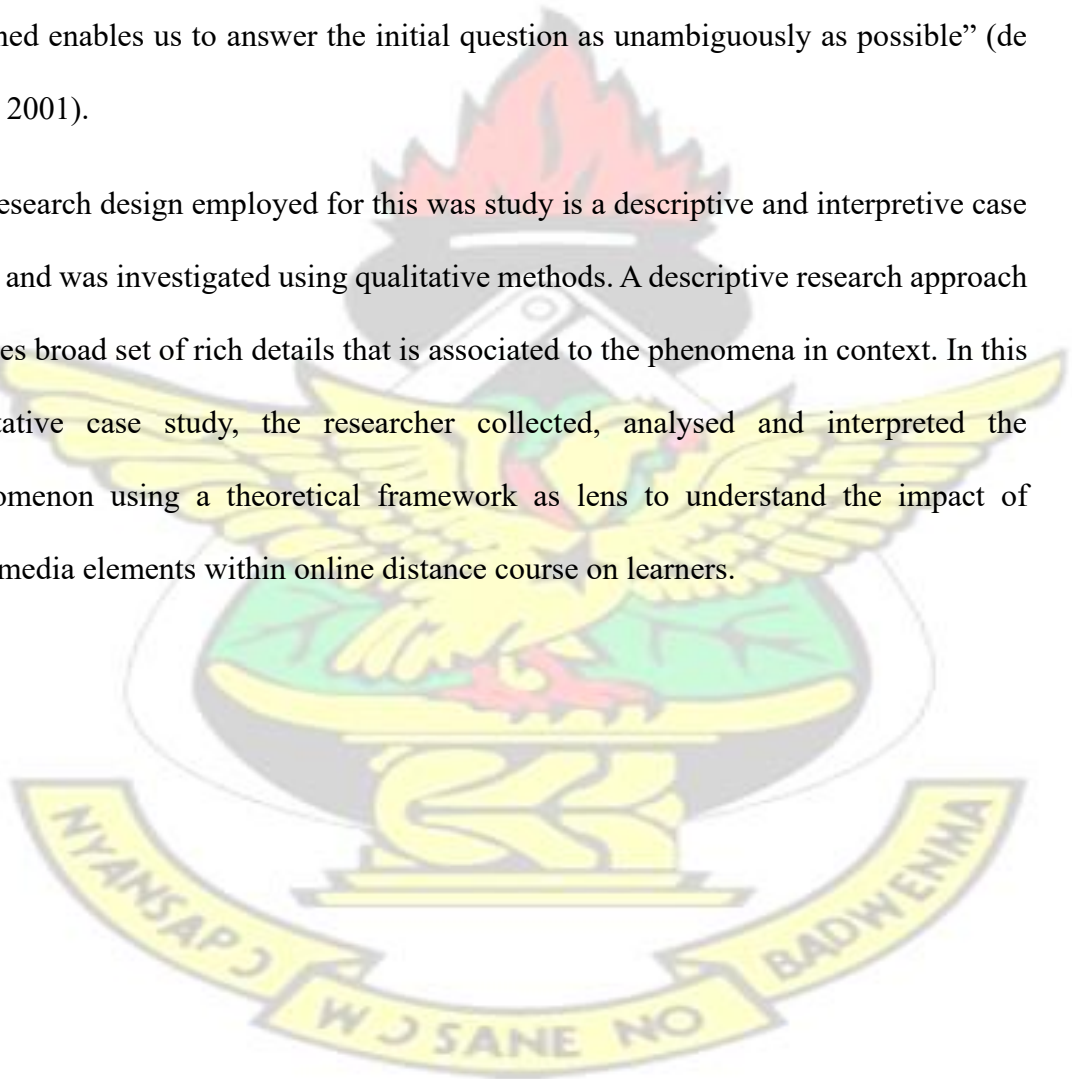
This chapter identifies and discusses the philosophical assumptions, the theoretical framework as well as design strategies that supports this study. In addition, the chapter explains the research methodologies and design employed in the study. This includes the research strategies, data collection instruments, and procedure for data collection and analysis. This study was performed with the main objective to answer the research question put forward. The objective was to identify the major characteristics of media elements, and to find out how these elements contribute to maximised learning in an online distance learning environment.

The processes and stages involved in the study are explained. The researcher considered a descriptive and interpretive case study as the design for the study and used qualitative methods and techniques to collect and analyse data. The researcher's justification for the data collection methods and procedures used in the study are also discussed. Methods used within qualitative research allowed for an in-depth probe into the perception of study participants on the design and use of the media element in multimedia course materials. Document analysis was also used to corroborate multiple data collection. The chapter ends with the strategy for analysing the collected data. An interpretive method was used to analyse participant's views based on theoretical principles as well as themes generated through data collection and analysis.

3.2 Research Design

A research design can be understood as the blueprint of the research that provides the direction along which the study should be conducted. In conducting social research, researchers advise on a structure or a plan prior to data collection and analysis (Gibbs, 2008; Maxwell, 2008). Research design is seen not only as a structure of the work, but also more importantly it should provide a strong indication of solutions to the research questions at hand. Thus, the role of the research design “is to ensure that the evidence obtained enables us to answer the initial question as unambiguously as possible” (de Vaus, 2001).

The research design employed for this study is a descriptive and interpretive case study and was investigated using qualitative methods. A descriptive research approach denotes broad set of rich details that is associated to the phenomena in context. In this qualitative case study, the researcher collected, analysed and interpreted the phenomenon using a theoretical framework as lens to understand the impact of multimedia elements within online distance course on learners.



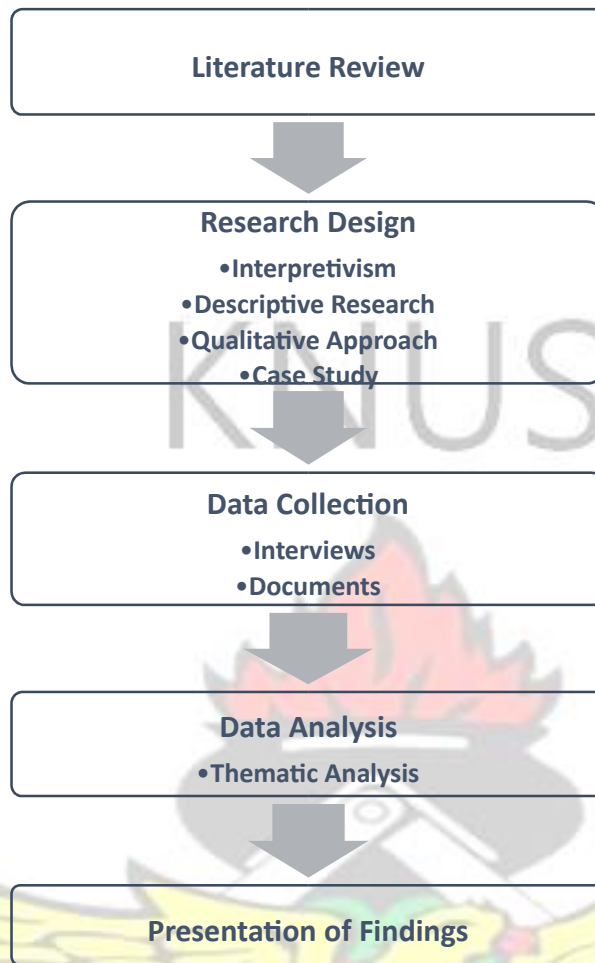


Figure 3. 1: Diagram of the research design approach used in this study

3.2 Research Paradigm

To explain the researcher's organisation of inquiry and methodological selections, an examination of the research paradigm adopted for this study will be discussed. All forms of research is grounded on some underlying philosophical supposition. This serves to validate the components of the research. It also includes the research method or methods that are suitable to contribute to knowledge in the study. Holliday (2002) is of the view that, "no matter how extensive the research, different researchers will always pursue and see very different things in the same setting". This projects that idea that, the researcher's assumptions in the selected research methodology will determine

the outcome of the study. A paradigm denote a viewpoint or assumption concerning how things work. Guba (1990) states that, a paradigm or worldview is "a basic set of beliefs that guide action". The same is defined as “an integrated cluster of substantive concepts, variables and problems attached with corresponding methodological approaches and tools” (Kuhn, 1970). These worldviews offered the researcher to assume a specific stance in conducting the research; and these beliefs directed the flow of the research. Three major questions are posed by Lincoln and Guba (1985) that help to explain a research paradigm:

The ontological question - What is the nature of reality? (This is concerned with the nature and form of reality). The epistemological question - What is the nature of the relationship between the knower and the known? (That is, concerning the philosophy of how we can know that reality). The methodological question - How we can come to know it? (Denoting the practice of how we come to know that reality)

Creswell (2007) presents that, based on the selected philosophical assumptions, which are ontology, epistemology, axiology, rhetorical and methodological, the researcher makes choices that directs the study. Practical implications for designing and conducting the study is as a result of the stance by the qualitative researcher.

3.2.1 Ontology and Epistemology

Ontological and epistemological stances, which are expressive of an individual's worldview has much influence on what is believed to be the nature of reality. Ontology refers to “a branch of philosophy concerned with articulating the nature and structure of the world” (Wand and Weber, 1993). It identifies the nature of truth and what can be established about it. Epistemology denotes the nature of the relationship between the researcher (the knower) and the research (the known). It refers to “the nature of

human knowledge and understanding that can possibly be acquired through different types of inquiry and alternative methods of investigation" (Hirschheim, Klein, and Lyytinen, 1995). Positioning the study under Interpretivism as the epistemological stance, it is significant to understand what the knowledge is, and how it would be generated. That is, the philosophy that underpins the relationship between the research subject and the researcher.

Drawing on these arenas of discussions, the purpose of the study is to investigate the process of learning and teaching through multimedia by learners and educators in an online distance learning setting. This study was considered in an online learning environment in a post graduate distance education programme to study events in their natural setting, with a view to interpret the phenomena through the perspectives of individuals. Educational research, essentially concerned with exploring and understanding social phenomena would therefore find support within an Interpretivist and qualitative research stance.

3.2.2 Interpretivism

Interpretivism or the Interpretivist paradigm is known to be associated with qualitative research and its emphasized context is important when an analysis is being made (Reeves and Hedberg, 2003). This worldview is considered when a study seeks to understand the world from the perspective of characters subjectively. As such, it makes use of methods that builds a subjective relationship with the research subjects, such as through interviews and participant observation.

On the other hand, Positivism, which is connected with quantitative research involves testing a hypothesis to acquire truth. Within positivism, truth is seen as objective. Thus,

it is used predicting future occurrences. Positivistic researchers mainly adopt a quantitative approach in gathering data to come out with objective truths. Carr and Kemmis (1986) contend that, using an interpretive approach, the researcher is permitted to be a participant observer, and is not detached from the study. Accordingly, the researcher's roles within the given social context enables him to participate in the conducts, as well as distinguishes between the values of behaviours as communicated by participants. Within this study, the focus of the researcher was to solicit for multiple experiences of the participants, the meanings of events and processes and procedures in tutoring and the researcher's understanding of these. This approach suggests an interpretive stance using qualitative methods to be able to provide interpretations for such complex behaviours and reveal correlations that exist among multifaceted dimensions of individual interactions.

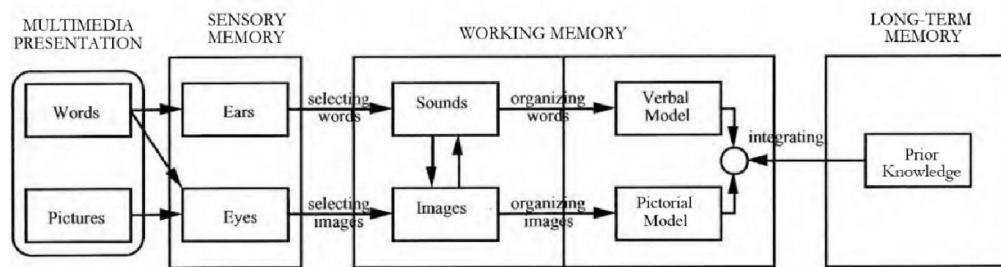
Table 3. 1: Characteristics of interpretivism as it applies to this study

Characteristics	Description of the character
Aim of the Research	□ The aim of the research is to understand how media elements in multimedia learning contributes to maximised learning in an online distance learning environment. The focus is on the use of media elements in multimedia instructional content by online distant learners.
Ontology	• Relativist Approach: Multiple truths exist. • This truth or reality can be explored; the researcher is a part of knowledge construction together with participants. • There are varieties of social realities as a result of different individual experiences and understandings.
Epistemology	• An understanding of the event is done within the social context of real life or natural settings through interpretation • Both the researcher and research participants are connected in an interactive process to create knowledge.
Methodology	• Using qualitative approach through interaction • Methods of data collection is through interviews and analysis of collected documents. • Research is a product of the values of the researcher

3.2.3 Theory adopted in this research study

The study adopted the Cognitive Theory of Multimedia Learning (CTML) as a theoretical lens through which the analysis was conducted (Figure 3.1). This has been discussed in the previous chapter (Section 2.4.1). The theory proposes that learning can be maximised through a combination of words and images than from only words (Mayer, 2005). This is in relation to how learners can process information through separate channels for meaningful learning. Hence, the design of instructions is crucial if educators seek to achieve the promise of learning via multimedia. The framework used in this study provides a benchmark that can be used to understand how the design and use of multimedia elements impact on learning through the perspectives of participants.

A number of research-based principles that would be used in evaluating the designed online multimedia courses are provided through this theory. Five principles were



chosen for this study

Figure 3. 2: Cognitive Theory of Multimedia Learning (CTML) (adopted from Mayer, 2005, p. 37)

The principle of Multimedia Learning for analysis (Chapter 2: Section 2.4.3)

The study considers the following five (5) principles in the analysis of collected data.

They are:

1. Multimedia principle
2. Coherence principle
3. Signalling principle
4. Redundancy principle
5. Segmenting Principle

3.2.4 Qualitative Research

According to Domegan and Fleming (2007), “Qualitative research aims to explore and to discover issues about the problem on hand, because very little is known about the problem. There is usually uncertainty about dimensions and characteristics of problem. It uses ‘soft’ data and gets ‘rich’ data”.

Adding to this, qualitative research helps researchers to understand people, and the social and cultural contexts within which they live (Myers, 2009). Bricki and Green (2007) explain, “qualitative research is characterised by its aims, which relate to understanding some aspect of social life, and its methods which (in general) generate words, rather than numbers, as data for analysis”.

Thus, this study, using qualitative inquiry attempts to study the research subjects in their natural setting, serving as a useful approach to study educational settings and processes. Accordingly, Creswell (2007) states that, the reason for conducting a qualitative study is when “... we want to understand the contexts or settings in which participants in a study address a problem or issue”.

In order to answer the research questions, it is important to understand the phenomena from the participants experience or point of view. On this, Denzin and Lincoln (2007) is quite clear, “...qualitative research involves an interpretive, naturalistic approach to

its subject matter; it attempts to make sense of, or to interpret, phenomena in terms of the meaning people bring to them” (Denzin and Lincoln, 2007).

Sources of qualitative data as noted by researchers include direct observations and participant observation, interviews, questionnaires, documents and the researcher's impressions and responses (Creswell, 2003, 2007; Myers, 2009; Yin, 2003). Also, the researcher's written descriptions or field notes of people, views, attitudes, events, and environments are rich sources of relevant data for a qualitative study. Through these methods, data can be obtained for analysis. Within qualitative research, data analysis is conducted through an inductive approach (Sprinthall, Schmutte, and Surois, 1991). Merriam (1998) contends that qualitative case studies in education are often enclosed within concepts, models and theories that helps to shape the study. This research adopted a qualitative research approach in order to extensively understand and appreciate the multiple views of the subjects and to provide a meaningful analysis of collected data. It makes use of students, tutors and course materials as sources of primary qualitative data, collected mainly through interviews and documents. This approach would also be used analyse the data for themes that can be best used to explain and make meaning to the data.

Table 3. 2: Data Collection Matrix: Type of Data by Source

Data Source	Interviews	Documents Analysis
Students	Yes	No
Faculty	Yes	No
Staff (Others)	Yes	No
Course Materials	No	Yes
Related Literature	No	Yes

3.2.5 The case study research strategy

A case study is a research approach that is centred on gaining an in-depth understanding of a specific unit or event bounded in time and place. It allows for an exploration into individuals or organizations, communities or programs in order to understand the relationships that exist in such phenomena Creswell (2007). As stated by Yin (2009), “the case study is used in many situations, to contribute to our knowledge of individual group, organisational, social, political and related phenomena”. In essence, the case study approach is convenient in contextual settings of the event being studied. It is also applicable in unpredictable events where the researcher focuses on a particular unit of analysis (Willig, 2008). Creswell (2007) considers the case study research as a study of a phenomenon investigated through a single or multiple cases within a constrained system. Within these definitions of a case study research, the central idea hangs on multiple perspectives within specific, yet real-life contexts. It allows researchers to conduct in-depth investigations into a case within a time frame though the use of multiple sources of data available within the given context.

Methods of data gathering within case study research is acquired through multiple sources. Among the data sources are interviews, direct observations, audio and video data, documentation, archival records, physical artefacts, and participant-observation (Creswell, Hanson, Clark Plano, and Morales, 2007; Yin, 2009). The use of multiple data sources is considered as a strategy to enhance data credibility (Yin, 2003; Patton, 1990). Data gathered through these methods can then be analysed to provide meaning to the study. Thus, the research questions are answered and the right explanations can be given to make a phenomenon understandable. This scope of the study is consistent with an descriptive qualitative case study design (Baxter and Jack, 2008). This was chosen because it allows for an inquiry into a "bounded system", with the focus being

either the case or a subject that is explained by the case or cases (Stake, 1995). Within this single case study, participants were identified as multiple sources of information for observation and one-on-one interviews (Creswell, 2007). Mertens (1998) offers his voices on using a single case study for research in the fields of education and psychology. This approach is seen to be effective in assessing “specific instructional strategy” (Mertens, 1998). As such the interpretive position and the methodology would help to answer the research question, ‘*What are the main features of media elements in multimedia learning and how do they contribute to maximized learning in online distance learning?*’

Thus, the chosen methodology enabled the researcher to collect research data using multiple methods, obtain the multiple view of participants and investigate deeper into how multimedia elements impact on learning objectives.

Given the interpretive stance adopted in this research and the nature of the research question, the researcher considers the case study approach to be suitable for this study as a research strategy. Researchers accept the case study approach to be advantageous in providing in-depth detail of information relevant to understand the distinctive insights and views of the research participants (Creswell, 2007; Yin, 2003). This, however, may be not fully realise through a quantitative approach.

3.2.5.1 Context of the research case: IDL case study

Making meaning of case studies involves the need for the researcher to clarify the case in context, so as to identify the unit of analysis which is rarely ‘isolated from and unaffected by the environment in which it is embedded’ (Babbie and Mouton, 2001). This would be helpful in identifying the unit of analysis within the context of the study.

The study was conducted at the Institute of Distance Learning (IDL), KNUST, Ghana. The institute, which was established with the mandate to “deliver programmes of study both on-going and new ones from all colleges of the University in the distance learning mode” (IDL PLAN 2K17, 2013), has in its decade grown extensively. KNUST runs a dual-mode programme and make use of the same curriculum, course structure and content for its on campus and distance modes (Osei, Dontwi, and Mensah, 2013). With a high demand for tertiary education at the national level, IDL has upon its vision, sought to increase “access to relevant and flexible tertiary and continuing education and training anytime, anywhere through the distance mode using multimedia” (IDL, 2012). More so, the institute focuses its activities on six strategic goals and themes which include the “development of quality print and on-line course materials”(IDL PLAN 2K17, 2013). This theme therefore calls for a critical understanding on how existing resources are being implemented in teaching and learning processes in order to improve on their efficacy.

Currently, two departments under the Institute are the Centre for Distance and Continuing Education (CDCE); and the Centre for E-Learning and Technologies (CELT) which provide Face-to-Face sessions at ten regional centres across the country; and provide learning support to students.

3.2.6 Population for the study

The population for this study comprised the students of the Institute of Distance Learning (IDL) - KNUST, Kumasi in Ghana. In this study, the subjects were postgraduate students who have enrolled in a distance education programme in MSc Development Management. The number of students enrolled in the programme is sixty (60). Tutors and Learning support staff who have been employed to create and facilitate courses at the Institute and make use of online multimedia courses in their teaching

practice are significant to the study and are part of the population. Also, multimedia based course modules were also included to enable the researcher conduct an in-depth analysis of the document.

3.2.7 Sampling

The study made use of purposive and snowball sampling. In all, eight (8) persons were sampled from the population to be respondents in an interview. This comprised three (3) staff of the institute, who were sampled using the snowball technique; and five (5) students enrolled in a distance learning programme, who were purposively sampled. In addition, the researcher chose one (1) course to be included as a document from which data could be sourced.

3.2.7.1 Purposive Sampling

Patton (2002) suggests that purposive sampling, which is a non-random method of sampling is used by researchers to pick out “information-rich” cases for in depth study. This study therefore considered the students in order to understand the meaning they give to the phenomenon. The researcher believes that these participants could provide the needed data to make the study empirically sound. Merriam (1998) suggests that purposive sampling is employed when the researcher consider a sample which can give most data for the study. It is the most common sampling strategy in qualitative research and is needed to understand a social situation from participants’ perspectives. This would allow for rich and in-depth information from multiple realities to be studied in great detail, forming the fundamental importance to the purpose of this research. According to Patton (2002, p.234), “Any common patterns that emerge from great variation are of particular interest and value in capturing the core experience and central, shared dimensions of a setting or phenomenon”. This provides the importance

in the use of purposeful sampling in this study. Student participants were purposefully selected to be respondents to the interview.

3.2.7.2 Snowball Sampling

Atkinson and Flint (2004) define snowball sampling as “a technique for gathering research subjects through the identification of an initial subject who is used to provide the names of other actors”. It basically involves the selection of study participants by recommendations by already selected participants. By this sampling technique, Bhattacharjee (2012) suggest identifying some respondents that fits the criteria for your study. They would then be asked to enlist others potential respondents who fit in the same category. This “acts as an expedient strategy to access hidden populations” (Atkinson and Flint, 2004). The study required the snowballing sampling technique in order to identify the staff for the semi-structured interviews. The notion was to find key respondents who are involved in designing and teaching with online multimedia resource in distant environments. All participants were notified by telephone and the researcher explained his intentions concerning the study, to which they agreed to be respondents.

3.2.8 Data Collection Methods

The study required sources that could generate new and relevant data for further analysis. As characteristic of qualitative research, Creswell (2007) agrees with using multiple sources of data such as through interviews, observations, and documents, instead of a only source data, to enable the researcher analyse them further into themes. This means that, multiple data collection methods would be employed to source for data from the research participants. Qualitative case studies draw strength from various methods for data collection which includes interviews, artefacts, observations and documents (Yin, 2009). In order for the researcher to collect data that reflects the

experience and interpretation of the participants, the following sources were considered.

Primary data sources comprised postgraduate students enrolled in the distance learning programme and make use of using multimedia-based courses in their learning process, tutors who make use of multimedia course modules as well as technical support staff for the programme. Multimedia-based online courses module developed for teaching and learning in the distance learning programme served as the secondary data source. The main data collection methods used in this research study consisted of (i) interviews; and (ii) documents.

3.2.8.1 Interview

As a method of collecting information, interviews are conducted through verbal inquiry. Polit and Beck (2006) in their study defined an interview as, “a method of data collection in which one person (an interviewer) asks questions of another person (a respondent): interviews are conducted either face-to-face or by telephone”. This is done by asking essential questions that would generate the needed response for a qualitative study. According to Bhattacharjee (2012), interviews are the main approach to collecting data in case study research. An advantage of interviews according to Shneiderman and Plaisant (2005) is that, it allows the interviewer to concentrate on specific topics that create a constructive environment.

Using interview as method of data collection creates direct contact with interviewees through which constructive submissions can be made. As an advantage, they foster the gathering of detailed and rich data through the use of the few participants, especially

in understanding the views of learners (Genise, 2002). The study made use of semi-structured interview with participants.

Semi-structured interview

Semi-structured interview was selected as the main method for collecting qualitative data for this study (Babbie and Mouton, 2002). Two main reasons called for the use of semi-structured interview. It includes;

1. Semi-structured interviews help to explore the experiences and views of participants to unearth complex problems.
2. Semi-structured interviews provide much flexibility through an iterative process of asking questions. Respondents are at ease to provide answers at an increase rate (Creswell, 2007; Kohlbacher, 2006).

The semi-structured method blends both the structured and unstructured interviews strategies, thereby making use of closed-ended as well as open-ended questions (Bhattacharjee, 2012). Through the use of an interview guide, the researcher is able to follow a consistent path in acquiring data from the participants (Creswell, 2007). This study therefore interviewed the sampled participants using the semi-structured interview approach to assess the design of the multimedia-based resources. The interviewees fully responded to the guide within the interview protocol. In answering the research questions, the interview sought to identify the main features of media element of multimedia learning in online distant learning environment and how they contribute to maximised learning. This required an understanding into (i) what media elements are being used in teaching and learning; (ii) how are these media elements been implemented in teaching and learning; (iii) the extent to which multimedia

instructions been implemented to maximise online distant learning; and (iv) how the design and development considerations support teaching and learning.

Table 3. 3: Matrix of Interview Session with study participants

No.	Name	Designation	Role of Interviewee	Date of Interview
1	Staff A	F1	Facilitator	2th June, 2015
2	Staff B	F1	Facilitator	4th June, 2015
3	Staff C	TS	E-Learning Technical Support Staff	7th July, 2015
4	Student A	SA	Post-Graduate Student: 2nd Year	4th July, 2015
5	Student B	SB	Post-Graduate Student: 2nd Year	11th July, 2015
6	Student C	SC	Post-Graduate Student: 2nd Year	4th July, 2015
7	Student D	SD	Post-Graduate Student: 2nd Year	26th June, 2015
8	Student E	SE	Post-Graduate Student: 2nd Year	5th July, 2015

Interviews with the staff were focused on the role of facilitators in the design of online multimedia courses. Their views on multimedia technology as well as instructional design processes were reviewed. It included the criteria for the selection of the type media elements, how they were implement and its impact on learning. The interview sessions with the students considered their reasons for opting for online learning via multimedia technology; how they identified the integrated media elements within courses; problems or challenges with the use multimedia; changes they would recommend and competencies of a distant learner. An interview with an e-learning support staff bothered on issues such as their responsibilities in and criteria for designing e-courses, media selection and utilization and competences and requirements needed in designing online courses. The semi-structured interview allowed the process to be undertaken with greater flexibility (Denscombe, 2003). The discussions with the interviewees made it convenient for them to address the topics put forward.

The interview guide

The researcher's first step was to draft interview guides that would be used as a direct the gathering of data from participants. This was approved by the research supervisor to ensure accurateness in relation to the research questions being asked. The interview protocols were designed to solicit for insights into the criteria for designing and developing of online multimedia courses, competencies in learning and teaching with media elements, characteristics of multimedia in the context of online environments, views on the integration of media elements, challenges in its use as well as recommended changes in current practise. With the intention to let the interviewees feel at ease, the researcher's approach was conversational. In circumstances where the interviewees were not clear about the questions, the researcher reiterated it again and the response was given. Follow-up questions allowed clarity of responses by the interviewees. To ensure consistency, the guide was followed throughout with each participant during the interview. The researcher made it explicitly clear that the study would not become an appraisal of subject matter or pedagogical assessment. As such, the study did not concern the work of subject matter experts or individuals associated with the creation of pedagogical content.

Audio Data Collection System

A digital audio recording device was used to record interview sessions with the student and staff interviewees. The researcher with the consent of all participants recorded the sessions in order to be able to transcribe participant's views for analysis. The use of the digital audio recording device facilitated the free flow of the discussion. It also allowed the researcher to playback the commentaries to ensure that salient points which were made during the interviews were captured.

Field Notes (Interview observations)

Observations which were noted during the interview sessions with the participants were recorded. These were recorded into a log book. This also included phrases, keywords and certain gestures observed during the interview process. These were compared alongside the audio recording to validate the views of the respondents.

3.2.8.2 Documents (Audio Visual Materials)

Among the methods for collecting qualitative data, rich primary data can be obtained from documents acquired from the research site. This include gathered documents such as memo, journals, dairies, official documentation, letters, photographs, advertisements, invoices and social artifacts (Creswell et al., 2007; Creswell, 2007; Mogalakwe, 2006). Krippendorff (2004) endorses screening, counting and coding of documents which are key sources of research data in order to obtain the right evidence to verify or disproof assumptions, or as stated by Yanow (2007), “perhaps, to challenge what is being told, a role that the observational data may also play”. The use of documents helped to corroborate multiple qualitative methods for this case study. This further enhances the reliability and validity of the results (Noor, 2008). In this study, a multimedia course module was obtained with permission to serve as a source of data. A copy for offline preview as well as an online preview was reviewed to determine if implementation of the program reflects intended needs of the course. Hence, it would identify, for the context of online distance learning, (i) the main characteristics of media elements in multimedia learning; (ii) how are the media elements being implemented in teaching and learning and (iii) the extent to which has multimedia instructions been implemented.

3.3 Data Analysis

In the quest to derive meaning from the data sourced, the researcher sought to analyse the data in an attempt to provide an understanding to the phenomenon in context. Bogdan and Biklen (1982) gives a definition of qualitative data analysis as “working with the data, organising them, breaking them into manageable units, coding them, synthesising them, and searching for patterns”. In order for research based on an interpretive philosophy to present findings that unveil the experiences of the research participants, the process of analysing data remains is essential. As stated by Miles and Huberman (1994), *“qualitative data, with their emphasis on people’s lived experiences, are fundamentally well suited for locating the meanings people place on the events, processes, and structures of their lives and for connecting these meanings to the social world around them”*..

This therefore provides a strong direction for embarking on an analysis to condense the data obtained. This process would help to reduce the data into “patterns” needed to identify connections among the data, as it is identified in case study research (Yin, 2003). Miles and Huberman (1994) also refer to data reduction as “the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written up field notes or transcriptions”.

3.3.1 Analysis of Interviews

The researcher embarked on an analysis of individual interview data after interview records and audio recorded interviews were finally transcribed into a text document. First of all, each of the transcriptions for the eight subjects involved in the study as interviewees were categorized for analysis. The interview protocol allowed for participants to freely respond to the researcher verbally. These in turn provided valuable information which was connected to their personal experiences. The

interviews were transcribed by the researcher himself; this facilitated a better understanding of the process and familiarity with the data to be analysed. The raw data was read in detail and studied qualitatively for meaning through thematic analysis. According to Braun and Clarke (2006), thematic qualitative analysis is a method for “identifying, analysing, and reporting patterns (themes) within data. It minimally organises and describes your data set in (rich) detail”. The thematic analysis process was used to generate codes, then further into categories and themes by reducing the data from each transcribed response and comparing it individual response as well as literature reviewed. A theme, as defined by Braun and Clarke (2006), “captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set”.

3.3.2 Analysis of Document

Secondly, a rubric for analysing documents obtained from the Institute was established. This was based on five (5) grounded principles of multimedia learning.

The document obtained was a copy of a multimedia course, DM 501 – Development Management Theories, used by tutors (facilitators) in teaching online. The course is available online as part of the Virtual Class (VClass) managed by the Moodle Learning Management System (LMS). The analysis of the document went through a rigorous iterative process in order to ensure an efficient outcome of the findings.

3.3.3 Triangulation

According to Huberman and Miles (1998), Triangulation of research data deals with “checking for the most common or the most insidious biases that can steal into the process of drawing conclusions”. This involves mixing of data or methods or the use

of multiple data. This research made use of interviews and documents to provide a pluralistic viewpoint on the data collected.

3.4 Ethical Considerations

Fundamental to social and educational research is the key issue of ethics. Every research environment presents an ethical condition whereby the researcher may impinge on sensitive issues concerning the subjects. Qualitative research requires that the researcher interacts with people and objects in order to understand events as they happen in their lives. In this qualitative case study, the researcher interacted with human subjects, as participants. Adherence to strict ethical issues are crucial when people are being interviewed. Cavan's (1977) definition, as cited in Cohen, Manion, and Morrison (2000) is relevant in understanding ethics in research. Ethics is defined as,

a matter of principled sensitivity to the rights of others. Being ethical limits the choices we can make in the pursuit of truth. Ethics say that while truth is good, respect for human dignity is better, even if, in the extreme case, the respect of human nature leaves one ignorant of human nature (Cavan, 1977, p. 810).

As such, it is the duty of the researcher to respect the rights, wishes, values and wishes of all the participants in the study (Creswell, 2003). Ethical consideration and guidelines that were observed in this study include informed consent, privacy, confidentiality, and anonymity; harm and risk, voluntary participation, honesty and trust. These are explained below.

3.4.1 Informed consent

The researcher sought the consent of all participants before the commencing to collect data from them, owing to their important roles in the study. This included the facilitators, the students and key personnel with regards to the use of documents. The

Participant Informed Consent form (Appendix B) which explained the purpose of the study was read and signed by both the participants and the researcher to ensure clarity of terms.

3.4.2 Privacy, confidentiality, and anonymity

Confidentiality as explained by Polit and Beck (2006) involves the protecting the participants involved in the study by hiding their identities from the information they give in such a way that the individuals cannot be publicly known. As such the researcher made sure to adhere to ethical guidelines to ensure the privacy, confidentiality, and anonymity of all participants. Also, the consent forms which were made available to all participants assured them of the removal of any identifying characteristics before widespread dissemination of information. Participants' names would not be used for any other purposes, nor will information be shared that reveals their identity in any way, unless by their consent given. Burns and Grove (2005) maintain that all participants reserve their right to privacy, anonymity and confidentiality. They however emphasize that true anonymity occurs only when the researcher keeps the identity of the participant unidentifiable.

3.4.3 Harm and risk

In conducting this research, there were no risks or discomforts associated. Participants were duly assured of full privacy, and anonymity. In adhering to ethical considerations, as stated by (Trochim, 2006), this study did not subject any participant to situations where they could be harmed physically or psychologically as a result of participation.

3.4.4 Voluntary participation

Participants were made aware of their voluntary participation in this study. The researcher made it clear that, the study was for academic purposes only. As such they

were at liberty to withdraw at any time without giving reasons. No one was coerced to participate.

3.4.5 Honesty and trust

The researcher adhered to ethical standards known about the conducting a study in all honesty and trustworthiness and in collecting data, and in the analysis of data (Creswell, 2007).

3.5 Summary

This chapter outlined the research paradigm, research methodologies, strategies and design used in the study. This includes the participants, sampling techniques, data collection tools, data collection procedures and analysis methods as well as data credibility issues. The research design for this study was a descriptive and interpretive case study. Data collection was through a qualitative approach using interview and documents. Furthermore, the design and development of the data collection procedures in the study are identified. Finally, it also described the phases and the processes involved in the analysis of the qualitative collected data.

The next chapter reports on the findings of analysed the data. It accounts for the procedures used in designing themes based on the information collected. It discusses various evaluation instruments used that help the researcher to interpret the information for relevant meaning.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter reports on the results of analysed data as well as the discussions on the research findings interpreted from the data. The result presented was obtained from thematic analysis adopted for this study in order to establish the relationships or patterns that exist in the use of media elements in the teaching and learning process within online distant environments. This was intended to answer the research questions:

RQ. 1. What media elements are being used in teaching and learning?

RQ. 2. How are the media elements being implemented in teaching and learning?

RQ. 3. To what extent has multimedia instructions been implemented to maximise online distant learning?

RQ. 4. How do the design and development considerations support teaching and learning?

4.2 Data Analysis

This section presents the results obtained from the methods of qualitative data analysis of interviews and documents. It focuses on the data collected through semistructured interviews with students and staff respondents as well as documents obtained. The aim of the study was to identify the features of media elements in multimedia learning and how they contribute to maximized learning in online distance environments. Responses from the participants provided valuable information that helped to

understand the relationship between the design and use of media elements and its contributions to online distant teaching and learning.

Using thematic analysis, the collected data was condensed into codes and categories. The qualitative description of the interviews generated as many as 229 initial codes. These codes were derived based on the responses from the interviews of 5 students and 2 facilitators and 1 technical support staff. They cover the issues of the characteristics of multimedia elements, criteria for design and development, roles, challenges in integration and use and competencies; as they relate to maximising the learning experiences of students within online distant environments. These codes were further reviewed and refined to result in 66 categories, out of which emerged 4 major themes (Appendix C).

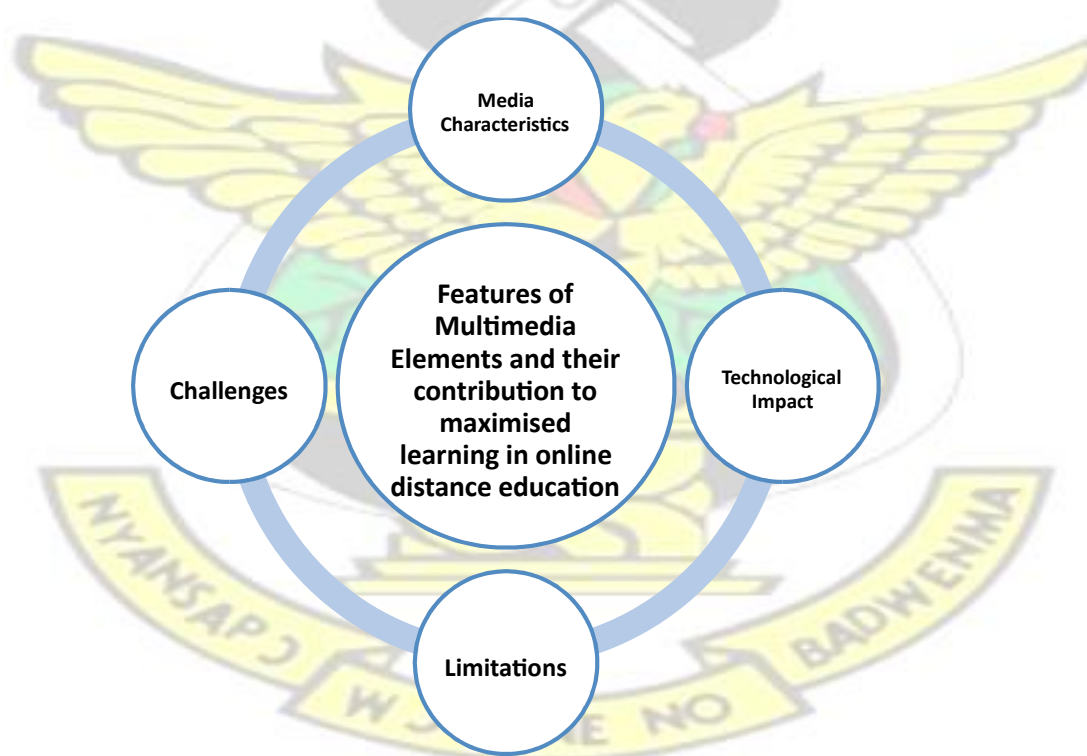


Figure 4. 1: Diagram of themes generated from qualitative data analysis of interviews
4.3 Results

This section presents the results as they relate to the research questions and themes in order to meet the objectives set out for the study. The study sought to understand how

media elements in multimedia learning contribute to maximised learning in an online distant learning environment.

RQ. 1: What media elements are being used in teaching and learning in the online distant environment?

The first research question of the study sought to identify the characteristics of media elements used in online distance education. These characteristics were identified from the responses of the study participants using semi-structured interviews and documents. In the context of this study, the media elements were identified as *text*, *image*, *video* and *animation media*. It was observed that, the types of designed instructional media were packaged as text-materials (PowerPoint slides, Portable Document Files (PDF), published articles and external web sources), video media (pre-recorded lecture videos as well as links to externally linked video resources), image media (diagrams and illustrations) and animated media adapted from external web sources. Among these media elements, text and video media were identified to be dominant. These media were observed to be integrated based on their different characteristics which make them unique in influencing instructions differently.

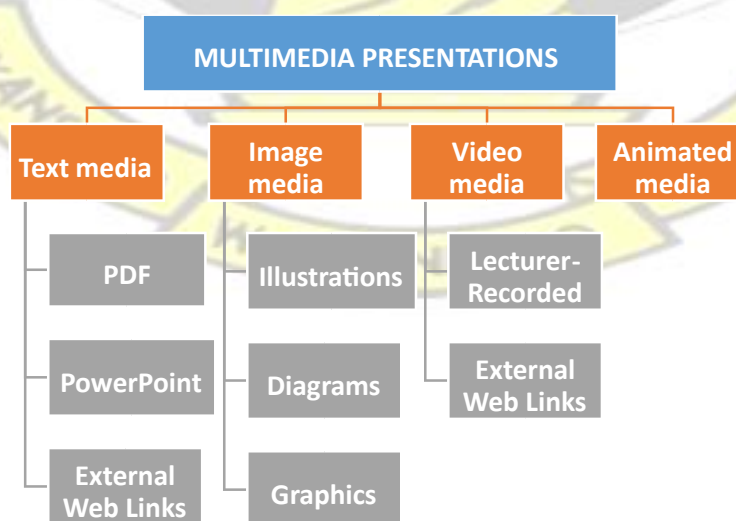


Diagram showing features of media elements integrated in course

RQ. 2: How are the media elements being implemented in teaching and learning?

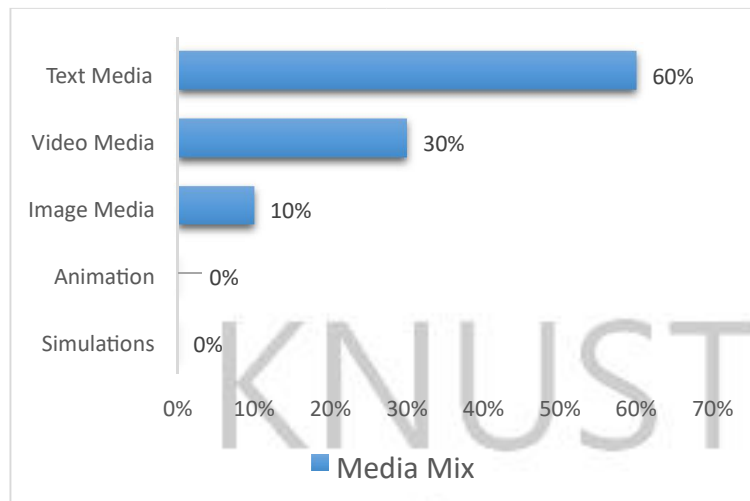
The objective of this research question was to find out how media elements were integrated into the learning and teaching within multimedia course materials. This study found the mix of media within course resources to be a mix of text, image and video media. In addition, some adaptation of animated media was noted. An integration and implementation of media elements within course design is realised in the structure provided by facilitators.



Analysis from the study however suggests some media selection imbalances, whereby some courses may lack the integration of some media elements.

Media mix is considered to be an effective combination of media elements such as video, audio, graphics, animations and other elements into the course design in order to engage learners to have an optimum learning experience (CEMCA, 2011).

Media mix of a multimedia course



(Course: Development Theories and Strategies)

RQ. 3: To what extent has multimedia instructions been implemented to maximise online distant learning?

It was observed that, the integration of the current mix of media offered learners the space for online learning to be interactive, engaging and motivating. Learners indicated a wide and easy access to their learning platform and made use of the needed interactive resources at their convenience. It was understood that within the online community discussions, multimedia elements were integrated into the course units in such a way which fosters interactivity among learners, content and facilitators. As such, participants noted a constructive learning environment for learning.

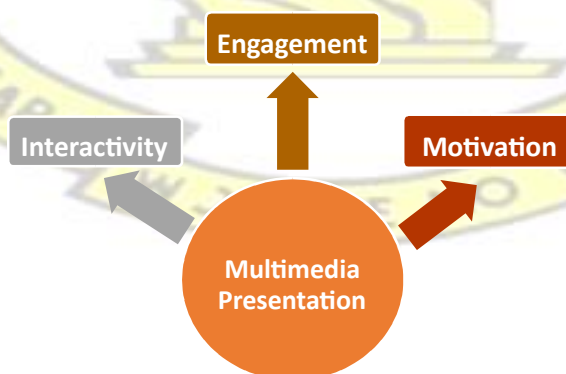


Diagram showing impact of multimedia on students learning

RQ. 4: How do the design and development considerations support teaching and learning?

Considerations for the design and development of multimedia resources, identified by facilitating staff includes *usability, readability, pedagogy, technological support as well as competence and experiences of learners*. These were noted to be among the primary factors for developing multimedia resources for students isolated by physical location but connected via an online learning platform. These key factors applied within the design process guide facilitators to develop instructional content that fosters learning in a constructive manner. The two main groups under which the design and development process elements were placed are *technology* and *learner*.



Within this qualitative case study, these themes emerged as a support to answer the main research question: what are the main features of media elements in multimedia learning and how do they contribute to maximized learning in online distance environments? The major themes identified from the categories are Media Characteristics, Technological Impact, Limitations and Challenges (Technological).

Table 4.1: Matrix of Codes, Categories and Themes from the analysis

Codes	Categories	Themes
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clear video, PowerPoint, convenience, animation, very helpful, illustrations, videos are on point, diagrams, doctored video, long videos length, images, voluminous textbased...	Media Selection Predominantly video and text Preference for video media Media elements Delivery mode Adaptation	Media Characteristics
visual enhances, recall, constructive learning, interactive, liberty Innovative, personal learning styles, enhance learning, convenience...	Accessibility Collaboration Constructive Learning Convenience Engaging Increased Engagement Interactivity Social Environment Support	Technological Impact
less animation, voluminous text, time limitations of video, facilitator social presence, low level it, prior-training, higher expectations, more facilitator interactions...	Design Process Facilitators Competencies Pedagogy (content/interactivity) Policy Upgrade	Limitations
Codes	Categories	Themes
requires reloading, videos do not capture practical experiences, remote students, lack of internet access, internet issues, technical issues, Referee missing...	Cost Connectivity and Instability Lack of Support Learning Difficulties Navigational Challenges Production Difficulties Social Isolation	Challenges

4.4 Discussion

The analysis of the data collected yielded much relevant information needed to answer the questions raised in the study. Emerging views from the analysis of the qualitative interview data are discussed.

The results indicated an acceptance in the relevance and use of multimedia technology in teaching and learning. Students and Facilitators both support the use of multimedia

elements in online course materials. The challenges of using multimedia technology is also captured. The data indicated the predominant use and preference of video media against other types of media. Video media also has to be considered effectively to achieve set goals, and as stated by Hansch et al (2015), "...when thinking about video for learning, the choice of video production style will have a great impact on a video's ability to effect pedagogical objectives and desired learning outcomes" (Hansch et al., 2015). In general, students found the integration of these elements key in their learning process in increasing their learning experience. This is as a result of the use of multiple elements comprising text, audio-visuals and animated agents in course design. This is considered to be an advantage in learning online and at a distance.

Although the integration of videos, and other visuals affords some interactivity, its current application within multimedia courses lacks of a good level of interactivity. The findings indicates that students at a distance require more bonding with their colleagues and the facilitator. This was clearly identified by learners. This is the need to bridge the gap created by social isolation through the creating of the needed social environment. This lack of interactivity creates the sense of isolation from other peer and facilitator (Siemens and Tittenberger, 2009). There is a need for educators to build an interactive and collaborative community through the use of multimedia elements. Researchers support this view by stating that, "...higher education teachers are challenged to cultivate community among students who are not in the same physical space" (Smith and Maiden, 2014, p.8).

Learners also indicated the need for a mediating presence of the facilitator. There was a call for Instructors to have more contact with the learner. This encompasses "the design, facilitation, and direction of cognitive and social processes for the realization

of personally meaningful and educationally worthwhile learning outcomes” (Anderson et al., 2001). From the analysis, students are required to have a basic IT competencies in order to be able to make good use of the learning platform. Facilitators indicated the need for more knowledge in online learning; this was a call for more training for course instructors and students as well.

The most important aspects of the design and use of the online distant multimedia courses in this study as evident from the findings was based on themes such as learner-centeredness, usability, accessibility, interactivity and instructor presence.

These remain significant to learners as well as facilitators in order to achieve maximise learning. Downes expresses his view of current e-learning practice to be based on, “learning managed by the learner, peer-to-peer collaboration, access to open content, learning demonstrated by online, multimedia assignments (e.g. eportfolios) and development of 21st century skills” (Bates, 2012).

Course evaluations based on grounded principles yielded results that indicated some contradictions. This would help to understand how certain multimedia design principles were taken into consideration during the design of resources. It was observed that lesson content contained voluminous text-based materials for reading by learners. Although, there are video media to support these text media, learner’s perception about the loads of text integrated calls for a revision on how to effectively include visual for multimedia learning. As noted, “The use of different media also allows for more individualization and personalization of the learning, better suiting learners with different learning styles and needs” (Bates, 2015). For video media, whether created by facilitators or adapted from external sources, the segmenting principle should be applied to keep video at the required length.

4.4.1 Discussion of Themes

Comments from the study indicated a mixture of both positive and negative remarks from students who make use of online course materials and facilitators involved in the design of multimedia resources and apply them in teaching. The following comments sourced from responses by these students were based on semi-structured interviews questions (Appendix A). In general, responses were corroborative on both sides of the collected data. However, individual different responses were also noted and are discussed.

4.4.1.1 Theme 1: Media Characteristics

Media elements serve as repository of educational information. They represent the main technology under which are found sub systems which shape the methods of communication (Bates, 2015). Media elements exist as text, audio, video, animation and interactive simulation. These five form the basic set which are present in most multimedia learning environments to contribute to enhance learning (Aloraini, 2012). However, technological advancement has expanded them to more than only the basic five (Lam and McNaught, 2006). These media have different media characteristics which make them unique in influences instructions differently. Bates (2015) adds that,

Perhaps even more important is the idea that many media are better than one. This allows learners with different preferences for learning to be accommodated, and to allow subject matter to be taught in different ways through different media, thus leading to deeper understanding or a wider range of skills in using content (Bates, 2015).

The questions therefore sought to identify the characteristics of such media elements and how they contribute to learning. This required specific views on the features of multimedia elements and their use in online courses. From the responses, the researcher observed that, most of the comments indicated four main types of designed media which includes text-materials (PowerPoint slides and PDFs), video (pre-recorded lecture videos), images (diagrams and illustrations) and animations. Out of which, 3 were dominant.

The contributions of these media elements are also captured. Students responded on the use of these media elements identified within multimedia resources and provided the following comments.

*“It helps, I bet you, it really helps, it really really helps... because for me when it gets to examination time, **I don’t trouble myself with the PDFs**” (SA, Interviewee).*

*“With regards to course content, the **videos are on point**” (SB, Interviewee).*

*“The **images** are clear. The **volume... Everything is clear**” (SE, Interviewee).*

The responses indicates that, video media is predominantly integrated within course design. This is the most used form of content delivery in most online courses (Hansch, Newman, Hillers, and Mcconachie, 2015). This also includes text-based materials and image media, which is packaged through ‘PowerPoint Slides, MS Word documents and PDF formats’. Respondents indicated that animations and audio media have not been used. The reference to the animated content was adapted for a particular topic. The following comments states respondents’ motives.

“We haven’t gotten to that level. Animations are properly simulated at the point of early childhood stuff. But the mature people would not need too much animation to get the understanding” (F2, Interview).

“...we had problems with the use of the software... It was expensive and the learning of it was difficult” (F1, Interview).

The same can be said of other interactive simulations.

“No. we have not gotten to simulations, that’s what we want to do. We want to add simulations. But...it’s the videos, the PowerPoint. If you have simulations, we will put it there for you, but we don’t do simulations” (TS, Interviewee).

The implication inferred from these thoughts is that, first of all, the choice a particular media is based on the requirements of the course in context. However, factors such as difficulty in the creation and use of such dynamic media and the lack of technological support have not permitted educators to fully consider their fair use. Creating animations and interactive simulations are also costly and require much expertise, time and effort. Although learning management systems are being used by learning institutions, they are in themselves not enough to solve these issues. Bates in his study noted,

*...increasingly, **instructors will need access to media producers who can create videos, digital graphics, animations, simulations, web sites, and access to blog and wiki software.** Without access to such technology support, instructors are more likely to fall back on tried and true classroom teaching (Bates, 2015, p. 325).*

This also confirms findings from Hansch et al. (2015) which indicates a mismatch between ‘*Content and Media and Pedagogy expertise*’, as it is in the case for most facilitators. As noted, “delivering content clearly on video requires a different set of skills than those required for classroom teaching” (Hansch et al., 2015, pp. 7–8). This obviously implies the need for instructional design expertise in this field of study.

According to Fahy (2004), images or graphics have the potential to increase user motivation. This assist them to “attend, prompt perception, and aid recall, and assist in the development of higher-order thinking and concept formation”. Key communication functions of visuals, which help to foster greater comprehension include “decorative, representational, mnemonic, organizational, relational, transformational, and interpretive” (Clark and Lyons, 2004). As such, the use of visual media can maximise cognitive activities which fosters learning. Responses to the questions, *‘how well do the media elements in understanding the course content and how do they augment learning style?’* allowed for a broad range of thoughts on their experiences on the use of the course. Some comments, expressive of the positive perceptions are;

“Sometimes I get lost with what the lecturer is saying, but with the videos, it throws more light on the subject” (SA, Interviewee).

“Trust me. Imaging adds something to learning ...once you visualize what’s been taught, it makes it easier to have it at the back of your mind at all time” (SB, Interviewee).

“Yes, you interact. You look at what someone has written, you comment, you criticise, you add something. It’s more or less a class discussion, but this time it’s virtual and you get to interact and you are made to know that it’s an official class so language and choice of words is very key” (SB, Interviewee).

“And you interact as though it’s some social media platform” (SB, Interviewee).

Corroborating the comments to the previous responses, student allude to the positive aspects of how the multimedia courses provide a better learning space for them. All Students indicated a positive response in the potential of media elements to enhance learner’s understand as well as support their personal learning experiences when

rightly applied in course design. Some comments were indicative of their preference for multimedia learning as against print based learning.

“Very comfortable, I find it very difficult to use hard copies now” (SA, Interviewee).

“It comfortable. I can react based on my freedom. That really makes a difference”

(SC, Interviewee).

These opinions of learners point to a more positive aspects of integrating media elements within online course materials. It may be possible to infer that, majority of students approve the use of multimedia learning as a tool, especially video media, to maximise their learning. Students also indicated external links to other learning resources with access to videos, articles and journals and other media. External video media were documentaries and interviews available on YouTube. However, students also described the feature of their video production styles. These characteristics of video media on the other hand are thought to be have a more negative connotation. Specific comments that gives more meaning include,

4.4.1.2 Theme 2: Technological Impact

The issue of technological impact in online distant learning as noted by literature stems from the advent of technology as well as its significant role in higher education. The integration of technology for higher education in the new era presents several benefits of learning through multimedia. As such, online learning environments offer substantial amount of possibilities from which learners can access learning resources with ease. As posited by Rahman (2009), it is possible to see a move“...in the application of integrated technologies (graphics, multimedia, etc) to improve the quality of education and increase easy access (application to run in low bandwidth) to information (Tworischuk, 2001).”

Research also points to how instructors acknowledge that multimedia enhances facilitating and cognitive activity (Antonietti and Giorgetti, 2006). Findings from this study are also comparable to other literature.

It is interesting to note that, responses to the inquiry on the *'preference for the use of multimedia technology in learning'*, provided comparable patterns of thoughts. Majority of the responses indicated a Positive Impact by technology. Minor themes which evolved include, *'Accessibility (Ease-of-use), Convenience and Comfortability and Efficiency'*. As Anderson (2008) states, "Not only is access to technology increasing, but access to an ever- growing body of content is also increasing". His study identifies, how accessibility has become ubiquitous in education. Learners have a wide access to the web even in developing countries and are able to find and use the needed resources at their convenience.

It was observed from participants that learners and facilitators alike uphold the prospect of learning and teaching online and via multimedia. Even at a distance, students who are new this new learning paradigm backed by technology, are seen to prefer this mode as an alternative to traditional face-to-face learning.

Participants indicated how comfortably it fits into the lifestyle of work and creates space for maximised learning. Comments include,

"It's more relaxed considering my time schedules where we used to travel a lot. It was relaxing, I would access the platform anywhere, anytime. Even when am not in the office I can use my phone or laptop" (SA, Interviewee).

"It's basically because of convenience and accessibility and the ease with which I could combine my work schedule as in the job am doing and school" (SB, Interviewee).

“I wanted to relieve myself form stress and all that, so I thought it wise to choose a course that is an online” (SE, Interviewee).

As such, this technology is noted to make space for students who apply multimedia in their learning process to access various course materials, make discussions, submit assignments and conduct further research. Employing the lens of the Cognitive Theory of Multimedia Learning and its design principles, it is laudable to understand the basis of choosing this mode of learning and this enable the researcher to understand learners appreciation of multimedia technology in learning in an online and distance learning environment. Thus, this supports the thought that,

Today’s students – K through college – represent the first generations to grow up with this new technology. They have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age (Prensky, 2001).

Other responses given indicate the intended functionality of the media integrated within courses.

“I would want them to feel part of a social environment and so these elements help to create a certain social environment” (F2, Interviewee).

In all, these media elements are expected to break the barrier of social isolation for learners through interactivity.

“...so I thought that these multimedia elements (functions) actually help to build interactivity, create an online social environment and engage the interest of the student” (F2, Interviewee).

“the media elements don’t just complement, it actually the bedrock... to give access and help assess...” (F1, Interviewee).

The researcher would not prefer to draw the line on these thoughts to conclude that this technological approach suits all learners. Although learners have accepted the application of multimedia learning as part of their education, or as the available alternative, there were some negative impressions with the use of this technology. Several comments in this section as well as in the subsequent sections provide some evidence of the learning challenges and limitations learners faced while using this technology. These are presented and discussed. Some of the comments include,

“Personally, I will still revert back to the classroom because I am the person who learns when the lecturer is in the classroom that’s when I when I learn most” (SD, Interviewee).

“I hadn’t been on such a platform before, but I was really expecting something much bigger than what I saw” (SC, Interviewee).

However, such comments could be explained on the basis that, the current experience with the technology these ‘highly motivated’ learners are not able to adequately engage them as ‘digital natives’ (Prensky, 2005). Perhaps, we could draw on the thought that, “the argument is that radical change in education is needed because our traditional institutions do not meet the needs of a new generation of ‘tech-savvy’ learners” (Bennett and Maton, 2010).

This could be as a result of inconsistencies created during learning in online discussions, submission of projects and assignments by the clock and technical issues related to the use of ICT in learning. Even though, these situations seems disapproving,

there is a positive response on the impact of multimedia technology in online distance learning.

Also, students' perception of the integration of multimedia elements in online course design provided their general view of media elements in course designs. The interview questions allowed students to express their *overall opinions of the online course design*. These are realised in the following comments.

Some satisfactory comments include,

"...it makes you an active student, because it makes you learn on your own; it's learner-cantered" (SD, Interviewee).

"...I think it's very very easy ...there is continued access to the course" (SE, Interviewee).

"...class is easy to access" (SD, Interviewee).

Having established the preference for multimedia technology, there was the need to understand the impact of *criteria, importance and the level of the competency in designing and using of multimedia technology* by facilitating and support staff.

The responses given indicated the subjective nature of the study. Responses indicated with positive statements that supports their use of multimedia technology in their practice. It was observed that facilitating staff also support the significance of multimedia learning. To understand the criteria for designing multimedia course materials, the researcher can infer that, this '*depends on the facilitator*'. It was evident from the comments that, depending on the pedagogical approach that '*suits the facilitator*', the content is designed and developed for students. There are some coherences in the responses provided by students; this was corroborated by the elearning support staff.

The main criteria for designing courses for students bothered on ‘*Usability, Learner Experiences and Competencies, Pedagogy (content), Interactivity, and Technology (support)*’. In all, the user or learner remains at the heart of the responses. Learners are however, required to be basically skilled in using “*emails, using Google, chatting online using Skype or Facebook or other social media*” (F2, Interviewee).

4.4.1.3 Theme 3: Limitations

The process by which media elements in the course design support learning styles unearthed various personalized preferences which educators could consider to fulfil personalised learning preferences. In all, various limitations were noted. For example, one student remarked,

“But there are certain course you would wish it was in contact form. One on one, physical. But at certain point we meet in class and go through these things. But then there are certain times you would wish it has run in that manner; it’s quite interactive... some courses are very interactive and it makes working on it on the virtual classroom difficult sometimes” (SB, Interviewee).

“I seriously don’t see so much of a difference with that of the F2F, with the exception of the timelines and freedom to be on the platform” (SC, Interviewee).

Pertaining to these limitation, changes that are expected by these learners include integration of a variety of media elements that would meet individual learning styles. This include more of video, images, audio and animation as indicated. Other important expectations are increase in interactivity, facilitator’s presence,

“So may be with the live class, it should be upgraded... If the live class is very interactive and very efficient, we should go through successfully” (SB, Interviewee).

“More facilitator interactions. More videos... Not so lengthy, 2hours, 1 hours, 45 minutes”(SB, Interviewee).

“I suggest they do the video more of audio. That you can just listen... you can read a whole PDF of 200 pages and you wouldn't get anything close to what the lecturer is asking. And that demands a lot of time reading. So I think, if you want to make the course more easier, they should always present PDFs that are readily available for the questions would be set” (SE, Interviewee).

“The referee aspect is missing... The teacher shouldn't always give all the information... not constructive” (SC, Interviewee).

However, other comments deal with the limitations in deadlines in regards to submitting assignments and amount of resources as a requirement for learning and making constructive inputs.

“When we started a first, we all complained that it was hectic. Combining it with work, because in a week you are given an assignment, discussions... the platform closes at Saturday, Sunday 11:59pm. Then you can't do nothing about it, but it has shaped us to be very disciplined being in time” (SA, Interviewee).

*“They can just bombard you with videos... you have so many videos, once the platform is there... **am sure somebody told you one video was like Indian movie.** Imagine that, one lecturers movie, the length was like an Indian and was publish in series. It's just like hand-outs that you go through” (SC, Interviewee).*

*“**We have very little input concerning what we get on the platform.** Because anybody can go online and download materials... What's the relevance?” (SC, Interviewee).*

On the Technical support side, this is seen as supposedly a mandatory option for facilitators creating multimedia courses.

“Because it’s an academic institutions, everyone use it. You have no other option. Of course, it gives fair idea of the content” (TS, Interviewee).

This may be a way of standardizing multimedia courses, where course developers in their course write up make space for media elements to be included. On the other side, there was the indication concerning the attitudes of some facilitators.

4.4.1.4 Theme 4: Challenges

Even though multimedia presents immense possibilities in the educational strategies, especially with regards to maximising learning experiences, several observations was made to elicit the challenges learners and facilitators faced. The sophistication of technological systems coupled with the complexity of designing and developing multimedia recourse pose some challenges within online distant learning environments. One major factor common to the design and implementation of multimedia at a distance is technical challenges (Deutscher, 2009). The findings from the analysis also reflected some issues that hinder the smooth flow of learning at a distance and online.

Challenges indicated by the students are reflected in the following comments. To a large extent, most of the respondents noted *technical difficulties* which includes, unstable electrical power, access to internet and connectivity.

“I think that would be on the internet side, technology side, our technology is not all that developed” (SD, Interviewee).

“You can have your data bundle, you can have your internet, but not the site; you are not able to access the site because of Technical issues...” (SE, Interviewee).

“The challenges now is those load sharing...” (SA, Interviewee).

The issue of instabilities in power and internet access may still be prevalent in developing countries and serve as a challenge to educators in the delivery of instructions. However, on students' engagement with the multimedia courses, facilitators perceive student engagement to be challenged mainly by *internet instability, connectivity, bandwidth and hardware issues*. However, students' remarks offer a different side to this issue. Although students give a thumbs up to the role of the media themselves, the presence of the facilitator in mediating is missing and still highly expected. The following comments address this challenge.

"More facilitator interactions. More videos... not so lengthy" (SD, Interviewee). "You can read a whole PDF of 200 pages and you wouldn't get anything close to what the lecturer is asking" (SE, Interviewee).

"The referee aspect is missing...There should be a visual impression in the course" (SC, Interviewee).

"It should have been interactive but then the system was such that, it became some form of a nuisance" (SB, Interviewee). [Referring to a synchronous class session].

"To be frank with you, the PDFs they supply is very voluminous, and the PowerPoint doesn't throw more light. It's just the points" (SA, Interviewee).

This implies that, the promise of multimedia learning may not be fully realised, based on these challenges. On this view, Hansch et al. (2015) notes the views of many experts in maximizing viewer engagement that, course developers should split videos into 2-3 minute segments or 6-minute chunks. This contradicts the view of an interviewee SE,

"...They can just bombard you with videos... you have so many videos, once the platform is there... am sure somebody told you one video was like Indian movie. Imagine that, one lecturers movie, the length was like an Indian movie and was publish in series" (SE, Interviewee).

Concerning other requirements, all students agreed on “IT” as the technical skill needed by online distance learners. This involves the ability to *‘put on a PC, log on to learning platforms. Browse the internet and navigate through course pages’*. Students would need to acquire 21st century competencies which include the efficient use of ICT (Sahin, 2009).

Facilitators’ responses indicated the use of pre-recorded videos in teaching, and this creates less challenges in course development. Other challenges outlined by facilitators has to do with cost of setting up for synchronous learning mode for learning. The researcher can induce that, in locations where students cannot access the internet, they would miss the opportunity to interact during the live classes. However, the recorded class sessions would be available to them. In addressing some production challenges, respondents noted:

“I make use [adapt] of YouTube a lot... It saves me the time... so I just pick the one on YouTube and acknowledge. A lot of times I adapt to other resources online” (F2, Interviewee).

“... Knowledge is shared, so if you want to see how for e.g. a baby gets delivered, and you have it on YouTube somewhere, why not give a link to that one? [Adaptation]: So for those ones we called them demonstrational videos. The link is there, we give due reference to where it was gotten. Because it’s not wiser to use that precious academic time to do what has been done already” (TS, Interviewee).

“Generally, I feel that eLearning and multimedia stuff, it’s all about support. You can do the best of things, if you don’t have support for them you are done. We they have problem, student and lecturers they need support” (TS, Interviewee).

Looking at the way forward, respondents indicated some needed changes. First of all, the researcher agrees with F1, on the *“...need to upgrade; it’s a pathway, you only*

advance". Currently regarded to be operating at a *"moderate or medium level"*, there is more room for the educators to expand the programme. This includes facilitators having more contact time with learners. As commented, *"The engagement with students should be increased"* (F2, Interviewee), for a constructive learner-centred learning approach. Hence **F2**, noted, *"There should be a process for student to generate knowledge and share it in the VCLASS"*.

It is possible to suggest that, learners are still in expectation of well-tailored resources that suite their learning styles, despite the many positive feedback. More so, the social presence and mediation of facilitators are needed within the online distance community. It was observed that, the inclusion of voluminous text-based materials are still evident and made available to learners. This should however be highly supported with other suitable media that is able to motivate and engage learners to have a deeper learning experience.

A suggested move to consider problem-based learning (PBL) approach is highly lauded. As stated by Spronken-Smith and Harland (2009), "Problem-based learning (PBL) encourages knowledge construction by starting each learning experience with a complex real-life problem that is typically presented to a small group of students in a tutorial setting".

PBL strategy offers a learner-centred learning environment for the co-construction of new knowledge by students. Learners are required to conduct independent study based in a given problem and later interact with peers to collaborate and find solutions to the

problem at hand. This is likely to lead to an increase in the three domains of interactions (Ustati, 2013), especially learner-to-learner interaction.

“We are also getting the PBL approach. Being a technical university had always been competency and project-based learning but now we are moving to PBL and e-learning. These strengthen universities and make students more interactive and opened to the global trends” (F1, Interviewee).

Adopting this strategy would mean that, there is an obligation for educators to have shared aspirations about the relevance and implications of adopting PBL and in addition strive to support the programme with the needed development and implementation plan, resources, competencies and motivations for instructors and learners (Moesby, 2004).

4.5 Conclusion

This chapter reported on the results and discussion of data collected and analysed. It discussed the method of analysis and the results obtained. As discussed above, the researcher analysed the subjective views to provide understanding into the worldviews of stakeholders in an online distance environment. The qualitative analysis for the study was used to extract important perspectives of learners and facilitators from the data. The results were organised and presented by the research questions for the study. Themes that emerged from the analysis were discussed in relation to the research questions to provide an understanding to the aim of the study. The next chapter concludes the study with a chapter summary, conclusions and recommendations.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a final conclusion on the study conducted. The aim of the study was to explore and understand the impact of online multimedia learning resources in an online distant learning environment. The research identified relevant issues within the literature that informs the study on the terrain of online learning via multimedia technology at a distance. The research methodologies and procedures adopted for the study are summarized. The researcher makes recommendations based on findings and concludes on the study.

5.2 Summary

The rationale for the enquiry was that there are still gaps between knowledge that supports learning and the technology-mediated practice of teaching and learning in various learning environments. The alternative of using various multimedia elements within online course design has not reflected efficiently through the use of different media elements needed to inform instructional strategies for efficient learning. This prompted the researcher to find answers to the question, “what are the main features of media elements in multimedia learning and how do they contribute to maximized learning in online distance learning?”

Furthermore, ample evidence from scholars as shown in the literature proves the positive relationship between Information and Communication Technology and Education. This synergy has led to possibilities in knowledge acquisition and the practice of strategies that is needed for 21st century learning. More so, the promissory note of learning through multiple human information processing channels is significant

to the online distant learner. Theoretical frameworks and models on learning serve as guide for educators to enhance the learning experience of students. This is also interconnected with competencies needed for the design and development of courses, especially where online course facilitators rely on these tools to create learning materials for students.

Thus, with the study cited under educational research paradigm through the application of ICT, the research methodologies aided in providing a framework for conducting the study. The use of a qualitative case study was founded upon an Interpretivist philosophy. This was aimed at using methods that supports making meaning of the subjective and constructive perspectives of individuals. As such, the process of collecting and analyzing qualitative data was established within the same worldview. This involved identifying data sources, research instruments, and tools used for analysis. Ethical and methodological procedures that corroborated in triangulation and validity were also discussed.

The result of findings were presented and discussed in order to establish the relationship among the various factors within the study as well as its contribution to knowledge. To achieve the aim of the study, the interpretation of the findings enabled the researcher to further understand the integration of multimedia technology within online distant environments in relation to existing knowledge.

A final recap provides a brief overview of the design of the entire study. Recommendations based on the findings on the study is believed to be significant in providing both theoretical and practical implications to guide in future design of multimedia instructional content needed for online distance education.

5.3 Conclusions

In achieving the aim, which was to understand how media elements in multimedia learning contribute to maximised learning in an online distant learning environment, the study identified the types of media elements being used for teaching and learning in online distant environments. The study confirms an acceptance of multimedia technology with a positive influence that could support maximized learning. Various characteristic features of these media elements are thereby noted to include their role in supporting learner's cognitive processes in processing information. Findings show that among the various media element available for integration with multimedia courses, text-based and video media remain dominant. Moreover, study results indicate that online learners prefer dynamic multimedia content such as video above all other forms. However, animation and interactive multimedia materials have not been fully explored as viable alternatives within course design and development. Furthermore, current media integrated within course materials have the capability to engage and motivate learners in an interactive online environment. However, limitations in terms of low mediating presence, inadequate media mix and technological challenges also impede on online learning experience that would not help to achieve maximized learning. Thus, the integration and use of multimedia elements within online distant learning programmes has proven to have significant contributions for learners especially as well as instructors. There is a high possibility of maximizing learning for the online distant learner. Yet, there remain space for increasing the capabilities of multimedia technology for higher education. Suggested recommendations may offer some ways in which all stakeholders can benefit from the use of multimedia learning.

5.4 Recommendations

This research was conducted to explore the conditions prevailing in multimedia learning environments as it affects educators and students. It does not serve as an appraisal for inappropriate methods of applying multimedia technology in teaching and learning in online distance. These recommendations add a voice to the push for enhanced learning through efficient designing of multimedia learning resources. The researcher present the following recommendations based on the findings of the study.

5.4.1 Policy and Practice

With technology tipped to advance into more innovative applications in higher education, the relevance of strategic policy development and implementation is key in achieving learning goals. Adoption of good practices in multimedia learning in HE institutions within its various modes is critical for successful learning. This, to a large extent, depends on an understanding and application within the specific context of the institution. Policies that do not adequately support teaching and learning with multimedia technology could potentially impede on the institution's goal to fulfil its vision and mission. As indicated by a participant in study, policy is needed to guide the interaction that should exists among the fundamental elements of distance education, namely Technology, Facilitator and the Learner.

Policy should also cover faculty development support in terms of training and professional development. This is because it is important for educators to understand the needed competencies in their field of practise. Policies which ensure staff training is in support of this viewpoint. As stated, "teachers must consider that the way people are learning is different in today's century, so they must accommodate technology to their teaching practices' (Pineida, 2011).

5.4.2 Educators and Designers

The researcher recommends a participatory and collaborative approach in designing instructions for online distant environments. Furthermore, evaluation of multimedia instructions is recommended perhaps within every academic year in order to make updates to learning resources. This would help prepare facilitators to adequately plan and re-design instructional materials that meet students' learning needs. Expectations in terms of more mix of rich visual media should be upheld, with less of text-based materials. As noted by Windham (2005),

Faculty must toss aside the dying notion that a lecture and subsequent reading assignment are enough to teach the lesson. Instead, the Net Generation responds to a variety of media, such as television, audio, animation, and text. The use of a singular unit should be kept short and alternating, producing a class period as diverse in structure as it is in content (p.5.9).

For instructors or facilitators in an online, blended or hybrid learning environment, a higher requirement of training is needed. Bates (2015) states,

It is not just a question of learning how to use a learning management system or an iPad. The use of technology needs to be combined with an understanding of how students learn, how skills are developed, how knowledge is represented through different media and then processed, and how learners use different senses for learning. It means examining different approaches to learning, such as the construction of knowledge compared with a transmission model of teaching, and how technology best works with either approach.

Hence, it is highly recommended that institutions equip online facilitators to meet the needs of their students.

5.4.3 Online Distant Learners

The study revealed the issue of low IT literacy levels of some learners in regards to knowledge and application of ICT in online learning environments. Although all the students may indicated ‘basic IT’ as the skill needed for learners enrolled in an online distance programme; it is also expected by educators that students should possess good IT skills. However, that is not the case. There is the need for students to update themselves with relevant IT skills to support their learning within and out of the classroom. Training with the use of multimedia technology for learning within the context of their learning space is encouraged. For example the use of virtual learning environments or Learning Management Systems for learning. As such, Kvavik (2005) stresses the need for students to develop “...information literacy or fluency and the technical skills needed to use the tools. Defining technology skills is difficult because of rapid changes in software that require new and different skills”.

Within this technological era, it imperative that learners learn to quickly adapt to the ever changing technologies in order to be able to survive this information age. More so, concerning basic IT skills for college courses, “students who are trained in the new environment develop the confidence in their skills that is instrumental in making them successful computer users” (Piccoli, Ahmad, and Ives, 2001). Educators should help learners to be aware of their personal learning style and adapt strategies in order to integrate the appropriate types of media that best suits their learning preferences.

5.4.4 Further Research

There is a need for a critical look into the aspects of quality resources in higher education. The ubiquitous use of technology will continue to affect all aspects of higher

education now, and in the future. There is the urgent need to reconsider how technology is used in the creation of resources for online distance learning. It is evident in various literature that the integration of technology could help to maximised learning experience for online distant students. Integrating and managing multimedia should result in an engaging, motivating and interactive environment for learners. The ability for facilitators to leverage technological tools in creating and providing the response to the learners needs within multimedia learning is considered to be vital. Further research into this field is therefore needed for a more extensive probe on how media elements could be selected and integrated into online course design to maximise learning in various distinct contexts.



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APPENDICES

APPENDIX A: INTERVIEW PROTOCOLS

(i) Student Interview Protocol

DEPARTMENT OF COMMUNICATION DESIGN

FACULTY OF ART - COLLEGE OF ART AND BUILT ENVIRONMENT,

KNUST

An assessment of the design of multimedia instructions in multimedia learning for
Distance Education

INTERVIEW PROTOCOL

QUESTIONS FOR STUDENTS: COURSE DESIGN

Set 1 - Preference for the use multimedia technology in learning

1. Why did you enrol in a programme that makes use of multimedia platforms for teaching and learning?
2. How do you feel about the methods in which multimedia technology is integrated in the design of online course?

Set 2 - Perception of the integration of multimedia elements in online course design

3. What is your overall opinion of the online course designs?
4. Please comment of the features of multimedia elements used in the course design?
5. What is your overall opinion of the use of images, videos, sound, simulations, animation, text...?
6. Please comment on how well the media elements help you to understand the course content?
7. How do the elements in the course augment your learning style?

Set 3 - Challenges associated with the use of multimedia learning resources

8. How comfortable were you with the technology to begin with? How comfortable now?
9. What problems, if any, have you had with the technology (multimedia)?
10. What changes in integration and use of media elements would you recommend?
11. What technical skills are required in learning from the course?

(ii) Staff Interview Protocol: Facilitator

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FACULTY OF ART - COLLEGE OF ART AND BUILT ENVIRONMENT,

KNUST

An assessment of the design of multimedia instructions in multimedia learning for
Distance Learning

INTERVIEW PROTOCOL

INTERVIEW QUESTIONS FOR STAFF (TUTORS)

Set 1 – Criteria for Design and Development

1. How important do you regard the use of multimedia technology in the course design, development and implementation?
2. What were the main criteria used in the development of the online course modules?
3. How comfortable were you with the multimedia technology to begin with? How comfortable now?

Set 2 – Perception in application in online course design

4. What types of multimedia elements are used in the course design?
5. What is your overall opinion of the use of images, videos, sound, simulations, animation, text...?
6. How well are students able to engage with the interactivity in the course design?
7. What challenges have you observed in the of the course design? In Asynchronous /Synchronous/ Blended Modes?

Set 3 – Challenges in the creation and application of multimedia in teaching

8. How do the media elements complement the subject matter?
9. What changes in use of media elements would you recommend?
10. What technical skills are required in developing and teaching from the course online course modules?
11. Do you find enough media elements in the course designs that augment your teaching strategy?
12. Is there any other relevant information you would want to give in regards to the designing of online multimedia courses?

(iii) Staff Interview Protocol: Technical Support Staff

DEPARTMENT OF COMMUNICATION DESIGN

**FACULTY OF ART - COLLEGE OF ART AND BUILT ENVIRONMENT,
KNUST**

An assessment of the design of multimedia instructions in multimedia learning for

Distance Learning

INTERVIEW PROTOCOL

QUESTIONS FOR STAFF (E-LEARNING SUPPORT STAFF)

1. What are the main criteria considered in course design and development?
2. What design process or model do you follow in designing a course module?
3. How important do you regard the use of multimedia technology in course design, development and delivery?
4. What types of multimedia elements are used in the course design and development?
5. What is your overall opinion of the use of images, video, sound, simulations, animation and text in online course design?
6. What software are employed in developing multimedia elements?
7. Please comment on the challenges you face in developing online course?
8. Within the courses, do you find the appropriate selection (by facilitators) of media elements integrated to augmenting teaching and learning?
9. Please comment on the challenges facilitators face in course design and development?
10. Any changes you would recommend in the selection and use of multimedia elements?
11. What technical skills are required in course design and development?
12. Any other information you would like to add?

APPENDIX B: INFORMED CONSENT

Participant Informed Consent Form

DEPARTMENT OF COMMUNICATION DESIGN

**FACULTY OF ART - COLLEGE OF ART AND BUILT ENVIRONMENT,
KNUST**

**An assessment of the design of multimedia instructions in multimedia learning
for Distance Learning**

PARTICIPANT INFORMED CONSENT FORM

INFORMATION SHEET

Description of the research and your participation

You are invited to participate in a research study conducted by Benjamin Prempeh. The purpose of this research is to understand how media elements in multimedia learning impact on learning objectives in an online distance learning environment. Your participation will involve your views about the design and the use of media elements in multimedia instructional materials through an interview.

The significance of the study has both theoretical and practical implications. The outcome of the study will identify knowledge gaps in the design and use of multimedia instructional content for distance learning. It will also provide an evaluation in the use of multimedia instructions in teaching and learning processes in distance education and contribute as guidelines in the design of future multimedia instructional content needed for online distance learning.

Voluntary participation

Your participation in this research study is voluntary. You may choose not to participate and you may withdraw your consent to participate at any time. You will not be penalized in any way should you decide not to participate or to withdraw from this study.

Protection of confidentiality

Confidentiality of your participation would be maintained through the removal of any identifying characteristics before widespread dissemination of information. Participants' names would not be used for any other purposes, nor will information be shared that reveals their identity in any way, unless their consent is given.

Risks and discomforts

There are no known risks associated with this research. You are assured of full privacy, and anonymity. This research would not subject you to situations where you might be harmed as a result of your participation, physically or psychologically.

PARTICIPANT CONSENT

I, the undersigned, confirm that (please tick box as appropriate):

1.	I have read and understood the information about the project, as provided in the Information Sheet.	☐
2.	I have been given the opportunity to ask questions about the project and my participation.	☐
3.	I voluntarily agree to participate in the project.	☐
4.	I understand I can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn.	☐
5.	The procedures regarding confidentiality have been clearly explained (e.g. use of names, pseudonyms, anonymisation of data, etc.) to me.	☐
6.	The terms of consent for interviews, audio, video or other forms of data collection have been explained to me.	☐
7.	The use of the data in research, publications, sharing and archiving has been explained to me.	☐
8.	I understand that other researchers will have access to this data only if they agree to preserve the confidentiality of the data and if they agree to the terms I have specified in this form.	☐
9.	Select only one of the following: - I consent to have my name used and understand what I have said or written as part of this study will be used in reports, publications and other research outputs so that anything I have contributed to this project can be recognised. - I do not want my name used in this project.	☐ ☐
10.	I, along with the Researcher, agree to sign and date this informed consent form.	☐

Name of Participant (BLOCK LETTERS): _____

Signature of Participant: _____ Date: _____

Researcher's Signature _____ Date: _____

Contact information

If you have any further questions or concerns about this study or if any problems arise, please contact the supervisor on **0208129073** or send an email to **eddappiah@gmail.com**.

APPENDIX C: DATA ANALYSIS

Codes, Categories and Themes

categories - Excel

No	Code	Category	Theme
1	1. Accessibility	10. Difficulty	1. Challenges
2	2. Accessibility	11. Difficulty	2. Challenges
3	3. Accessibility (cost)	12. Difficulty	3. Challenges
4	4. Accessibility issues (technical)	13. Difficulty	4. Limitations
5	5. Accessible	14. Difficulty	5. Challenges
6	6. Artistic learning	15. Difficulty	6. Challenges
7	7. Video Adapt internet filter	16. Challenge	7. Challenges
8	8. A. Accessibility	17. Media types	8. Media types
9	9. Animation	18. Media types	9. Media types
10	10. Mixed media	19. Support	10. Support
11	11. Consequence	20. Support	11. Support
12	12. Clarity	21. Effortless	12. Effortless
13	13. Clarity of result	22. Effortless	13. Effortless
14	14. Clarity Characterise	23. Effortless	14. Effortless
15	15. Comfort	24. Effortless	15. Effortless
16	16. Comfortability	25. Effortless	16. Effortless
17	17. Convenience	26. Effortless	17. Effortless
18	18. Convenience	27. Effortless	18. Effortless
19	19. Convenience	28. Effortless	19. Effortless
20	20. Convenience	29. Effortless	20. Effortless
21	21. Convenience	30. Effortless	21. Effortless
22	22. Convenience	31. Effortless	22. Effortless
23	23. Convenience	32. Effortless	23. Effortless
24	24. Dislike	33. Effortless	24. Effortless
25	25. Extended by construction	34. Effortless	25. Effortless
26	26. Difficult	35. Effortless	26. Effortless
27	27. Dislikes	36. Effortless	27. Effortless
28	28. Does not have	37. Effortless	28. Effortless
29	29. Easy	38. Effortless	29. Effortless
30	30. Effortless	39. Effortless	30. Effortless
31	31. Effortless learning	40. Effortless	31. Effortless
32	32. Effortless	41. Effortless	32. Effortless
33	33. Effortless	42. Effortless	33. Effortless
34	34. Effortless	43. Effortless	34. Effortless
35	35. Effortless	44. Effortless	35. Effortless
36	36. Effortless	45. Effortless	36. Effortless
37	37. Effortless	46. Effortless	37. Effortless
38	38. Effortless	47. Effortless	38. Effortless
39	39. Effortless	48. Effortless	39. Effortless
40	40. Effortless	49. Effortless	40. Effortless
41	41. Effortless	50. Effortless	41. Effortless
42	42. Effortless	51. Effortless	42. Effortless
43	43. Effortless	52. Effortless	43. Effortless
44	44. Effortless	53. Effortless	44. Effortless
45	45. Effortless	54. Effortless	45. Effortless
46	46. Effortless	55. Effortless	46. Effortless
47	47. Effortless	56. Effortless	47. Effortless
48	48. Effortless	57. Effortless	48. Effortless
49	49. Effortless	58. Effortless	49. Effortless
50	50. Effortless	59. Effortless	50. Effortless
51	51. Effortless	60. Effortless	51. Effortless
52	52. Effortless	61. Effortless	52. Effortless
53	53. Effortless	62. Effortless	53. Effortless
54	54. Effortless	63. Effortless	54. Effortless
55	55. Effortless	64. Effortless	55. Effortless
56	56. Effortless	65. Effortless	56. Effortless
57	57. Effortless	66. Effortless	57. Effortless
58	58. Effortless	67. Effortless	58. Effortless
59	59. Effortless	68. Effortless	59. Effortless
60	60. Effortless	69. Effortless	60. Effortless
61	61. Effortless	70. Effortless	61. Effortless
62	62. Effortless	71. Effortless	62. Effortless
63	63. Effortless	72. Effortless	63. Effortless
64	64. Effortless	73. Effortless	64. Effortless
65	65. Effortless	74. Effortless	65. Effortless
66	66. Effortless	75. Effortless	66. Effortless
67	67. Effortless	76. Effortless	67. Effortless
68	68. Effortless	77. Effortless	68. Effortless
69	69. Effortless	78. Effortless	69. Effortless
70	70. Effortless	79. Effortless	70. Effortless
71	71. Effortless	80. Effortless	71. Effortless
72	72. Effortless	81. Effortless	72. Effortless
73	73. Effortless	82. Effortless	73. Effortless
74	74. Effortless	83. Effortless	74. Effortless
75	75. Effortless	84. Effortless	75. Effortless
76	76. Effortless	85. Effortless	76. Effortless
77	77. Effortless	86. Effortless	77. Effortless
78	78. Effortless	87. Effortless	78. Effortless
79	79. Effortless	88. Effortless	79. Effortless
80	80. Effortless	89. Effortless	80. Effortless
81	81. Effortless	90. Effortless	81. Effortless
82	82. Effortless	91. Effortless	82. Effortless
83	83. Effortless	92. Effortless	83. Effortless
84	84. Effortless	93. Effortless	84. Effortless
85	85. Effortless	94. Effortless	85. Effortless
86	86. Effortless	95. Effortless	86. Effortless
87	87. Effortless	96. Effortless	87. Effortless
88	88. Effortless	97. Effortless	88. Effortless
89	89. Effortless	98. Effortless	89. Effortless
90	90. Effortless	99. Effortless	90. Effortless
91	91. Effortless	100. Effortless	91. Effortless
92	92. Effortless	101. Effortless	92. Effortless
93	93. Effortless	102. Effortless	93. Effortless
94	94. Effortless	103. Effortless	94. Effortless
95	95. Effortless	104. Effortless	95. Effortless
96	96. Effortless	105. Effortless	96. Effortless
97	97. Effortless	106. Effortless	97. Effortless
98	98. Effortless	107. Effortless	98. Effortless
99	99. Effortless	108. Effortless	99. Effortless
100	100. Effortless	109. Effortless	100. Effortless

categories - Excel

No	Code	Theme
1	1. Isolation	1. Technological impact
2	2. Isolation in online	2. Challenges
3	3. Learner experiences (competencies)	3. Media Characteristics
4	4. Access	4. Limitation
5	5. Access unlimited	
6	6. Accessibility	
7	7. Bedrock	
8	8. Bedrock for multimedia learning	
9	9. Collaboration	
10	10. Comfortable	
11	11. Complementary	
12	12. Constructive learning	
13	13. Convenience	
14	14. Engaging	
15	15. Functionality	
16	16. Increased engagement	
17	17. Interactive	
18	18. Interactivity	
19	19. Peer interactions enables	
20	20. Saves time	
21	21. Social environment	
22	22. Social environment	
23	23. Supports blended learning	
24	24. Alone	
25	25. Assistance needed	
26	26. Avoid risks	
27	27. Boredom	
28	28. Boredom	

APPENDIX D: LETTER OF SUPPORT

DEPARTMENT OF COMMUNICATION DESIGN

Faculty of Art
College of Art and Social Sciences
Kwame Nkrumah University of Science and Technology
Kumasi-Ghana
Email: design.communication@yahoo.com
Tel/Fax: 233-03220-63683



CASS/CD/DF/4

16th April, 2015

TO WHOM IT MAY CONCERN

INTRODUCTORY LETTER MR. PREMPEH BENJAMIN

I write to introduce to you Mr. Prempeh Benjamin, a Second Year M. Phil. Communication Design student of the Faculty of Art, College of Art and Built Environment.

As part of the Post Graduate requirement for Master of Philosophy in Communication Design, the above researcher is undertaking a research project on the topic, "AN ASSESMENT OF THE DESIGN OF MULTIMEDIA INSTRUCTIONS IN MULTIMEDIA LEARNING FOR DISTANCE EDUCATION." The Purpose of the research is to understand how media element in multimedia learning impact on learning objectives in an online distant learning.

I would be grateful if you could assist him with any information needed for the study.

Attached is a photocopy of the student identity card.

Your cooperation is highly anticipated.

Thank you.

Yours faithfully

A handwritten signature in blue ink, which appears to read 'Eric Francis Eshun', is positioned above the printed name.

ERIC FRANCIS ESHUN (PhD)
HEAD OF DEPARTMENT