#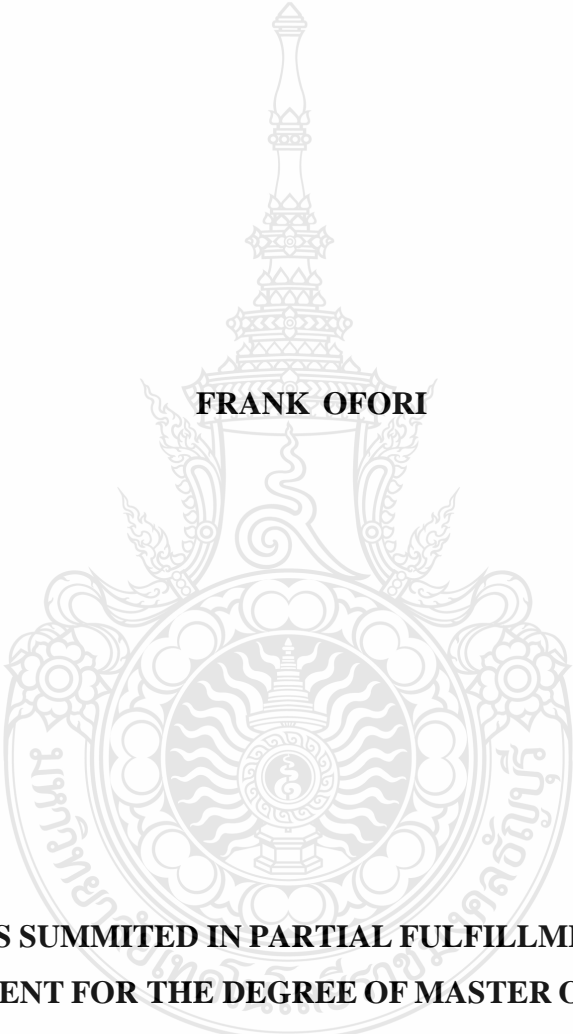 THE NEEDS ASSESSMENT OF ELECTRONIC MEDIA FOR TEACHING AND LEARNING IN THE 21st CENTURY: A CASE STUDY OF COLLEGES OF EDUCATION IN GHANA

FRANK OFORI

**A THESIS SUMMITED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE DEGREE OF MASTER OF EDUCATION
PROGRAM IN EDUCATIONAL TECHNOLOGY AND COMMUNICATIONS
FACULTY OF TECHNICAL EDUCATION
RAJAMANGALA UNIVERSITY OF TECHNOLOGY THANYABURI
ACADEMIC YEAR 2021
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วิทยานิพนธ์ฉบับนี้เป็นงานวิจัยที่เกิดจากการค้นคว้าและวิจัย ขณะที่ข้าพเจ้าศึกษาอยู่ใน
คณะครุศาสตร์อุตสาหกรรม มหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี ดังนั้น งานวิจัยในวิทยานิพนธ์
ฉบับนี้ถือเป็นลิขสิทธิ์ของมหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี และข้อความต่าง ๆ ในวิทยานิพนธ์
ฉบับนี้ ข้าพเจ้าขอรับรองว่าไม่มีการคัดลอกหรือนำงานวิจัยของผู้อื่นมานำเสนอในชื่อของข้าพเจ้า

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Frank Ofori
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Thesis Title	The Needs Assessment of Electronic Media for Teaching and Learning in the 21st Century: A Cases Study of Colleges of Education in Ghana
Name - Surname	Mr. Frank Ofori
Program	Educational Technology and Communications
Thesis Advisor	Assistant Professor Metee Pigultong, Ph.D.
Academic Year	2021

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ABSTRACT

The objectives of this research were to: 1) find out suitable types of electronic media used for teaching and learning in the colleges of education in Ghana, 2) develop a suitable electronic media prototype to be used in the colleges of education in Ghana, and 3) find out the quality of the electronic media developed for teaching and learning in the colleges of education in Ghana.

The key informants used for this research were 17 tutors and administrators from ten colleges of education in Ghana selected through purposive sampling. The Delphi technique through questionnaires was deployed to obtain the data for this research. The data collection was conducted three rounds. The first round solicited experts' opinions on the needs for using electronic media in the 21st century, the second round was the recommendations made by the experts on the media created, and the final round of the data collection was on the quality assessment of the e-book for teaching and learning.

The research results showed that there were needs for the use of electronic media for teaching and learning in the 21st century. Moreover, the data revealed that learners preferred electronic content that can be accessed through mobile phones to any other electronic devices. The findings also indicated that e-book was one of the best electronic media that could be used for teaching and learning in the colleges of education in Ghana ($\bar{X}$=1.41, SD=0.62). The e-book was chosen as the best electronic media because it allowed the blending of text, video and pictures in one lesson at the same time. With this, in-service training should be organized for the tutors in the colleges of education in Ghana to equip them with how to create online media for teaching and learning in the colleges. Education ministries and NGOs across the globe should sponsor the use of online electronic media for teaching and experiential learning in Africa because it is capital intensive.

Keywords: educational media, teaching and learning, the 21st century education, Delphi technique

หัวข้อวิทยานิพนธ์	การประเมินความต้องการสื่ออิเล็กทรอนิกส์เพื่อการสอนและการเรียนรู้ในศตวรรษที่ 21: กรณีศึกษาของวิทยาลัยการศึกษา ประเทศกานา
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ปีการศึกษา	2564

บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อ 1) ค้นหาสื่ออิเล็กทรอนิกส์ที่เหมาะสมสำหรับการเรียนการสอนในวิทยาลัยการศึกษาในประเทศกานา 2) พัฒนาต้นแบบสื่ออิเล็กทรอนิกส์ที่เหมาะสมเพื่อใช้ในวิทยาลัยการศึกษาในประเทศกานา และ 3) ศึกษาคุณภาพของสื่ออิเล็กทรอนิกส์ที่พัฒนาขึ้นสำหรับการเรียนการสอนในวิทยาลัยการศึกษาในประเทศกานา

ผู้ให้ข้อมูลหลักในการวิจัยนี้คือ ผู้สอนและผู้บริหารจากวิทยาลัยการศึกษา 10 แห่งในประเทศกานา ได้มาโดยการสุ่มตัวอย่างแบบเจาะจง จำนวน 17 คน ใช้วิธีดำเนินการวิจัยโดยใช้เทคนิคเดลฟายซึ่งมีการรวบรวมข้อมูล 3 รอบ รอบแรกเป็นการสอบถามความคิดเห็นของผู้ให้ข้อมูลหลักเกี่ยวกับความจำเป็นในการใช้สื่ออิเล็กทรอนิกส์ในศตวรรษที่ 21 รอบที่สองเป็นข้อเสนอแนะจากผู้ให้ข้อมูลหลักเกี่ยวกับสื่อที่ผู้วิจัยพัฒนาขึ้น รอบที่สามเป็นการเก็บรวบรวมข้อมูลรอบสุดท้ายเพื่อประเมินคุณภาพของ e-book เพื่อการเรียนการสอน

ผลการวิจัยพบว่า มีความจำเป็นต้องใช้สื่ออิเล็กทรอนิกส์ในการเรียนการสอนในศตวรรษที่ 21 นอกจากนี้ ผลการเก็บรวบรวมข้อมูลยังแสดงให้เห็นว่าผู้เรียนชอบเนื้อหาอิเล็กทรอนิกส์ที่สามารถเข้าถึงได้ผ่านโทรศัพท์มือถือมากกว่าอุปกรณ์อิเล็กทรอนิกส์ใดๆ ผลการวิจัยยังระบุด้วยว่า e-book เป็นสื่ออิเล็กทรอนิกส์ที่ดีที่สุดที่สามารถใช้สำหรับการเรียนการสอนในวิทยาลัยการศึกษาในประเทศกานา ($\bar{X}=1.41$, $SD=0.62$) e-book ได้รับเลือกให้เป็นสื่ออิเล็กทรอนิกส์ที่ดีที่สุดเนื่องจากสามารถผสมผสาน ข้อความ วิดีโอ และรูปภาพในบทเรียนได้ในเวลาเดียวกัน ส่วนความคิดเห็นของผู้ให้ข้อมูลหลักแนะนำว่า ควรจัดการฝึกอบรมระหว่างสำหรับผู้สอนในวิทยาลัยการศึกษาในประเทศกานาเพื่อให้มีทักษะการพัฒนาสื่อออนไลน์สำหรับการสอนและการเรียนรู้ และควรสนับสนุนการใช้สื่ออิเล็กทรอนิกส์ออนไลน์เพื่อการสอนและการเรียนรู้ นอกจากนี้ กระทรวงศึกษาธิการและองค์กรพัฒนาเอกชนทั่วโลกควรสนับสนุนการใช้สื่ออิเล็กทรอนิกส์ออนไลน์เพื่อการสอนและการเรียนรู้ในทวีปแอฟริกา แต่จำเป็นต้องใช้เงินทุนจำนวนมาก

คำสำคัญ: สื่ออิเล็กทรอนิกส์เพื่อการศึกษา สื่ออิเล็กทรอนิกส์ การเรียนการสอน
การศึกษาในศตวรรษที่ 21 เทคนิคเดลฟาย

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CHAPTER 1
INTRODUCTION

1.1 Background to the Study

Teaching is an art and science that has knowledge, presentation, dissemination of data using every aspect of all elements of communication. Teaching demands broader knowledge of the subject matter, a complete curriculum with standards, a position and caring attitude with energy, and desire for teaching and learning of classroom management, and a desire to make difference in the lives of learners.

Educational media' is the general term used to describe the resources instructors use to deliver lessons. Educational media can significantly increase learners' achievement by supporting learning. For example, an educational video may provide a learner with in depthness and an attractive worksheet may provide the learner with the chance to rehearse a new skill acquired in class. Ideally, the educational media will be fitted to the content in which they are being used by the teacher, to the students in whose class they are being used. Educational media in the past consisted of many shapes and sizes, but in recent times it consists of both print and electronic media. According to (Smith, R., 2014), there are many types or categories of media that teachers can use to support the teaching and learning process. Some media are more traditional such as textbooks, newspapers, others are more innovative such as television, social media, radio, computers, and laptops.

According to (Thomas 1998), there are two major approaches to using media and technology in schools. Firstly, students can learn from educational media and technology, and secondly, learners can learn with educational media and technology. Learners learning from educational media and technology are often referred to as instructional television integrated learning systems. Learning with educational media and technology is referred to in terms such as constructivist learning tools and cognitive environments. The role of educational media in teaching and learning cannot be underestimated. In the 21st century, online materials have now become one of the main sources of knowledge for students, especially in academic settings (Close, R., 2004). Close opined that, with the spread of digital educational spaces such as blogs, Online

Discussion Forums (ODF), Wikis, and Learning Management Systems (LMS), there is a rising demand for materials that can be read in digital formats. To situate in this context, it is the educator's role to equip students with suitable educational media and help students to explore various aspects so that they can make use of most media (Bell, J. 1999) and also to enhance learner autonomy. If learners are not properly resourced, they will face difficulties in learning, using the various media because, the materials change and distract readers with multimodal features especially when the resources are online (Cho & Afflerbach, 2017). Hence, teaching students how to effectively with electronic media, is crucial as library materials have been digitized to create e-books and online articles. In the center of teaching and learning, it is the teacher who needs in-depth knowledge on how to use the various electronic media to achieve results in the classroom.

The Colleges of Education in Ghana primarily aim at producing competent and highly qualified teachers employable in Ghana and abroad. In the light of this, valuable and appropriate information for evaluating the results of the education and training given to teachers are required. This, therefore, demands the study into how effective electronic media are introduced to the student teachers in the various Colleges of Education in Ghana. This is to find out how effective electronic media are in the various colleges. For instance, it was noticed with sage concern that, one of the major contributing factors to pitiable academic performance by basic school pupils in Ghana is a didactic problem of ineffective use of educational media by basic schools (Agyemang, 2016).

Electronic media are instructional resources that teachers use in the classroom to support and achieve a specific learning objective through the use of electronic gadgets. As provided by the new National Teachers' Standards for Ghana under the professional practices, teachers are to produce teaching and learning resources that enhance learning, including online material. Such resources are to be made from the local materials where possible and in sufficient numbers for all learners to handle. In the Ghanaian teacher training institutions, teacher trainees are supposed to be taught how to use electronic media in every lesson they have with their pupils. In the Colleges of Education, lesson delivery opportunities are to be given to teacher trainees to practice

the use of various educational media during on-campus teaching and off-campus teaching practices with some of them busily looking for materials within and outside the teaching practicing school environment. Some are also seen resorting to drawing those materials that are not readily available in their environment with some others downloading pictures, videos, and audios from the internet and also making use of video documentaries when necessary. These are termed as electronic media; they are the most important form of educational media needed in this 21st century. Following the trainees from the various Colleges of Education, it has however been observed that teachers at the basic school levels ceased to use educational media in their lesson delivery even though they were aware of their importance in lesson delivery.in the world of globalization, electronic media has become more prudent for teaching and learning. It is for this reason that research needs to be conducted into how effective these electronic media are used in the various colleges and their impact on these teacher trainees.

1.2 Statement of the Problem

The use of electronic media has been key in the delivery of teaching and it also enhances lessons in this 21st century". (Jossey-Bass, 2016), suggested that there should not be any lesson presented to learners without teaching and learning resources. Jossey even proposed that even if possible, teaching-learning resources should be exposed to learners a day before the instructor present the lesson.

Electronic media possess some inherent advantages that make them unique in the teaching and learning process. For starters, they give teachers with engaging and compelling platforms for communicating knowledge by motivating students to want to learn more. Additionally, by giving chances for individual study and reference, the learner's curiosity and interest are piqued. Furthermore, the instructor is supported in overcoming physical challenges that may have hampered his ability to effectively convey a specific topic. The microphone technology in most electronic media, for example, enables teachers with low voices. They make teaching and learning more enjoyable and less stressful in general. They are both key drivers of societal change and growth. Despite the inherent benefits of these media for teaching and learning, the

extent to which poor nations have profited from them in terms of teaching and learning efficacy is debatable. Many research in advanced nations has reported on the influence of electronic media in the efficacy of teaching and learning (Hepburn, 1998). However, not many of such studies have documented the experiences of less-developed countries of Africa, and especially Ghana. The scarcity of experimentally grounded observations necessitates a large number of further investigations in this field.

For instance, we are not fully informed on whether or not teachers in various levels of schools and colleges in Ghana effectively use these media as instructional materials, and with what effects. Following the outbreak of the covid-19 pandemic, the President of Ghana ordered the closure of educational institutions in Ghana beginning March 16, 2020. The shutdown affected 9.2 million students in elementary, secondary, and junior high schools, as well as 0.5 million students in higher education. Ghana had 4,700 confirmed COVID-19 infections by the 10th of May, 2020. Health experts had predicted that there will be an upsurge in the number of confirmed cases in the coming weeks due to an increase in testing. This implied that the closure of the schools might extend to a longer period than expected. This decision by the president had a great impact on the learners in Ghana, as they could not have quality contact hours with their teachers.

Agyemang (2016) for instance, stated that in most of the Basic schools in Ghana, the majority of pupils perform poorly in external examinations as a result of teachers' inability to use teaching and learning resources in the delivery of the concept to the learner. As such, this research wants to do the need assessment of electronic media for teaching and learning in the 21st century and a case study of the colleges of education in Ghana. The reason is that these colleges of education produce the majority of the teachers who teach in the basic schools in Ghana, as such to investigate the inability of teachers to use educational media to effectively deliver lessons in the Basic school, assessment should be done in the colleges.

1.3 Research Questions

The objective of this descriptive research is to do the need assessment of electronic media for teaching and learning in the 21st century and a case study of the colleges of education in Ghana. The research aims to address the following questions.

1.3.1 What are the suitable types of electronic media used for teaching and learning in the Colleges of Education in Ghana?

1.3.2 How quality is the electronic media developed by the researcher for teaching and learning in the colleges of education in Ghana?

1.4 Purpose of the Study

14.1 To find out suitable types of electronic media used for teaching and learning in the colleges of education in Ghana.

1.4.2 To develop a suitable electronic media prototype for use in the colleges of education in Ghana.

1.4.3 To find out how quality the electronic media developed is for teaching and learning in the colleges of education in Ghana.

1.5 Conceptual Framework

In many areas, people get educated through the media, where they get to learn many things from media about the politics, outside environment. Media like television is a good source for people to get updated through electronic media. Electronic media makes people aware of worldwide things. It is also believed that if electronic media is used for teaching and learning, instructors will be able to reach a lot of learners at the same time and also be able to communicate with a large number of learners.

The conceptual framework (figure 1.1) shows the use of electronic media on the colleges of education in Ghana. The conceptualized variables that are likely to influence the effectiveness of electronic media in the colleges of education in Ghana include the availability of the electronic media and appropriate use of the said media. Educational media that are available to the colleges of education in Ghana, utilization of the educational media, and their effects on the colleges of education in Ghana will transform the basic schools in Ghana. When these factors are considered, the possible

outcomes include improved performance in the colleges of education in Ghana, learners' independence during instruction, and thus developing a positive attitude towards teaching and learning. This leads to overall academic achievements in the colleges of education and the basic schools in Ghana, and subsequent change in the use of print and traditionally made media for teaching and learning in the 21st century.
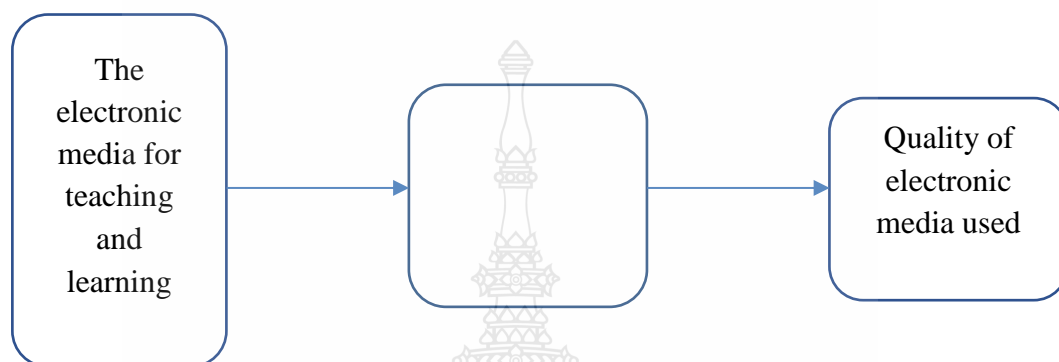
Figure 1.1 The conceptual framework of the research

1.6 Scopes of the Study

There are forty-six (46) colleges of education in Ghana and these colleges provide most of the teachers for the various 18,530 primary schools and 8,850 Junior High schools. With this research, the researcher seeks to research or investigate the need assessment of media for teaching and learning in the colleges of education in Ghana. Moreover, in the colleges setting, there are three things to look at, the instructor, the learning image (educational media), and the learner (teacher trainees). About this research, the researcher will investigate the use of electronic media for teaching and learning in the 21st century, in the case of the colleges of education in Ghana.

1.7 Limitations of the Study

Limitations are factors that may affect the study (Nachmias & Nachmias, 2009). Since the study aims at finding the use of electronic media on the colleges of education in Ghana, and the results shared to GES and MoE, respondents had reservations to share information concerning the adequacy of resources in the college about performance, since the researcher was mistaken to be on a fault-finding mission.

Since experts were required to respond to the questionnaire, getting respondents were quite a challenge to get experienced college tutors.

Despite the challenges, the researcher used the snowball approach to be able to get to the needed experts required for the research. Also, participants were meant to understand that, the research is solely for academic purposes. I hope that future researchers will investigate the use of electronic media for teaching and learning at the lower levels of the Ghana educational ladder.

1.8 Definitations of Significant Terms

For this study, the following terms will be used as defined below, Educational media: educational media consists of various types of media. Media falls into a few classifications such as text, image, audio, and video. It is a tool used for learning and teaching whether offline or online. It is also a means of communication.

Educational resources: they are teaching, learning and research materials in any medium digital or otherwise that are found in the public or have been released under an open license that allows no-cost access, use, adaptation, and redistribution by others with no or limited restrictions (UNESCO).

MoE	Ministry of Education
GES	Ghana Education Service
CoE	College of Education
TLR	Teaching Learning Resources

1.9 Organization of the Study

To ensure clearness and easy comprehension of this research work, the study has been divided into five chapters. Chapter one is the introductory aspect of the research work and it includes the background to the study, statement of the problem, objectives, research questions, conceptual framework, the significance of the study, the scope of the study, limitation, definition of significant terms and organization of the study. Chapter two is the second chapter that outlines the review of related literature and how the elements in it are organized. Chapter three deals with the research methodology and is also made up of research design, the study area, population, sampling procedure,

data collection instruments, data collection procedure, and analysis. Chapter four is concerning the results and discussion. And finally, Chapter five gives an overview of the entire research work, conclusions, and recommendations.

CHAPTER 2
REVIEW OF THE LITERATURE

This chapter reviews literature relevant to the need assessment for the use of electronic media for teaching and learning in the 21st century: A cases study of the colleges of education in Ghana. In this review, the researcher "carefully selects other research which provides a context for the upcoming findings" (Emerson, Fretz & Shaw, 1995) and "discusses those ideas which highlight on the analysis in the work". The reviewed literature includes introducing educational media, technology in educational media, teaching and learning in the 21st century, electronic media, nature of education in Ghana, the impact of the colleges of education on the Ghanaian educational sector, and the gaps detected in the literature reviewed. This review has a comprehensive understanding of the research topic, makes connections to the findings of this study, and detects gaps in the literature for further theory development.

2.1 Educational Media

    2.1.1 Classification of Educational Media

2.2 COVID-19 and Online Learning

    2.2.1 Teaching and Learning in the 21st Century

2.3 The Nature of Education in Ghana

    2.3.1 History of education in Ghana

    2.3.2 Structure of formal education

    2.3.3 ICT in Education in Ghana

    2.3.4 College Education in Ghana

    2.3.5 Teacher education in Ghana

    2.3.6 Covid-19 situation in Ghana

2.4 Delphi Technique

    2.4.1 Methodological choices

    2.4.2 Expertise criteria

    2.4.3 Number of participants

    2.4.4 Number of rounds

2.5 Conclusion and gaps

2.1 Educational Media

Educational media refers to the various communication channels that carry messages with an instructional intention. They are usually utilized for the sole purpose of teaching and learning (Wu G., & Liu F., 2013).

2.1.1 Classification of Educational Media

Educational Media is also anything used to send messages from the sender to the receivers to arouse the learner's thoughts, feelings, and interests to gear the students' learning. There are different ways to classify educational media, this includes, print media, non-print media, and electronic media.

1) Print media: this is one of the oldest and basic forms of communication. These are paper publications circulated in the form of books, journals, magazines, newspapers, workbooks, and textbooks.

2) Non-print media: This is a communication enterprise that does not produce paper publications. This communication enterprise comes in two forms: projected and non-projected media.

(2.1) Projected media: These are forms of media that need a light source for projection, this includes, film projector slides, and so on.

(2.2) Non-projected media: this type of media requires no light source. These include three-dimensional items, two-dimensional objects, prints, charts, models, etc.

3) Electronic media are those in which the content is accessed through the use of an electronic or electromechanical listenership. They include audio media, visual media, and audio-visual.

(3.1) Audio media: This form of media conveys sounds only, for instance, audiotapes, record players, etc.

(3.2) Visual media: These are the ones that can be seen. For example, television, computer, whiteboard.

(3.3) Auditory-Visual: This word refers to educational tools that offer learners both audio and visual experiences by simultaneously appearing on the hearing and seeing senses, such as television, video cassettes, and closed-circuit television (CCTV).

4) Hardware and Software

(4.1) Hardware: This is the categorization of machines or tools used in the instructional process. It is through these devices that the software is over send. These include television sets, tape-recorder, etc.

(4.2) Software: this classification is made up of all items used with the machine. They are the actual conveyer of information. These include films and tapes transparencies.

2.1.2 Theory and principles of educational media

2.1.2.1 Theory

Few theories of learning pay attention to media, but almost all of them give chance for media to be effective amidst them. For each theory, media can start as a form of communication and a way for the teacher as the creator to convey meaning to the student (Gladwell, M. 2005). But media can also be the medium through which learners demonstrate their learning or create their knowledge.

Cognitivism indicates that learning must be understood as following a category of processes within the mind. Understanding these processes helps us better design learning. Cognitivism prepares the groundwork for most of the research that seeks to look into how media supports learning effectively. Research into a cognitive load, dual processing theory, and other concepts form the basis for the theory (Gladwell, M., 2005).

Constructivism assumes that learners invent their knowledge as they communicate with content, facilitators, and each other. Constructivist lessons will use media to communicate content to learners often using cognitivist theories to design effective media, but may also ask that students demonstrate their learning by creating media. This is the constructivist approach to student media creation.

Learning theories, unlike most theoretical foundation disciplines, can coexist for any self-standing practitioner and in any singular context. In a single curriculum, there may be some outcomes best met with a behaviorist approach, others through a cognitivist approach, and some key outcomes demonstrated through constructivist works (Ghanney, R., 2008). The main resource for the theory supporting learning from media is the work of Richard Mayer. Mayer's Cognitive Theory of

Multimedia Learning resides within cognitivism. Mayer's significant model for effectively designing learning media is based on a study into how media can raise the rate at which information from one's active memory can be swapped to long-term memory, or how retention can be transformed to transfer (Gladwell, M., 2005). This situates well within the cognitivist model and gives information on how the design of text, audio, graphics, animations, and videos are made. Mayer has also developed a set of principles that offer practical advice to educators (Clark, R. C., & Mayer, R. E, 2008).

2.1.2.2   The Principles Behind Media Educational Applications

In a multimedia learning climate, to be considered efficient, some elementary principles should be considered when designing multimedia educational applications. According to Clark & Mayer (2008) these tenets are based on the nature of human learning experiences.

1) Multimedia Principle

The Multimedia Principle states that the multimedia application must be a combination of text and images, as information is transmitted, processed, and maintained better by the learner when the teaching environment links the presentation with these two elements. As indicated by the Cognitive theory of multimedia learning model, both channels of sensory are used, creating in the long-term memory a channel and the structured likeliness that contributes to the acquiring of knowledge.

2) Contiguity Principle

According to the Contiguity Principle, words should be presented at the same time with their corresponding images, rather than splitting them up in a multimedia application. Clark & Mayer showed that images must be present next to the text mentioned, as distance tends spawning increased cognitive load, to the already limited knowledge capacity memory, which has the direct consequence of dissuading the learner from active learning.

3) Modality Principle

A principle which is the specialization of the Multimedia principle and recommends that words are to be presented as an acoustic narration rather

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than as a visual text on the screen. It is plausible to make better learning conditions when choosing conditions that do not outage a single channel of recruitment but make up a whole, as predicted by the model of cognitive theory for multimedia learning.

4) Redundancy Principle

This principle underprops the narrative presentation with images rather than images and narration and text on the screen. This principle claims that the excess information involved in learning, instead of facilitating, cognitively affects the learner. The cognitive load can occur when the information itself is presented in more than a single form (audio and visual) or when presented without certainty in a complex way since the processing capacity of each channel is limited. However, the teacher can sometimes refuse to pay attention to this principle when they identify that, they can adapt the application to its rhythm and needs, or they may have challenges in editing the narrative.

5) Coherence Principle

The Coherence Principal switch to the immunity of multimedia presentation from word and pictorial information. At this level, there is the need to avoid irrelevant texts, sounds, and images in multimedia teaching. Emphasis is laid on focusing only on the presentation of the relevant information. Adding interesting but unnecessary material can distort the learning process since it risks the cognitive load.

6) Personalization Principle

The Personalization Principle emphasizes the use of a friendly and familiar way of expression, that's a narration in the first and second person, as well as the use of an effective pedagogical agent, helping the learning process. Based on the Cognitive Theory of Multimedia Learning, this approach approaches human discussion, and so learners are actively involved in the learning process, trying to understand what the instructor means and as a result become more involved in cognitive processes of choice, organization, and integration.

7) Worked Examples

They are directed to the detailed presentation (step by step) of information to solve a problem or to perform a task. According to the Cognitive

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Theory of Multimedia Learning, active memory plays a significant role in cognitive processes for the generating of new knowledge. The use of analytical illustrations provides support to better management of the limited cognitive resources of the active memory, as this gives support mainly to beginners, to see the solution process, as results robotize the process with the consequence of reducing the cognitive load.

8) Practices

In all multimedia learning applications, the worked illustrations should carry out a series of unresolved exercises to train the learners. Based on the fading technique outlined above, the learner reads a worked example, then applies one or two steps from the next model, and finally solves a problem entirely on his own.

2.1.3   Technology in educational media

Technology, as a means to resourcing ample choices of educational media, can seem difficult especially when potential users lack the requisite skills and attitude, which will make them shun using something they are not familiar with (Frankfort-Nachmias, C., & Nachmias, D., 2008).

According to Robert B. Kozma (1994), Computers can be distinguished from the two previous formats by what they can do with the information, that is, by their ability to process symbols and symbol systems. The prototypic computers tend to transform information in one symbol system to that in another and they can organize information.

In its transforming function, a computer with a voice synthesizer can change typed text into speech; using an integrated software package, it can transform numerical values into charts and graphs (Thompson, 1985). In its proceduralizing function, a computer can operate on symbols according to specified rules: for example, it can rotate a graphic object on the screen according to the commands issued. Through both functions, a computer can help students construct links between symbolic domains like graphs and equations and the real-world phenomena they represent. So, it is the processing capabilities of the computer and the expertise of the user that make its primary contribution to students.

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A study from the Educause Center for Applied Research (Micka, 2013) indicated that 67% of surveyed undergraduate students believed that mobile devices were important to their academic success. Learners would use their electronic devices for academic activities. Learners are also driving the adoption of electronic devices, such as smartphones and tablet computers, in higher education. Mobile learning is an enlarged form of e-learning for the use of electronic devices that involves connecting to the internet for downloading, uploading, and online working via Wi-Fi or mobile networks, and linking to institutional e-learning systems.

Students typically struggle to relate their symbolic learning in school to "real world" problems (Heather Brasell, 1987), but the computer's transformational powers can assist them in doing so. For example, according to Brasel, several studies have shown improvement in graph-interpretation ability for students working in microcomputer-based laboratories. Sensors connected to a computer are used in these labs to collect data. Glaser, R. (1984) opined that the computer transforms the data, displaying the information as graphs rather than numbers. The transformation capabilities of the computer as results make immediate and direct the connection between the graphic symbols and the world they represent. Identifying this connection aids in the development of students' ability to read graphs, that is, to transform a graph into a description of what it means in the "real world.

Perhaps even more imperative, the processing capabilities of the computer can help novices build and refine mental models to be more like those of experts (Roberts, 2000). Much of the research in this area has involved many academic disciplines, in which a series of studies have established the nature of expertise and knowledge: it is extensively, organized into large portions that are structured around major fields in academia.

2.1.4 Teaching and learning

When it comes to teaching and learning, several terms are used. Sometimes the same word may convey different ideas to different people, and sometimes different words may convey the same idea. For example, Americans tend to use the word 'evaluate' to describe testing students to see if they have learned, while the British often use the word 'assess'.

2.1.4.1 Learning

We all make sense of things based on our prior experiences. This is also true of 'learning' people get ideas of what 'learning' means from what happened to them in the past. So, for example, one may think of 'learning' as something which takes place in a school or college or a classroom. Students may think of learning it as an individual seated alone at night, trying to commit a lot of ideas to the memory so that s/he can pass an examination. However, a bit of reflection will show that 'learning' is much wider than that. After all, children learn a great deal before they even get to school, they learn how to speak and how to walk. Educational psychologists state that any activity which leads to a change in behavior is 'learning'. Learning can be formal or informal. People learn informally through their daily experiences: things that happen to them cause them to modify their ways of thinking and doing. Students may be unaware that they are learning, which can lead to issues. For example, health professionals may pick up negative attitudes from others. Formal learning can take place when students enroll in a structured course at a school or institution. People don't just learn knowledge and facts they also learn skills and attitudes. Interestingly, students learn knowledge, skills, and attitudes in different ways. For example, students may learn a new idea from a discussion but may learn skills by practicing them and getting feedback.

2.1.4.2 Teaching

Once again, an understanding of what 'teaching' is, is based on experience. The earliest experience was in school, where the teacher was also a 'master' or 'mistress', standing in front of the class, telling students what to do and what to learn. Some of the people experienced the same kind of 'teaching' at college. Others may have had lessons where the 'teacher' is more of a partner, taking into consideration the learner's background and even learning from them. For that matter, Abbatt and McMahon opined that 'Teaching is helping other people to learn. It is up to the instructor to select what the pupils should learn. The students may take part in the learning process, but both the teacher and the learner are guided by the same principle. The future carrier of an individual determines what one should study. People have to learn all the knowledge, skills, and attitudes that are needed to perform a particular job.

Individuals study what they 'must know' and 'should know' for a particular task ahead, not what is nice to know to them.

The teacher's job is to assist the students in learning. This does not mean that the teacher teaches the students everything they need to know at all costs. It means that the teacher's priority should be that, the students should learn well what they need to know. Teaching sessions or classes must be properly organized, taking into account the students' learning styles, language, and backgrounds. In short, the teaching must be student-centered, not teacher-centered. Teaching and learning are therefore a process that includes many variables. These variables communicate as learners work toward their goals and absorb new knowledge, behaviors, and skills that add to a wide range of their learning experiences (Avand, A.-Q., 2009).

2.1.5 Educational media in Teaching and learning

The more you work on the learning environment, the more you will identify that taken to its complete value, one will identify that to be truly successful you need to tailor the learning environment into the individual preferences, needs, and interests of each student taught by you (Afolabi, S.O. 2005). Teaching and learning are the collective responsibility of the teacher and the students. The success of each other depends on the other, and greater cooperation should be done in the classroom. Teaching-learning resources are the materials that link the student and teacher in the classroom. In the classroom situation, TLRs are the entities that bring the real-life situation into the classroom or bring practicality to the classroom.

By involving your students more fully in the process of improving their climate for learning, you are likely to find more appropriate solutions more quickly (Roberts, 2000). It can be concluded that the perspective of the teachers towards the DepEd Learning Resource Portal and other non-DepEd initiated learning materials providers has a significant impact (Esra SİPAHİ 2020). According to Esra, this means that teachers who are not taking advantage of the available existing materials have no or limited resourcing skills. Based on that, the students' performance is much more affected. Esra, also indicated that most of the teachers need more professional development training to improve their resourcing skills. Because of this, teachers should

be well exposed to the use of teaching and learning resources before they will be able to implement them in their respective classrooms.

Learning material resourcing skills is an important factor that will affect teaching-learning processes which mainly has a significant effect on the students' performance in their academic subjects, (Glaser, R., 1984). According to Glaser, for any results to be achieved in the classroom, TLRs should be available for the instructor to use. For effective teaching-learning according to Glaser, unless educational media is "By the learners, for the learners, and of the learners" it does become just a decorative piece, nothing more. Until teachers involve the learners in the process of making the educational media, that sense of ownership of the process and that level of understanding will not develop. If an instructor is creative and has a certain level of understanding, he/she may suggest to the students to use the things available from their surroundings. According to Eshun and Bordoh (2013), there is no need to rush to the store to buy materials, however educational media help in removing the boredom and lack of variety in the classroom by adding variety to the classroom activities.

According to Chirwa (2018), educational media used by teachers in the teaching and learning processes are mostly self-made. However, there are very few if none with regards to their attempts and willingness to have their media assessed, quality-assured, and shared to other agencies or websites (Eshun, I., & Bordoh, A. 2013). Further examination should be conducted to determine the effectiveness of teaching and learning processes considering the provisions for instructional material supplies, supports from stakeholders, and availability of localized educational media (Tety, 2016).

Some facilitators sometimes improvised educational media during lessons (Tety, 2016). These improvised media are mainly produced using locally available materials. This could be the reason why some of the facilitators in the school are unable to teach with educational media because, improvising is time-consuming, expensive, and currently out of date. The non-availability of some educational media was also a factor that affect the use of educational media by facilitators" (Bordoh and Eshun, 2013). With this Bordoh and Eshun meant that educational media are expensive for teachers to be using their resources to purchase it and could be one of the reasons

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why teachers refuse to use them. Nonetheless, sometimes availability of the resources incapacitates teachers and denies learners the use of teaching-learning resources.

The import of educational media in a study done by (Kaur, Shri, & Mital, 2018), posits that educational media in science prove an effective reinforcing agent by increasing the probability of the reoccurrence of the responses associated with learners. Music, on the other hand, could be used as a very active part of lessons to aid learning in action (Tety, 2016). It can be used as examples for teaching, to explain other people's ideas, and provide discernment into different cultures and religions. Learners holistically enjoy the use of music in their lessons, even if that is not the kind of music they love listening to. Learners could also be involved in creating music (jingles, raps, songs to illustrate key points or emotions) some of these techniques are outlined in so many ways (Wu G., & Liu F., 2013). Students could also be asked to suggest types of music for lessons, asking them to justify why each of the songs should be used for that lesson. Hence there are multiple ways through which lessons can be delivered for the understanding of students. Putting the above works into perspective it could be detected that, there are a variety of ways in which the instructor can use educational media to deliver content to the learners in the classroom to the optimum benefit of all learners.

2.1.6   Used of Electronic Media for teaching and learning

From our conceptual clarification, electronic media used for teaching and learning would include all instructional materials that are electronically generated. They can be networked or non-networked depending on whether several equipment or materials are interconnected or inter-related in lubricating information flow (Koert, 2000). Radio, television, projectors, tape recorders, video sets, computers, internet capabilities, and communications facilities are all examples of electronic media. Some of these media have been described below and point out their implications for teaching and learning.

2.1.6.1   Radio

This is perhaps the most prominent audio teaching aid that is used for teaching and learning. The widespread usage of radio sets is linked to the fact that many households own radio sets since they are inexpensive. Its application is nearly widespread, since it may be found in workplaces, markets, and schools. Educational,

cultural, and social knowledge may all be easily shared by radio transmission. This media has been used to achieve societal reorientation, political beliefs and teaching, and social transformation. The capacity of radio to cover events accurately and disseminate information to a large audience at the same time, and when required, repeatedly, has demonstrated its usefulness in achieving these goals. Seminars, lectures, and workshops can be efficiently delivered over the radio channel. Scholars listed a number of advantages and disadvantages of radio as an instructional medium, including (a) It is far less expensive than television (many schools can afford to buy a radio set), (b) Radio lectures prepared by experts can reach a large number of people at the same time, and it can be relayed to a large number of people at the same time, (c) It can broadcast events immediately as they happen (unlike television). Radio transmissions are fascinating because they broadcast music and drama. Nevertheless, some people learn better when they see and hear the teacher at the same time.

2.1.6.2 The Tape Recorder

The tape recorder serves as an audio teaching tool. It tapes learning experiences in class or from radio or television documentaries, which may later be replayed in class or at home. The cassette tape recorder is a common educational tool. Aguokogbuo (2000) also listed the benefits and drawbacks of tape recorders as follows: (a) The tape recorder is simple to use; (b) It is less expensive than most other projected devices, and (c) It is less expensive than most other projected devices. It is usually transportable and may be transported from one site to another and/or electrical devices.

2.1.6.3 Computers and Internet Facilities

Computers are highly efficient learning tools that are employed as instructional resources in social and business courses. For this goal, a variety of applications and programs have been developed over time. Statistical, processing, and spreadsheet software for social sciences are notable examples. As a result of these and other circumstances, the learner obtains social information, which leads to behavioral changes. Because of advancements in computer technology, teachers and students may now access online resources. There is a plethora of websites that teachers and students may go to get the knowledge they need. Efficient professors of social and business

studies in higher education institutions have effectively influenced their pupils by directing them to certain websites where they obtained instructions. Many libraries are increasingly going online, allowing students and researchers to visit them electronically via computers rather than physically visiting such facilities. This is quite creative.

2.1.6.4 Telecommunication Equipment

This is a piece of technology that uses the auditory system to provide information to the listeners. Some in this category, such as GSM mobile phones, now have visual capabilities. The instructor can efficiently send short messages, guidance counseling, and other connected difficulties using telephones. In less-developed countries (LDCs) and rural locations, the use of telecommunication devices as instructional materials is uncommon since they are costly to maintain.

2.1.6.5 Projectors

Projectors are pieces of hardware that allow students to clearly understand the contents of software materials such as slides, filmstrips, transparencies, documents, and photographs (in the form of still pictures or motion pictures). Overhead, slide, and computer-driven projectors are the three types of projectors. These are excellent learning or teaching tools for social studies. The rich visual and aural content of projectors is one of the devices' benefits. They contain both high and low levels of technology.

2.2 COVID-19 and Online Learning

2.2.1 Teaching and Learning in the 21st Century

Students master material while creating, synthesizing, and analyzing knowledge from a broad variety of subjects and sources with an awareness of and respect for various cultures in twenty-first-century learning. The three Rs, as well as the three Cs: creativity, communication, and cooperation, are demonstrated by students. Students exhibit digital literacy as well as a civic duty. For students of all ages, virtual tools and open-source software offer borderless learning areas that can be accessed at any time and from any location. B. Berry & J. Eckert (2012). Berry also opined again that, insightful learning of this nature requires well-prepared facilitators who infer on heightens in cognitive science and are strategically arranged in teams, in and out of

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cyberspace. Many will become teacher preneurs, functioning as learning custodians, virtual network guides, gaming specialists, community organizers, and policy researchers while working directly with learners in their local communities.

Ambogo, M. M. (2012) defines twenty-first-century learning as "recasting" old concepts of learning, such as "core knowledge in subject areas," for today's environment, where a global perspective and collaborative skills are important. According to Ambogo, it's no longer sufficient to have an idea about things. It's more important to remain curious about finding out what is not known. The Internet, which has aided efficient global interaction and access to information, simultaneously, holds the key to creating a new educational system in which students use the knowledge at their fingertips and collaborate in teams to accomplish more than one person can alone, reflecting the 21st-century job. Lynne Munson (2010) explained that Twenty-first-century learning will ultimately be "learner-driven." Our old stories of education that's, factory-model, top-down, compliance-driven are breaking down or broken, and this is because the internet is releasing dormant intellectual energy that stems from our basic aspirations to have a voice, create, and contribute. The knowledge-based outcomes look a lot like democratic governments. Not tightly restrained and extremely self-directed, these teaching and learning activities go beyond the authority or influence of formal educational institutions. I anticipate that governmental and institutional reactions will continue to promote highly organized and defined ideas about education, such as national standards or (ironically) the teaching of 21st-century skills. These will, however, seem more and more out-of-sync not just with guardians, teachers, and administrators watching the internet changing, but with learners, who are to a large extent prepared to drive their educations.

The twenty-first-teaching and learning involve more innovative pedagogies and experiential learning. According to research conducted by the University of Washington education department in (2011) teaching and learning will expand beyond the traditional classroom, involving more experiential, problem-based, collaborative, small group learning experiences and attention to forming learning communities. Fieldwork, trips, and classroom phase learning will show course concepts and engagement with opinion leaders in the community and role models. Teaching will

include making online materials accessible promote, peer learning, and communicating outside the classroom. Teachers will seemly act as guides and facilitators, uncovering the key concepts and helping learners make sense of information. Teaching and learning are both fields of study in and of themselves. Instructors will increasingly use research methodologies to establish optimal practices and add to the corpus of knowledge throughout the world. For teachers experimenting with pedagogical innovations, best practices will be offered as toolkits, methods, and other peer resources.

2.2.1.1   The twenty-first learning is characterized by more collaboration than individualism

Diane Ravitch (1998) predicted that teaching and learning will be more collaborative as students and faculty work with peers within and across disciplines and institutions are growing larger. Students will engage topics, situations, and individuals from across the room to across the globe through local and remote cooperation. According to Diane, there will be more choice, course options, and interdisciplinary majors as the study shifts towards problem-based learning and breaks down social, communication, and institutional boundaries. Collaborative teaching will include team-teaching onsite, online, and broad experimentation. Administrative collaborations in IT and student advising will provide course-of-study planning tools to twenty-first-century students and beyond.

2.2.1.2   The twenty-first-century education is supported by technology

Modern educational technology, media, internet, and electronic modes of distribution and engagement will enhance rather than replace instructor-student contact. Beyond course materials, students will increasingly access internet resources and combine their social and academic activities and networks. Physical location and schedules will provide fewer constraints as students move between face-to-face and virtual interaction with some coursework available 24/7, on-demand, on devices of their choice (Marton, F., 2009). Marton, again indicated that instructors will organize content and interaction, incorporating simulation, tutorials, video, e-texts, annotation tools, and resources that make use of cloud computing, social networking, and emerging technologies. Many new faculties will expect to customize materials to

learning objectives, to link to relevant text and materials, and to use teaching technologies, collaborative and course management tools (Richardson, 2008).

Cunha et al. (2016) also indicated that alternative course formats will incorporate technology with online, hybrid, and blended courses. Teaching will entail being comfortable with a variety of forms and media, determining whether tasks are better done online or in person, and utilizing the improved quality of digital tools, visual materials, classroom, and mobile technologies. Cunha reiterated that it will include attention to developing critical digital literacy skills so that students can detect the reliability of information and negotiate trust, privacy, etiquette, academic research, and writing skills in a digital age. Instructors however will need support which will include ways to adapt to and adopt emerging technologies.

2.2.1.3 The 21st Century Teacher

Teaching in the twenty-first century means using today's tools and technology to do what you've always done. It entails making use of everything necessary in today's world for students to be able to survive and flourish in today's economy, as well as the capacity to lead and prepare students for the future. And, of course, as they enhance their courses and teaching using technology, these instructors are seeing their jobs and classrooms transform. According to International Education Advisory Board, generally, today's educators also share the following characteristics:

1) They may resist learning about new technology. Coming from the Baby Boom generation and somewhat reluctant to adopt new technology too quickly, some educators feel intimidated by students' knowledge of tools they do not understand.

2) They work in environments where professional development is underemphasized and undervalued by their employers. Of the 75 percent of teachers who participated in educational technology integration professional development courses, the majority more than 60 percent-spent less than eight hours in 12 months in this type of training. When only a few hours were spent on this instruction, 87 percent of instructors thought their teaching did not improve much.

3) They need support and planning time. The most common cause of teacher unhappiness, which leads to their leaving the profession or transferring to other schools, is a lack of preparation time.

4) New technology takes them out of their comfort zones. Technology requires teachers to play more of a facilitator role rather than a more directive or authoritative one. This new position contradicts traditional teaching approaches by requiring professors to take a step back and let students learn without their direct supervision. In any case, twenty-first-century teaching and learning require highly knowledgeable teachers who have the expertise in technology. Also, teachers who are willing to allow students to take the center stage in learning, that's lessons should be learner-centered in the classroom. Also, curriculums should be drafted to be learner-centered and technologically driven. It must be reiterated that twenty-first-century teaching and learning is more centered on technology and more virtual than the old traditional face-to-face approach of teaching and learning in the classroom.

It must be however admitted that technology can be distracting. Although twenty-first-century teaching and learning require high technology, learners and teachers may become very distracted by it. ICT in the classroom necessitates teaching students and educators how to utilize technology as a tool responsibly and securely. The costs associated with implementing new technological resources in academic institutions are disconcerting. Funding hardware, software, infrastructure, professional development, and technical support must be an ongoing priority. ICT costs are recurring, as is the need for teachers to be repeatedly trained and prepared to use technology.

2.3 The Nature of Education in Ghana

2.3.1 History of education in Ghana

Pre-colonial Ghanaian education was informal; information and skills were passed down verbally and via apprenticeships (Joe Adu-Agyem & Osei-Poku P., 2012). With the entrance of European settlers in the 16th century, new types of education emerged. Formal schools were built, which provided book-based education (Denis Cogneau, A. M., 2012). Local elites (mulattos, sons of local chiefs, and wealthy

traders) made up their audience, and their presence was restricted to colonial forts on the coastlines (Denis Cogneau, A. M., 2012).

2.3.1.1 Castle schools

The Portuguese government's desire to create schools was reflected in the imperial order issued in 1529, encouraging the Portuguese ruler of Elmina Castle to educate the inhabitants in reading, writing, and the Catholic religion (Ansah & Solomon, 2017). The best-known Castle Schools on the Gold Coast included one operated by the Danish at Osu Castle, formerly known as Fort Christiansburg. A Dutch school was established at Elmina Castle (after its conquest) while a British school was established at Cape Coast Castle (Denis Cogneau, A. M., 2012).

2.3.1.2 Mission schools

The impact of missionaries grew throughout the nineteenth century. With the influx of new missions into the country, the number of mission schools in southern Ghana has exploded. Wesleyan and Basel missionaries constructed schools at Cape Coast, Accra, Anomabu, Dixcove, Akropong, and other coastal communities between the 1830s and 1850s. The Ashanti Region never had access to formal education until 1831s, this is where two princes Owusu Kwantabisa, son of Osei Yaw Akoto, and Owusu Ansah, son of Osei Bonsu from the Ashanti kingdom was taken to the Castle school in Cape Coast to have a formal education, by the command of Captain George Maclean, the then governor for the Gold Coast (Kwamena-Poh, 1975). Later, the two princes were transferred to England to pursue their education. By the 1840s, Wesleyan missionaries had moved to Kumasi to establish missionary schools (Ansah & Solomon, 2017).

Great Britain had acquired control over Ghanaian lands by the turn of the century, leading to the formation of the Gold Coast Colony in 1874. With it came an influx of mission schools and mercantile businesses, the most notable of which was the Wesleyan and Basel missions (Kwamena-Poh, 1975). The Wesleyan mission persisted on the coasts because English was its major language. The Basel mission went further inland and employed vernacular languages as a missionary tool (Kwamena-Poh, 1975). Missions thrived in a largely decentralized system with many opportunities for pedagogical independence, thanks to the British government's backing. Missions

remained the main provider of formal education until independence (Denis Cogneau, A. M., 2012). Under colonial rule, formal education remained the privilege of the few (Kwamena-Poh, 1975).

2.3.2 Structure of formal education

Basic education, secondary education, and higher education are the three sections of Ghana's educational system. The academic year usually goes from August to May inclusive (NUFFIC, 2013) and lasts 40 weeks in primary and junior high school, and 45 weeks in Senior high school (NUFFIC, 2013). Lessons are taught primarily in English.

2.3.2.1 Basic education

Basic education lasts 12 years (ages 4–15) Addae-Mensah (2014). The curriculum is free and mandatory, and it is described as "the minimal time of education required to guarantee that students learn fundamental reading, numeracy, and problem-solving abilities, as well as creative and healthy living skills." Kindergarten, primary school and junior high school (JHS) are the three levels of education that culminate in the Basic Education Certificate Examination (BECE). Kindergarten lasts two years (ages 4–6) (Addae-Mensah, 2014). Language and Literacy (Language Development), Creative Activities (Drawing and Writing), Mathematics (Number Work), Environmental Studies, Movement and Drama (Music and Dance), and Physical Development are the six major elements of the program (Physical Education).

Primary school lasts six years (ages 6–11) (Basic Education curriculum, 2014). English, Ghanaian languages and culture, ICT, mathematics, environmental studies, social studies, and French (as Ghana is an OIF associated-member), general science, pre-vocational and pre-technical skills, religious and moral instruction, and physical activities such as Ghanaian music and dancing are all offered at the primary or basic school level. There is no certificate of completion at the end of primary school (MoE, 2013). Junior high school lasts three years (ages 12–15). English, Ghanaian language and culture, social studies, integrated science, mathematics, Basic design and technology, ICT, French (optional), and religious and moral education are all included in the BECE, which is the final test in JHS.

2.3.2.2 Secondary education

Students who pass the BECE can continue their education in secondary school, pursuing academic or vocational programs. Students enroll in senior high school for academic purposes (SHS). The SHS curriculum is made up of basic topics that are supplemented by electives (chosen by the students). The core subjects are English language, mathematics, integrated science (including science, ICT, and physical education), and social studies. Economics, geography, history, and government are all elective subjects (Ansah A, 2013). Students then select four optional topics from a list of five options: agriculture, arts or science, business, vocational, and technical programs (Ansah A, 2013). This curriculum presently lasts three years as a result of multiple revisions: it was enlarged to four years in 2007 and then returned to three years in 2009. (Addae-mensah, 2014). The duration of the SHS remains a point of contention (Akyeampong, 2014).

The SHS ends on a final exam called the West African Senior School Certificate Examination (WASSCE), formerly called the Senior Secondary School Certificate (SSSC) before 2007 (Nsia-Perprah, 2004). Every year, the Ministry of Education's Statistics, Research, Information, Management, and Public Relations (SRIMPR) division compiles a SHS rating based on WASSCE results (Adoma & Yeboah, 2014).

Different types of vocational and technical education (commonly known as "TVET") exist. Students interested in vocational education have two options: they may enroll in SHS and take vocational programs as electives, or they can enroll in a technical and vocational institute (TVI). SHS students follow the usual SHS three-year curriculum. They can then enroll in a university or polytechnic program after obtaining appropriate WASSCE grades. Students at TVI typically follow a four-year curriculum separated into two two-year cycles, culminating in City & Guilds, the Royal Society of Arts, or the West African Examinations Council awards. (Tetteh, 2020). They can then pursue a polytechnic program.

2.3.2.3 Tertiary education

In Ghana, tertiary education has grown significantly in the previous two decades, both in terms of enrolment and institutions (Ansah A., 2013). The

private sector is responsible for a significant portion of this progress. (Nsiah-Peprah, 2004). Universities (6 public and 49 private institutions) (Ansah, 2013) offer academic education, from bachelor to Ph.D. The availability of formal vocational programs in the private sector is also difficult to define, and the Ministry of Education recognizes that it is unable to provide public vocational programs. A Bachelor's degree is usually completed after four years of majoring in a specific field (NUFFIC, 2013). There are two types of master's degrees: one-year programs that end with a final paper based on a literature review, and two-year programs that culminate with a final paper based on one year of independent research (NUFFIC, 2013). Both can lead to a Ph.D., usually achieved in three to five years within a doctoral program (NUFFIC, 2013).

In Ghana, there are 10 polytechnics that provide three-year vocational programs that culminate to a Higher National Diploma (HND). Institutions have different grading systems (Akyeampong, 2014). Almost all higher institutions utilize the Grade Point Average (GPA) to determine whether a student is failing or passing, however, due to customized marking methods, different schools have their own method of computing GPA. For example, a mark of 80 may be an A in one school but an A+ in another school.

2.3.3 ICT in Education in Ghana

In the past decade, the government's attention has shifted to the use of computer technology in teaching and learning. The Information Communication Technology (ICT) standard in Ghana's educational policy authorize the use of computers for teaching and learning at all levels of the educational ladder in Ghana. The Ministry of Education has attempted to assist institutions in the teaching of ICT literacy. Most secondary schools, as well as some primary schools, include computer labs. Despite the federal government's interest in ICT, computer access is limited, and employees frequently carry electronic gadgets to prevent theft.

According to recent research on the pedagogical integration of ICTs in 10 Ghanaian schools from 2009 to 2011, there is a disconnect between legislative directives and actual practices in schools. The official curriculum places a strong focus on students' ability to operate ICT equipment, but not necessarily on using technology to study subjects other than how to utilize the gadgets. The study also discovered that

the Ministry of Education is presently striving to deploy adequate ICT resources in order to create the requisite ICT literacy for computer skills integration into teaching and learning (Mereku, 2019). In 2021, the Government through the ministry of education and Ghana provided laptops to all government teachers at the pre-tertiary level.

2.3.4 College Education in Ghana

Colleges are educational institutions that offer higher education, professional or vocational training, or a combination of the two. The impact of colleges across the globe is enormous. In Europe, Colleges are places where people learn to choose a carrier path before finding the grounds to the university (Mereku, 2019). In Africa, colleges are not different from elsewhere in the world, however there is a bit difference among them. In Ghana for instance, there are various forms of colleges, agricultural, health education etc. For the purpose of this study much attention is to be geared towards the colleges of education in Ghana.

2.3.5 Teacher education in Ghana

Early Christian missionaries established the first schools that provided the basis for teacher training institutes in many developing nations, including the erstwhile Gold Coast (Mereku, 2019). According to Mereku (2019), the pattern, that is, the organization, substance, and technique of these institutions' training programs were identical to the pattern in Europe at the time. Therefore, what became the accepted pattern for training teachers in Ghana in the post-independence era was a slight modification of the traditional nineteenth-century European pattern of training teachers. Dent (1977) in her book, 'The Development of Training Colleges in England and Wales: 1800 - 1975', presented an explanation of how European teacher training college setups in the early nineteenth century may be regarded as teacher training schools today. She saw that the overall culture, social interaction, and structure and organization of labor at training institutions at the time mirrored many of the early seminaries or tiny mission boarding schools of the twentieth century. In terms of curriculum and social life, many training institutions in Ghana maintained most of the features of such seminaries or tiny mission boarding schools for a long time (Mereku, 2019).

Training colleges in Ghana were largely boarding institutions located outside communities giving trainees very little opportunity of mixing with people in the broader environment outside the college (Kombo, K., & Tromp, A., 2005). Attendance, clothing, exeats, responding to bells and timeliness, completing keep-fit activities, and penalties were all severely enforced by rules and regulations. Life in the colleges were highly controlled giving students very little opportunity to be responsible for their own affairs (Mereku, 2019). In 2006, the Names were changed from teacher training colleges to colleges of education. This resulted in a change in a certificate awarded by these institutions from the teacher 'Cert A' to 'diploma in education. Since the insertion of teacher education in Ghana, all colleges that trained teachers were affiliated to the University of Cape Coast until 2019, where changes were made for other universities to nurse some colleges of education and their status changed from diploma awarding to degree-awarding institutions. There are forty-six (46) colleges of education in Ghana producing about 168,546 teachers for the over 18,530 primary schools and 8,850 Junior High school (Denis Cogneau, A. M., 2012).

In an era when quality education is a concern for education focused international organizations and dominates national debates, teacher quality must equally be a priority (Glavin, 2017). Teacher education must be of the greatest quality in order to achieve any educational objective, given the teacher's key position. It is thus commendable that the Ghanaian government has chosen to execute Act 847, the Colleges of Education Act, which was approved in 2012 to give legal backing to the new status of the institutions. Colleges of Education have been put under the National Council for Higher Education (NTCE) the government organization in charge of regulating tertiary education institutions in Ghana, as a result of that Act.

There is a school of thought that teachers graduate to teach exactly the way they are taught (Glavin, 2017). If this is the case, there will be more effort than we anticipate. The current generation of educators has progressed beyond the days of "A for Apple; B for Ball," to name a few examples. Today, teaching has been transformed to the degree where the teacher must find all means necessary to help each and every student unlock their potential in life. This goal will almost surely not be fulfilled if we continue to use the traditional technique of cramming a class of students into a single

classroom and pushing learners to memorize everything is written down without the use of proper teaching aids.

A new curriculum has been designed by five public universities to focus on practical learner-centered approaches so as to encourage critical thinking amongst students. Stakeholders have urged the Education Ministry to modify the present theoretical teaching style, prompting this action. With the help of the 'Challenge Fund,' a government aid package, certain institutions of education have already begun taking efforts to ensure the seamless implementation of the new curriculum, under the Transformation Teacher Education and Learning program (T-Tel), a four-year government Program financed by the UK Aid. According to the curriculum, after completing their four-year bachelor's degree in education, student teachers will spend one year teaching in elementary schools while hired by GES before receiving their license to practice and achieving qualified teacher status.

It is therefore imperative for deeper research to be conducted into how efficient these teachers will be in the classroom in this 21st century. Are teachers well exposed to the use of electronic media? Can teachers use the appropriate electronic media in the classroom for effective teaching and learning? How effective is the use of electronic media in colleges? With these questions in mind, it can be said that the teacher should be electronically literate and multi-tactful in all aspects of their career, not just the mastery of content and methods but, also the knowledge on how to use electronic devices in every content in this 21st century, thus, make use of electronic media to achieve the needed results in the classroom.

2.3.6 Covid-19 situation in Ghana

On March 12, 2020, Ghana announced its first two cases of COVID-19. On March 15, 2020, the President of the Republic of Ghana announced a series of measures to combat the virus's spread in Ghana. The government's efforts were aimed at limiting the virus's transmission by implementing social distance and improved cleanliness procedures. The President ordered the closure of education institutions in Ghana beginning March 16, 2020. The shutdown will affect 9.2 million students in elementary, secondary, and junior high schools, as well as 0.5 million students in higher education. Ghana had 4,700 confirmed COVID-19 infections by the 10th of May, 2020.

Health experts have predicted that there will be an upsurge in the number of confirmed cases in the coming weeks due to increase in testing. This implied that the closure of the schools might extend to a longer period than expected. This decision by the president had great impact on the learners in Ghana, as they could not have quality contact hours with their teachers. In Ghana what most learners are familiar with is the face-to-face teaching and learning. As result, the inability of the teachers to meet their learners in school suggested no learning at all. In most cases, people may have thought that this unfortunate incident might have happened to the basic schools only, but all sectors in Ghanaian education were affected from basic to tertiary.

2.3.6.1 Rolling out of online programs in Ghana during the school closure In the near term, the GES collaborated with the Center for National Distance Learning and Open Schooling (CENDLOS) to give all SHS students with access to the content on the iBox and iCampus. Too far, all 1.2 million SHS students were registered on the iCampus system, which allows them to undertake online and self-guided study. GES collaborated with the Ghana Library Authority to give an online learning tool to all Upper Primary, Junior, and Senior High School students, as well as working with Scholastic to deliver online content to children in Kindergarten and Lower Primary. In addition, the GES sort to immediately begin the establishment of a robust integrated Learning Management System that can support the multiple learning resources, platforms, and open-source materials including the iCampus content and the Edmodo online learning tools which were being set up. The tertiary institutions also employed some measures which later yielded no or little results. Colleges of educations tried the used of some electronic media. The successful nature of these media could not be determined.

2.4 Delphi Technique

The capacity to make successful judgments in circumstances when there is conflicting or insufficient information has resulted in a rise in the usage of consensus approaches such as brainstorming and nominal group technique and Delphi is a surveying technique (hereafter referred to as the Delphi). This approach was called after the legendary oracle at Delphi and was originally created by the Rand Corporation for

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technology forecasting. The method has been widely used in medical, nursing, and health services research (Williams & Webb, 1994; Kirk et al., 2002 & Gibson, 1998) and there are now many different variations. These include the `muddied Delphi' (McKenna, 1994), the `policy Delphi', and the real-time Delphi' (Beretta, 1996). The literature is filled with research documenting its usage because to the technique's exhibility, although modified variations of the Delphi have been critiqued for a lack of methodological rigor since the mid-1970s (Sackman, 1975). Regardless of the format used, the effective application of this strategy necessitates a high level of methodological precision and study rigor (Peiro Moreno & Argelaguet, 1993).

The Delphi method is a pragmatic technique based on philosopher and educator John Dewey's philosophical principles that social science research should directly connect to and influence real-world practice and decision making (Kirk & Reid, 2002). The Delphi approach stresses organized anonymous dialogue among persons with knowledge on a particular issue with the purpose of reaching a consensus in policy, practice, or organizational decision-making. (Birdsall, 2004).

2.4.1 Methodological Choices

While the Delphi approach is most commonly utilized for quantitative purposes (Rowe & Wright, 1999) it may also be used for qualitative purposes. Qualitative research is interpretivist in the sense that it is interested in how the social world is interpreted, understood, and experienced; it is flexible and sensitive to the social context in which the data was collected; and it is about producing holistic understandings of rich, contextual, and detailed data (Mason, 1996). In contrast to research done in a laboratory, qualitative research entails conversing with study participants in a natural situation (Creswell, 1994). The qualitative researcher tries to understand or interpret the occurrences in terms of the significance that the participants assigned to them (Creswell, 1998). The Delphi approach is best suited to capturing qualitative data with rigor. It may be seen as an organized process in which qualitative, quantitative, or mixed research approaches are used. This versatility not only allows the approach to address a wide range of research topics, but it also allows it to be effectively suited to the graduate student's strengths and aptitudes.

2.4.2 Expertise Criteria

Participants in the Delphi should have the following "expertise": I knowledge and experience with the topics under inquiry; ii) ability and desire to engage; iii) adequate time to participate in the Delphi; and iv) excellent communication skills (Adler & Ziglio, 1996). The round-by-round response rate can be used to indicate commitment to participate in a multi-round Delphi (Keil, et al., 2002). True specialists in an area, in our opinion, have a wealth of knowledge; nevertheless, they are frequently quite busy and may not be able to fully contribute. Questions that are engaging, succinct, and well-written can frequently attract them to participate. Those with marketing talents are frequently good at developing samples and getting a high response rate. When it comes to colleagues who qualify as specialists, the student's supervisor is frequently a great resource.

2.4.3 Number of Participants

The sample size is a practical factor for the researcher. While there are no hard and fast laws, there are a few things to think about in the Delphi research:

1) Heterogeneous or homogeneous sample: in cases when the group is homogeneous, a smaller sample of ten to fifteen persons may be adequate. However, if disparate groups are involved (e.g. an international study), then a larger sample will likely be required and several hundred people might participate (Delbeq, et al., 1975). To the rookie researcher, a word of caution: varied groups can considerably increase the complexity and difficulty of gathering data, gaining consensus, conducting analysis, and validating results.

2) Tradeoff between decision quality and Delphi manageability: as sample size grows, group error decreases (or decision quality improves). However, administering the Delphi process and interpreting the data becomes inconvenient over a certain point in exchange for negligible gains.

3) Internal or external verification: the larger the group, the more conclusively the results may be claimed to have been validated. However, a smaller sample size might be employed, with results confirmed by follow-up study. A single Delphi research is typically served for master's theses; however, for a PhD dissertation, the Delphi is usually confirmed with a follow-up study (e.g. interviews or survey). In

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these Delphi investigations, the sample size varies greatly. Because such expertise is limited, just three Delphi participants created a homogenous sample to generate criteria for the ceramic casting process (Lam et al., 2000). In contrast, 45 people from three countries were involved in identifying software development risks. The number of experts has a positive relationship with the sample size. It's also important to remember that the sample participants' perspectives may not be indicative of a larger group (Brancheau et al., 1996), which makes results generalization difficult. If the sample size is limited (Nambisan et al., 1999) and/or the participants' knowledge is questionable, cautious interpretation of the results is advised.

2.4.4 Number of Rounds

Again, the number of rounds is varied and depends on the goal of the research. According to Delbecq, Van de Ven, and Gustafson (1975), a two or three iteration Delphi is enough for most studies. If group unanimity is desired and the sample is diverse, three or more rounds of voting may be necessary. However, if the purpose is to comprehend subtleties (as in qualitative research), and the sample is homogeneous, fewer than three rounds may be enough to attain consensus, theoretical saturation, or reveal adequate information. Finally, as the number of rounds grows and the work needed of Delphi participants increases, the response rate frequently decreases (Alexander, 2004).

2.5 Conclusion and Gaps

According Esra SIPAHI (2020) the use of educational media has impact on teaching and learning. He indicated that, teachers who do not use educational media in their lessons when the said media is available is because, the instructor may not have any knowledge about it. Glaser, R. (1984) however indicated that, the presence of educational media alone can have a great impact on teaching and learning. According to Glaser, the availability of educational media is the ultimate key to every successful lesson in the classroom.

Chirwa (2018) on the other hand, opined that both teachers and learners are to be computer literate before they can achieve any success with the use of modern electronic media. Bordoh and Eshun (2018) also re-emphasized how important the role

of the teacher in the implementation of educational media in the classroom. Bordo and Eshun, stated that, even though the use of educational media is important, the massive failure to be used by teachers is because most of the materials are provided by the teachers without any support from any stakeholder.

Robert B. Kozma (1991) & Thompson (1985) were of the view that, computers are needed to make teaching and learning easy and attractive in the classroom. They however eliminated the essence of conducive computer labs and the knowledge of the instructor. Micka (2013) stated that mobile devices are needed if teaching and learning will be more effective in the 21st century, hence laying emphasis on the use of electronic media. According to Micka, learners will highly enjoy lessons if teachers make use of mobile electronic devices in the classroom. (Hashemi and M, Azizinezhad, 2011) indicated that mobile phones and their networks are easy to be used and less expensive and as such it will be more prudent to use mobile phones for teaching and learning. It must be emphasized that Micka, Hashemi, and M, Azizinezhad, refused to acknowledge the distractions that characterizes the use of mobile devices. Learners can be sway from the content and go completely over board and outside the classroom. This could amount to teachers spending most of the instructional time to be asking students to concentrate on the lessons. Even though mobile devices can help greatly in the delivery of content in the classroom but their challenges should also be stated. Again, S.K.S Cheung in his research conducted in October 2014, concluded that about 70% of learners wish to use a mobile device to study. In his research, learners were able to learn extra hours. Some students sacrificed their playing times and even studied at the dining table. This gives indication that, electronic media can enhance teaching and learning beyond the classroom, that's why it's important for electronic media to be used for teaching and learning.

According to Lynne Manson (2010) learning in the 21st century should be learner driven. Research conducted by University of Washington's department of education in 2011, indicated that, 21st century teaching and learning requires innovative pedagogies. The research also further indicated that lessons should use the problem-based approach. The experiential learning approach is what instructors should adapt.

The Delphi method is a versatile research strategy that works effectively when there is a lack of understanding about a phenomenon. In the IS field, there are several interesting research possibilities that focus on challenges, opportunities, solutions, and projections. For such research initiatives, the Delphi technique would be an excellent choice. It is not only a quantitative approach, but it also performs exceptionally well in qualitative research. This strategy, according to the researcher, is particularly suited to IS study since it is a fluid discipline ripe for investigation. Delphi studies, like IS projects, are not the same. Delphi comes in a variety of flavors, ranging from qualitative to quantitative to mixed-method Delphi. While there are many different types of Delphi, they all have design concerns in common, such as sample composition, sample size, methodological orientation (qualitative and/or quantitative), the number of rounds, and manner of interaction. Considering these options contributes to the method's rigor. Rigor increases the likelihood of a successful Delphi and a greater grasp of the IS discipline.

It is against this background that, the researcher set the quest to do the need assessment on electronic media for teaching and learning in the 21st century: A cases study of the colleges of education in Ghana. This is because none of the research works reviewed focused on the colleges of education in Ghana and Africa at large. Chirwa (2018), however, stated how important the teacher is in the use of educational media. Again, Berry (2012) also opined again that, Powerful learning of this nature demands well-prepared teachers who draw on advances in cognitive science and are strategically organized in teams, in and out of cyberspace. It will not be out of place to assess the use of electronic media in Ghana from the perspective of the colleges, because these colleges of education provide and will continue to provide the greater number of teachers in Ghana, hence if the test for the efficiency of the electronic media is conducted here, it will have a great impact on the general spine of the educational sector of Ghana.

CHAPTER 3
RESEARCH METHODOLOGY

The approach utilized to conduct the research is discussed in this chapter. It highlights the research design, target population, sampling techniques and sample size, research instruments, validity and reliability of the research instrument, data collection procedures data analysis techniques and ethical consideration.

3.1 Research Design

3.2 Target Population

3.3 Sampling Techniques and Sample Size

3.4 Instrument for Data Collection

3.5 Administration Procedure

3.1 Research Design

For this study, the Delphi technique approach was used. The approach was chosen because it allows communication between and among a panel of experts, allowing the process to be more productive and the group as a whole to deal with a complicated topic that is critical in this research. This strategy, once again, increases important idea production through systematic information gathering and processing of collective input from a panel of geographically dispersed specialists. Although numerous qualitative methodologies for the research were explored, including classical grounded theory, descriptive survey design, and constructivist inquiry, the Delphi method was chosen for the following reasons: 1) participants in this study were dispersed across multiple regions of the country due to the vacation of Ghana's colleges of education, making in-person interviews impractical; 2) the participants in the study were busy professionals who needed flexibility in when they participated, which open questionnaires allowed; 3) all participants were experienced tutors and administrators who can often be distrustful and non-participatory in academic research, and 4) finally, the Delphi approach presented a practical mechanism for learning as much as possible from highly experienced organizing practitioners in as little time as possible.

3.2 Target Population

The term "population" refers to all of the people who are of interest to the researcher (Marczyk, DeMatteon & Festinger, 2005). The target population is defined by Nachmias and Nachmias (2009) as the total collection of relevant units of analysis or data. According to Krishnaswami, O. R. (2001) the criteria for the inclusion of a unit in a survey are based on the characteristics of respondents who are eligible for participation in the survey. For that matter, the target population of this study comprised all the tutors and administrators of the 46 colleges of education in Ghana.

3.3 Sampling Techniques and Sample Size

The selection of study participants is an important aspect of Delphi research since it is their expert judgments on which the Delphi's output is based (Ashton, 1986; Bolger & Wright, 1994). In this study, four criteria were utilized to identify experts as proposed by (Adler & Ziglio, 1996): 1) knowledge and expertise with the topics under inquiry; 2) competence and desire to engage; 3) adequate time to participate in the research; and 4) excellent communication skills. Because expert opinion is sought, a purposive sample was utilized, and individuals were chosen not to represent the broader population, but rather to demonstrate their expert capacity to answer the study questions (Fink & Kosecoff, 1985). To determine the initial set of experts, the supervisor's guidance was solicited, and the "snowball" sampling approach was utilized to create future participants. 17 individuals were carefully chosen from ten (10) Ghanaian educational institutes. These were professionals who had worked as tutors or administrators at colleges of education for at least ten years. This indicates that these are specialists who have been thinking about how to utilize media for teaching and learning for over a decade.

3.4 Instrument for Data Collection

In this study, the primary data gathering instrument was a questionnaire. The Delphi surveys were distributed by e-mail. Round one of Delphi Questionnaires was created-Care and attention were paid to developing the initial wide question that focused on the study since respondents were required to grasp the issue in order to offer

acceptable replies or they would be disappointed (Delbeq, et al., 1975). The initial round of questionnaires was used to generate ideas. Delphi Pilot Study-A pilot study was carried out with the purpose of testing and adapting the Delphi questionnaire to increase comprehension and iron out any procedural issues. Each questionnaire was also pre-tested by the researcher.

Release and Analyze Round One Questionnaire-Questionnaires were delivered to participants, who completed them and returned them to the researcher. The Round One data were then analyzed using the research paradigm (qualitative coding). Reality maps were also created and sent to Delphi participants. Reality Maps were graphical representations of the fundamental concepts being studied. They showed reality from the perspective of the participant, and frequently illustrated relationships, causes and consequences, process flow, and other facets of their world. Reality Maps may substantially increase comprehension and allow the formation of collective intelligence about the issue under research in succeeding rounds (Lindstone & Turloff, 1975).

Round Two Questionnaire-Questionnaires were guided by the study aims. The Round Two Questionnaire was distributed to study participants and returned for analysis once completed. A media was created by the researcher upon which the round two questionnaire was based on. The questionnaire sought experts' recommendations about the media. However, participants were first given the chance to confirm that the Round One response accurately reflected their thoughts and to amend or broaden their Round One response. Continuous verification is required throughout the Delphi process to increase the dependability of the outputs (Adler & Ziglio, 1996; Delbeq, et al., 1975 and Linstone & Turoff, (2010) as a result, it was integrated into the research design. In round two, a similar analytical procedure was frequently followed. Round three Questionnaire-The round two replies were used to improve on the electronic media for teaching and learning in the colleges of education in Ghana, the media was then sent back to the panel of experts, and feedback was brought back to the researcher, using grade points. This helped the researcher to understand where these results may be extended. At each phase, the research questions were more concentrated on a specific topic.

3.4.1 Validity

Content validity was established through the administration of the instruments before they were administered. Views from other researchers (peer review) also established content validity. Further, advice sought from my supervisor on how to draft the questionnaires, and the channel through which questionnaires be administered established validity. This enabled the researcher to identify items that needed to be included and those that needed adjustment or replacement. Hence, accurate and adequate information of the variables, methods, and objectives under this study was collected.

3.4.2 Reliability

Several efforts were taken to ensure the study's dependability. The Delphi questionnaires were distributed to tutors from all disciplines and institutes of education in Ghana. To be more definite about the diverse replies offered by the experts, the Delphi questionnaires were published on the same problem three times in a row. The data obtained as well as the techniques utilized to acquire the data were compared and contrasted. Furthermore, the researcher took into account the remarks of professionals, peer reviews, and supervisors, as well as the surveys that were made available. They aided in identifying gaps in data gathering techniques. Their criticisms aided in the modification of the devices to assure dependability. The input from participants was also utilized to add missing elements and reduce ambiguity from the instruments.

3.5 Administration Procedure

Schmidt's approach for "ranking-type" Delphi investigations was used to administer the surveys. It consisted of three general steps: 1) brainstorming for key aspects; 2) limiting the initial list down to the most important ones; and 3) ranking the list of critical factors.

3.5.1 General questionnaire design issues

For the majority of the design concerns, the researcher adhered to the principles proposed by Delbecq et al. and Dillman. First, because Delphi research, with its several phases and iterations, requires significantly more time from respondents than

a regular survey, one of the goals was to guarantee that no one item took more than 30 minutes to complete. Second, investigate the administration technique of using e-mail and Web versions of the survey at the same time. The surveys were meticulously developed by the researcher to guarantee that the three formats were equal as described in Schmidt et al., which details the procedure of delivering the Delphi study.

3.6 Data Analysis Techniques

The process of examining and logically appraising data in order to study each component of the data acquired using research equipment is known as data analysis. After the third round, responses from the team of experts were compared and the instruments were reviewed for completeness and errors, and the questionnaires were then organized, coded, and fed into the computer for analysis using the Statistical Package for Social Science (SPSS). Descriptive statistics were used to analyze quantitative data by filling in frequencies and percentages depicted in tables, charts, and graphs.

The level of unanimity to be used was also taken into account. The Delphi does not have a widely agreed-upon proportion since the level employed is determined by the sample size, the purpose of the study, and the available resources. McKenna (1994), building on the work of Loughlin and Moore (1979), says that consensus should be defined as 51 percent agreement among respondents, Sumsion (1998) supports 70 percent, while Green, et al. (1999) chose 80 percent. For that matter, percentages were utilized to assess the consistency of respondents' replies in round one and two. In the initial round of answers, McKenna (1994), building on the work of Loughlin and Moore (1979), 51 percent agreement among respondents or higher were deemed desirable. As advised by Green et al., replies with an accuracy of 80% or above were considered in the second round of responses as consensus. The replies from round three, on the other hand, were represented by mean and standard deviation.

3.7 Ethical Considerations

There was no harm to any of the participants in this study. The administrators and college tutors who took part in the Delphi questions completed online consent forms and agreed that their responses would be properly analyzed and utilized in this research. The researcher, on the other hand, went into great detail about the study. Throughout the study, the names of the administrators and college tutors/respondents were kept private. The names of those who took part in answering the Delphi questions were Respondent A, Respondent B, Respondent C, Respondent D, Respondent E in that other to the last respondent. Furthermore, no component of the questionnaire allowed respondents to disclose their names or any other information that might be used to verify their identification.

3.8 Steps in Creating an E-book

Step #1: write your e-book content,

Step #2: organize your content,

Step #3: use your style guide,

Step #4: choose images and create Visuals,

Step #5: design Your e-book,

Step #6: publish and share the e-book.

CHAPTER 4

RESEARCH RESULT

This chapter deals with the discussion of the data collected from the field. The chapter is presented in three sections. The first section deals with the responses for the first round of the Delphi respondents. The second section focused on the results from the second round of the Delphi data and the third section dealt with results from the experts based on the feedback from the electronic media created by the researcher.

4.1 Results from the First Round of the Delphi Data

4.2 Results from the Second Round of the Delphi Data

4.3 Results from the Final Round of the Delphi Research

4.1 **Results from the First Round of the Delphi Data**

Contained in this section is the biodata for the research and the initial opinions of a panel of experts about the use of electronic media for teaching and learning in the 21st century.

Research question one: What are the suitable types of electronic media used for teaching and learning in the Colleges of Education in Ghana?

Table 4.1 Number of colleges used for the data collection

Name of college	Number of representations
Ola college of education	4
Accra College of education	2
St. Ambrose college of education	1
St. Francis college of education	2
Gbewaa college of education	1
Methodist college of education	2
SDA college of education	1
St. Monica college of education	2
Jasikan college of education	1
Berekum college of education	1
Total	17

Table 4.1 shows the number of colleges the experts used for this research were taken from. This indicated that the number of Tutors and administrators used in this research were obtained from 10 colleges of education in Ghana. It is through these experts that all the data for all three rounds of the research were derived.
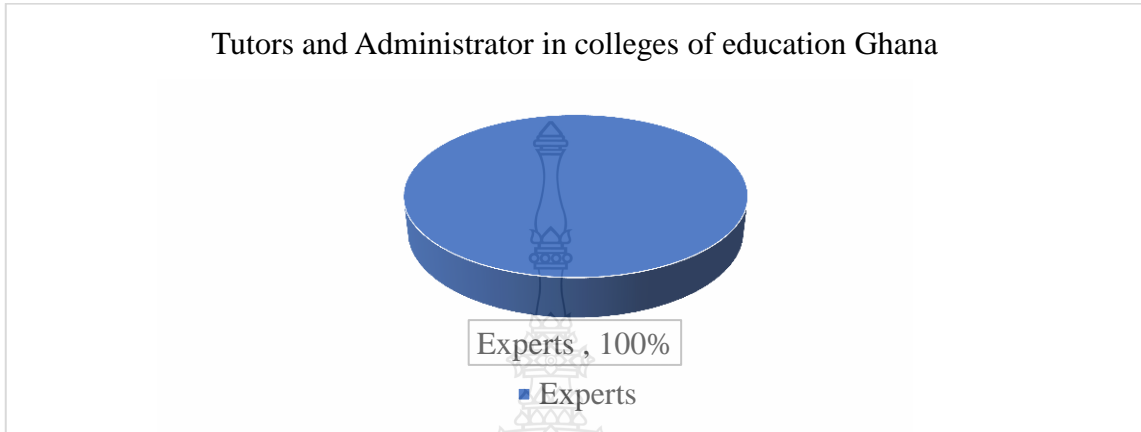

Figure 4.1 Representation of Tutors and administrators in Colleges of Education Ghana

Figure 4.1 indicates that all the panel of experts were from the public colleges of education in Ghana. This research focused on using the colleges of educations in Ghana, and all panelists chosen for this research were all tutors and administrators from the public colleges of education in Ghana.
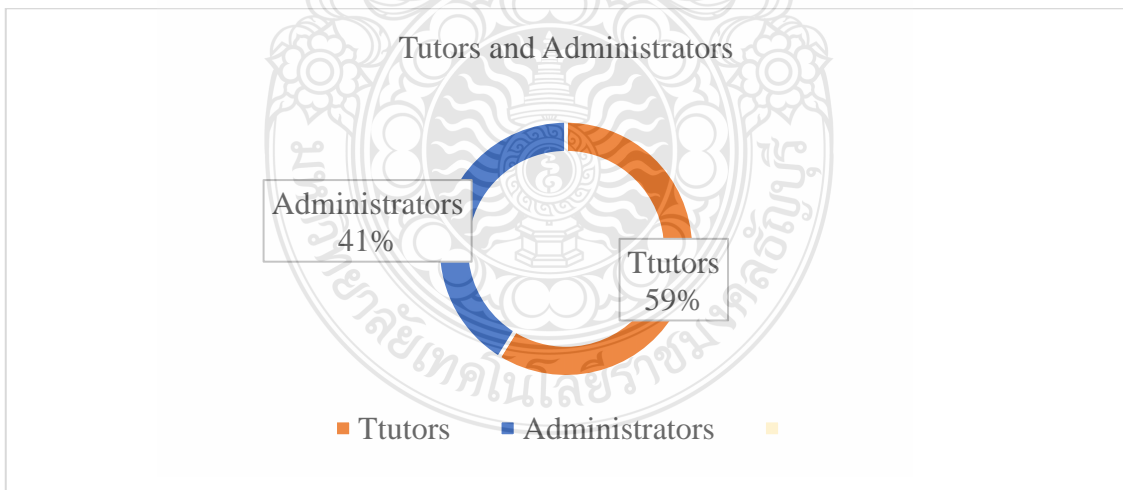

Figure 4.2 Status of Respondents

Figure 4.2 shows that 10 of the experts representing 59% used for the research were tutors from the colleges of education in Ghana while 7 of them representing 41% were administrators from the colleges of education in Ghana.

Table 4.2 The meaning of electronic media

Number of respondents	Response	Percentage (%)
3	Assessing information through electronic means	17.6%
5	It's a tool and means of communication through airwaves	29.5%
9	It is a vehicle through which information is shared or received	52.9 (%)
Total = 17		100%

Table 4.2 explains the general idea about respondents' idea about what electronic media means. 3 of the participants representing 17.6% defined electronic media as Assessing information through electronic means. 5 experts representing 29.5% defined electronic media as, as a tool and means of communication through airwaves. And 9 experts representing 52.9% defined electronic media, as a vehicle through which information is shared or received. According to McKenna (1994), building on the work of Loughlin and Moore (1979) says that consensus should be defined as 51 percent agreement among respondents. For the benefit of this research electronic media was defined as, "A vehicle through which information is shared or received" as recommended by the panel of experts.
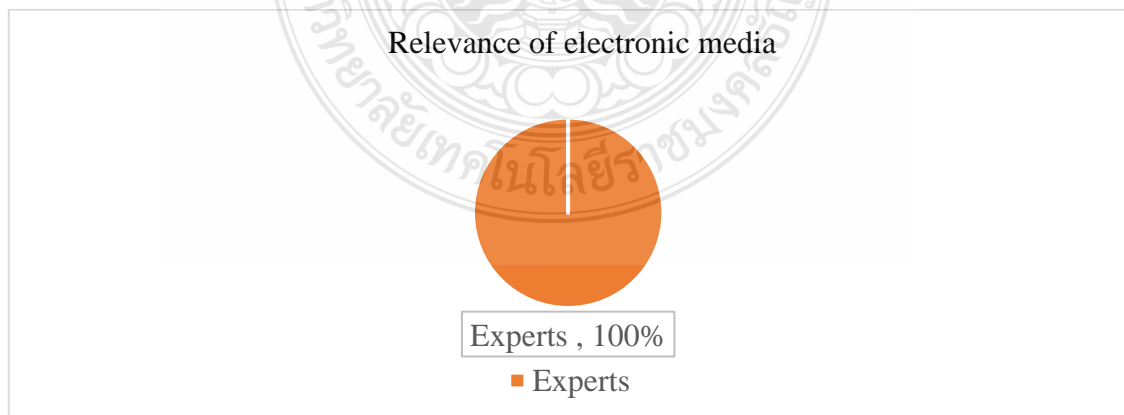
Relevance of electronic media

Experts , 100%
■ Experts

Figure 4.3 The use of electronic media in the teaching and learning process in the college of education in Ghana

According to Figure 4.3, all 17 experts agreed that the use of electronic media for teaching and learning in the twenty-first century is highly significant and should be employed in Ghanaian educational institutions. According to Kitaboo (2018) electronic media raises people's awareness of global issues. Greater chances are acquired by having all the media in one location; this is a benefit of media. All experts agreed that electronic media may significantly increase academic achievement.

Table 4.3 The importance of the use of electronic media in the teaching and learning process in the colleges of education in Ghana

Number of experts	Responses	Percentages (%)
6	Because it supplements the face-to-face teaching and learning	35.3%
8	It helps students to grasp teaching and learning easier.	47.1%
3	It makes research by teachers easy for delivery of lessons.	17.6%
Total=17		100%

Table 4.3 indicates that all the experts agreed that, the use of electronic media is very important for teaching and learning in the colleges of educations in Ghana, they however justified how important it is to them from different perspectives. It must be reiterated that all experts indicated that, it is very important to use electronic media in the colleges of educations in Ghana given 100% consensus by experts.
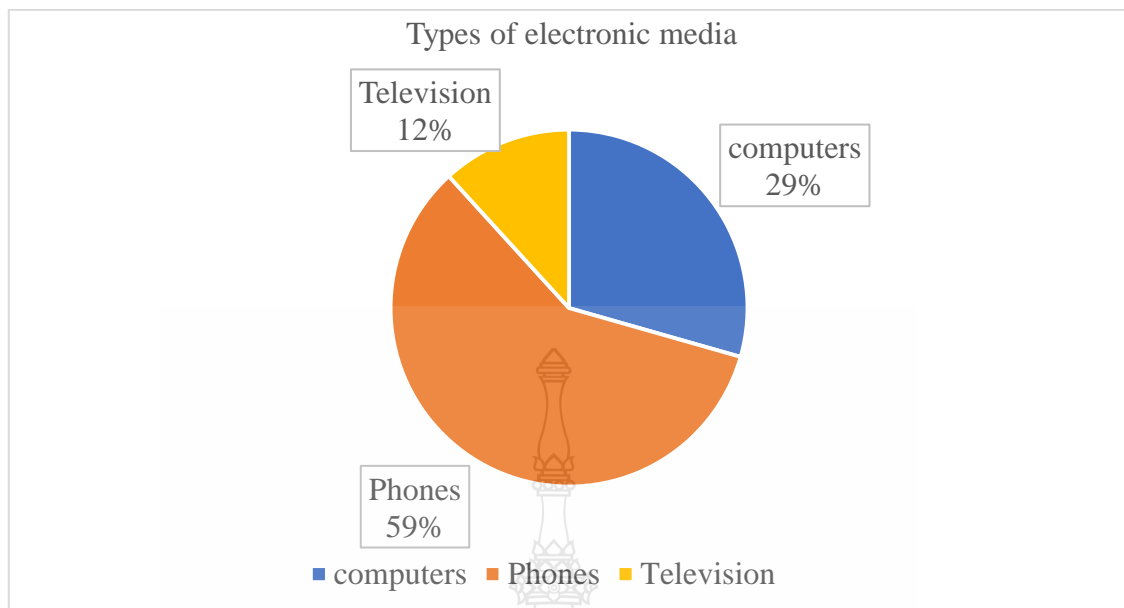
Figure 4.4 Type(s) of electronic media do experts find its user friendly for teaching and learning

Figure 4.4 shows that 29% find the usage of computers for teaching and learning more friendly than any other electronic device. 12% stated that they find the usage of television for teaching more user-friendly. And 59% indicated that the use of mobile phones for teaching and learning is more friendly than any other electronic device. Going by McKenna (1994), building on the work of Loughlin and Moore (1979), which says that consensus should be defined as 51 percent agreement among respondents, it is therefore imperative to state that, respondents find the use of mobile phones for accessing electronic contents for educational purposeful than any other electronic device.
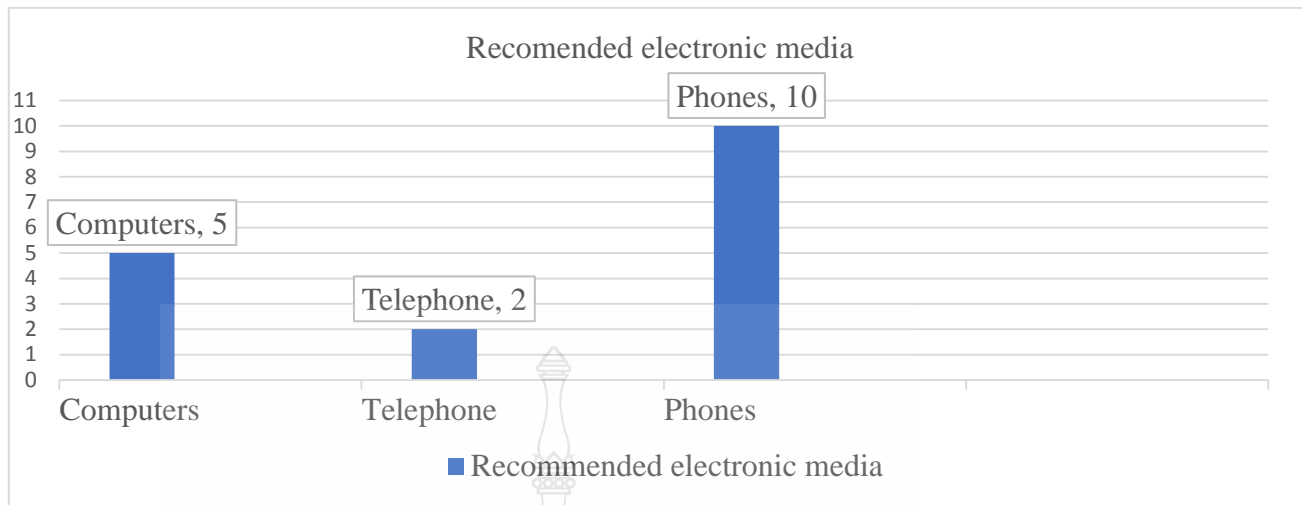
Figure 4.5 Type of electronic media recommended by experts to be used for teaching
and learning in the colleges of education in Ghana

Figure 4.5 shows that 5 experts recommended the usage of computers to access electronic content for teaching and learning, again, 2 experts recommended the usage of television for teaching and learning while 10 experts recommended the use of mobile phones for electronic content. This indicates that 58.8% of experts recommended that, content that can easily be accessed on the mobile phone should be used for teaching and learning in the colleges of education in Ghana. This finding is supported by (Hashemi and M, Azizinezhad, 2011), who stated that mobile phones and their networks are easy to be used and less expensive and as such it will be more prudent to use mobile phones for teaching and learning.

4.2 Results from the Second Round of the Delphi Data

This section contains the data analysis of round two of the Delphi research. This includes the recommendation made by a panel of experts for the researcher to adjust the electronic media created for teaching and learning in the colleges of education in Ghana.
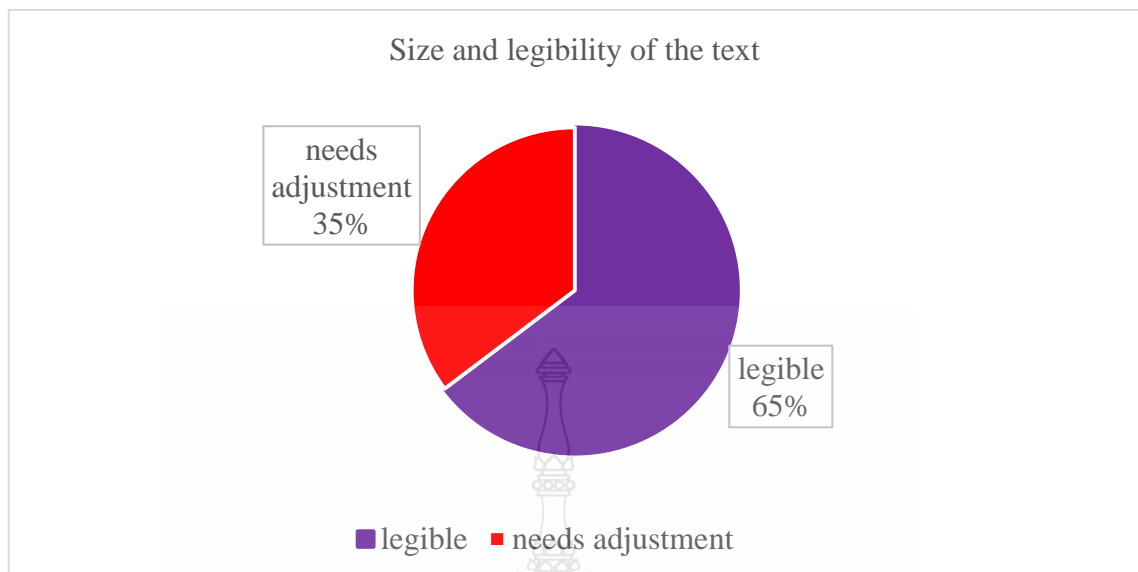
Figure 4.6 The size of the text and legibility in the e-book

Figure 4.6 shows that 65% stated that the text in the e-book was legible enough to be read, meaning, the font size and the type of font selected were perfect. On the other hand, 35% recommended that some of the text sizes should be adjusted to get uniformity in the texts. Even though 65% of the experts indicated the text legibility and size were perfect, adjustments were made to meet the recommendations of the 35% of the experts to be able to get an e-book of high-quality for educational purposes.
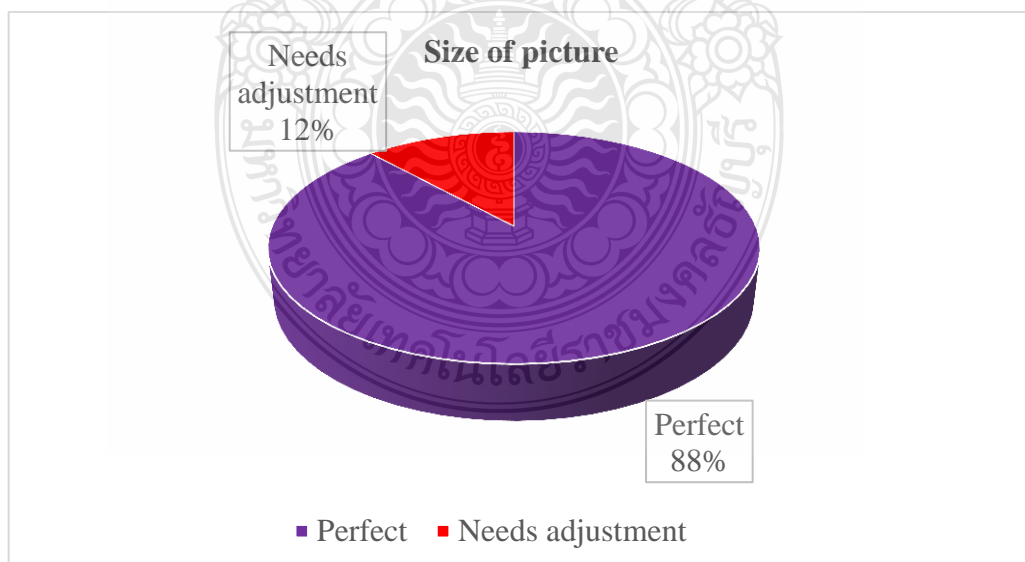

Figure 4.7 The appropriateness of Sizes and quality of the pictures included in
        the e-book

Figure 4.7 indicates that 88% of the experts stated that the picture sizes included in the e-book were clearer and bigger enough to be seen by learners and instructors for educational purposes. Again, the same percentage of experts indicated that the arrangements of the pictures in the e-book were good enough for educational purposes. However, 12% raised no concerns about the picture quality in the e-book, they however raised concerns about the arrangement of the pictures in the e-book. Even though according to Green et al., replies with an accuracy of 80% or above were considered in the second round of responses as consensus, the suggestions made by the 12% of the experts were taken into consideration, and adjustments were made for the betterment of the e-book for teaching and learning in the 21st century.
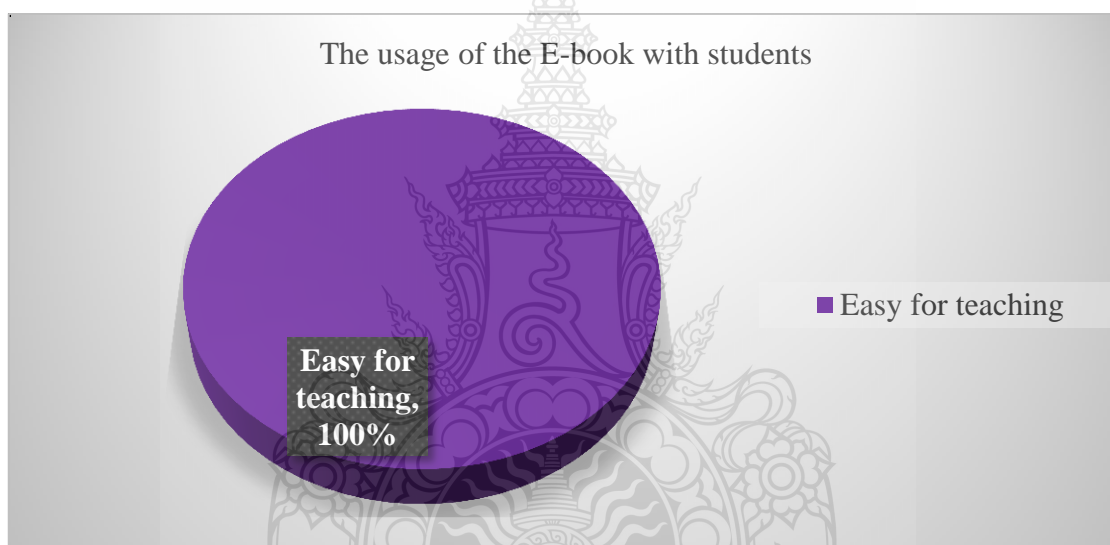
Figure 4.8 The use of e-book with the student in the colleges of education in Ghana

Figure 4.8 shows that all experts agreed that the e-book is very convenient to use for teaching and learning in Ghanaian educational institutes. The goal of an E-book, according to Kitaboo (2018) is to simplify and improve the whole learning experience. Digital books enhance the learning experience by making it more interactive and interesting. Students may now actively engage in the learning process rather than passively listening to one individual who is always talking. All experts agreed with Kitaboo's assessment (2018). The e-book was also suggested for usage by tutors at Ghanaian educational establishments for teaching and learning reasons.

Figure 4.9 The content created in the e-book

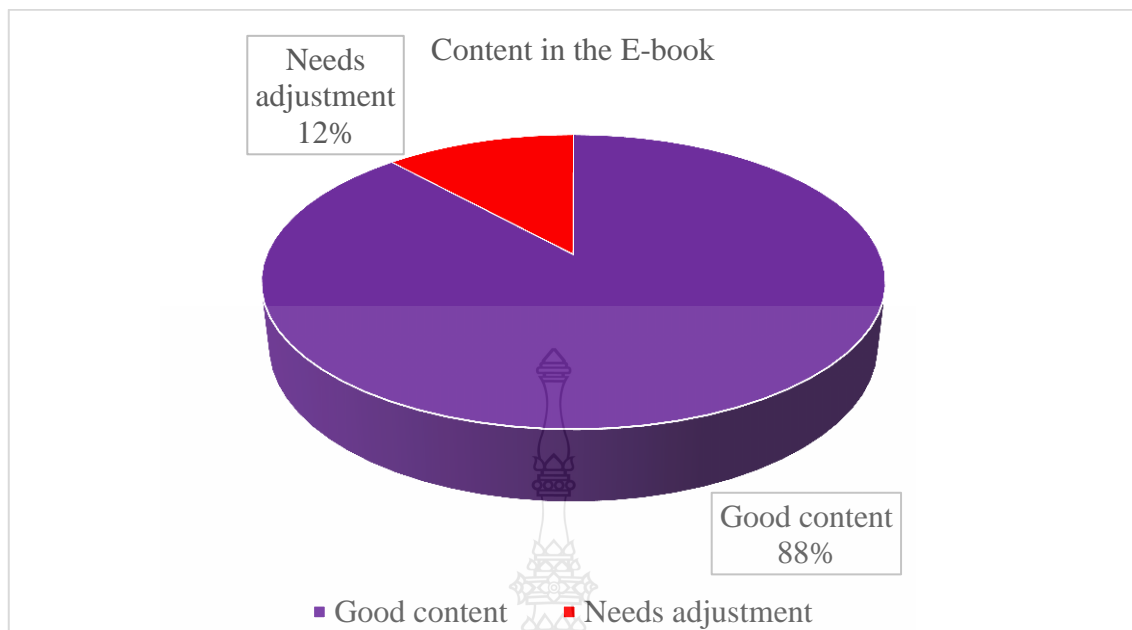Figure 4.9 shows, 88% of the experts suggested that the content created was inline and good for educational purposes. However, 12% of the experts even though agreed that, the content in the e-book is good for educational purposes, they stated however that, it needs to be adjusted and expanded to give details for the tutors to be able to create their content for online teaching and learning. Even though according to Green et al., replies with an accuracy of 80% or above were considered in the second round of responses as consensus in this research, it was however written to all experts and explained to them, the main objective of the content created. That's the content only aimed at the creation of online media. It was noted that the concerns of the experts were concerning the explanation to be given to the usage of the online media taught in the e-book. Hence called for an enlargement of the content to cover a wider range.
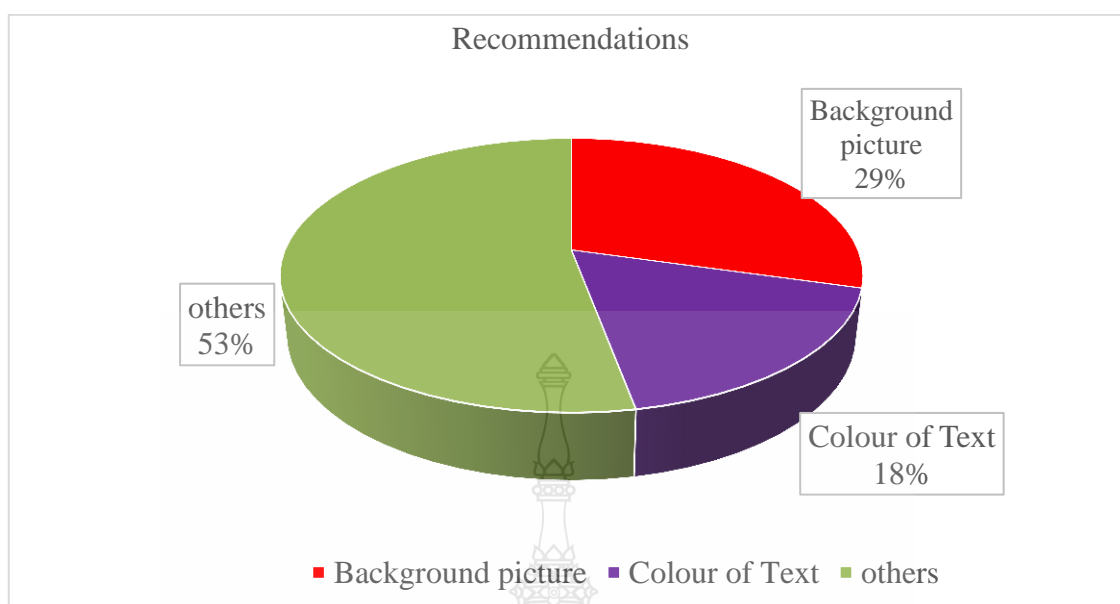
Figure 4.10 Other recommendations by experts

Figure 4.10 shows, 29% of the experts recommended that the background image should be changed for another. Even though it was admitted by experts that every text on the background can be seen well, experts, however, indicated that background colors do not blend well with most of the text on some of the pages. 18% of experts also recommended that the choice of text color chosen for the e-book should be considered on each of the pages. 53% of the experts recommended that everything in the e-book was good for educational purposes. Notwithstanding, the researcher considered the type of background chosen and made changes also in the color of text chosen for each page, to be able to get the idealized e-book as recommended by all the panel of experts.

4.3 Results from the Final Round of the Delphi Research

The results of the main data have been presented in accordance with the two research questions. Respondents were asked to respond to twenty items on a four and five-point scale.

Research question two: How quality is the electronic media developed by the researcher for teaching and learning in the colleges of education in Ghana? Satisfaction with the use of the e-book

On the satisfaction on the use of e-books on the scale of 5, experts indicated been very satisfied with the used e-book for educational purposes with (mean=1.411765 and SD=0.618347)

The size of the text in the e-book

Concerning the sizes of the text in the e-book and how legible the texts were, on the scale of 4, the data shows that experts indicated that the texts were very legible in the e-book with (mean=1.647059 and SD=0.701888)

How the color of the text blended with the background

With how the color of the text blended with the background, on the Scale of 4, the data indicated that experts stated that the color of the text blended well with the background and pictures in the e-book with the (mean=1.470588 and SD=0.624264).

The picture quality on the e-book

On the quality of the pictures in the e-book for teaching and learning, on the scale of 4, the data showed that experts indicated the pictures were quality enough to be seen and used for educational purposes with the (mean=1.647059 and SD=0.606339)

The size of pictures in the e-book

When experts were asked on the sizes of the pictures on the e-book on how bigger they were for educational purposes on the scale of 4, the data indicated that, experts agreed that the sizes of the pictures on the e-book were bigger enough to be used for teaching and learning in the 21st century with (mean=1.764706 and SD=0.437237).

Quality of background of the e-book

On the rating of the background image of the e-book on the scale of 1-5, the data showed that, the background very high for educational purposes with the (mean=3.705882 and SD=0.469668)

Ease of navigation

On the rating of the attribute of the navigation of the e-book on average, the data showed that the navigability of the e-book was above-average of any other sites or electronic media for teaching and learning<with the (mean=1.470588 and SD=0.514496) on the scale over 4.

Accuracy of information

On the rating of the accuracy of the information in the e-book by experts on the average, the data showed that, experts rated the accuracy of the information in the e-book on average as credible information for educational purpose with (mean=1.529412 and SD=0.514496) on the scale over 4.

Quality of content

Experts also rated the quality of the content in the e-book on an average scale, experts indicated that, the content an average as good content as credible content for teaching and learning purposes with the (mean=1.705882 and SD=0.469668) on the scale over 4.

Layout/design

When experts were asked on rating the layout and the design of the e-book on an average scale, experts indicated that the design and layout of the e-book created by the researcher were on average as any design on every site or electronic media they have come across with the (mean=1.588235 and SD=0.5073) on the scale over 4.

Meeting needs of students

On the issue of e-books meeting the needs of students, experts were questioned whether or not it met the needs of students for teaching and learning purposes on average rating scale, experts rated the e-book on meeting the needs of average students for teaching and learning purposes with (mean=1.529412 and SD=0.71743) on the scale over 4.

The likelihood of using e-books for teaching and learning in the future

On the likeliness of recommending the use of e-books for teaching and learning in the future, experts indicated that it is very likely for them to recommend the use of electronic media for teaching and learning in the future due to its ability to blend both video, picture and texts at the same time with the (mean=1.294118 and SD=0.469668) over the scale of 5.

Relevancy of the content in the e-book tutors or administrators in the college of education

On the relevancy of the content on the e-book to the college tutor or administrator, the data showed that experts rated the content on the e-book as relevant to the tutors and college administrators for teaching and learning using the electronic media, with the (mean=1.705882 and SD=0.685994) over the scale of 5.

The likelihood to use the e-book created by the researcher as a primary source of information to create an electronic media

On how likely experts were going to rely on the information in the e-book created by the researcher as the primary documents for the creation of the online media for teaching and learning in the colleges of education in Ghana, with (mean=1.941176 and SD=0.966345) over the scale of 5, the data indicated experts are likely to use the information on the e-book to create their online media for teaching and learning in the colleges of education in Ghana.

How likely experts will recommend to colleague tutors the content in the e-book

On how likely experts will recommend the content in the e-book to their colleagues, the data showed that it is very likely for experts to recommend the content in e-book for teaching and learning in the colleges of education in Ghana, with the (mean=1.647059 and SD=0.492592) over the scale of 5.

How likely e-book will be recommended to colleague tutors in future

The data indicated that experts that they will recommend the use of e-book to their colleague tutors for teaching and learning purposes in the future in the colleges of education in Ghana, by stating that, it is very likely to be recommended with (mean=1.647059 and SD=0.492592) over the scale of 5.

How likely experts recommend e-books to their students for teaching and learning purposes

The data shows that experts will highly recommend the use of e-books to their students for teaching and learning purposes in their various classrooms in the future. Rating on how likely it will be for experts to recommend, experts indicated it's very likely for them to recommend it to their students with (mean=1.411765 and SD=0.618347) over the scale of 5).

How comfortable the experts were in using the e-book created by the researcher for educational purpose

On how comfortable experts were with the use of the e-book for teaching and learning, the data showed that experts were comfortable with the use of e-books for teaching and

learning purposes in the colleges of education in Ghana with the (mean=2.058824 and SD= 0.658653) over the scale of 5.

Comparing the e-book created by the researcher to other electronic media for teaching and learning

Comparing the e-book created by the researcher to other electronic media used for teaching and learning, experts rated the e-book as an above-average of any electronic media used for teaching and learning purposes with (mean=3.705882 and SD=0.771744) over the scale of 5.

Recommending the use of e-book for teaching and learning in the colleges of education in Ghana.

On the issue of recommending the use of e-book for teaching and learning in the colleges of education in Ghana in the future, experts agreed with the researcher that, the e-book should be the most suitable electronic media used for teaching and learning purposes in the Colleges of educations in Ghana with (mean=4.294118 and SD=0.587868) over the scale of 5.
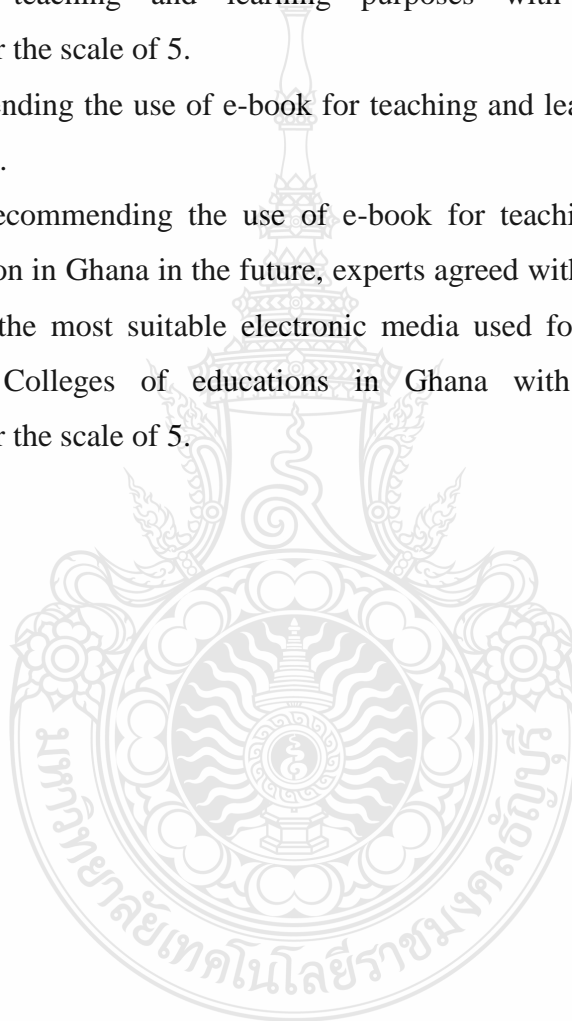
CHAPTER 5
SUMMARY DISCUSSION AND RECOMMENDATION

The preceding chapter offered the analysis and discussions of the findings. This chapter presents the important results summary, conclusions, and recommendations, as well as ideas for further study.

5.1 Summary of the Research Process

The analysis discovered several important concerns. These were found with regards to the use of electronic media for teaching and learning in the 21st-century case in the colleges of education in Ghana. The main purpose of the study was to find out:

5.1.1 To find out suitable types of electronic media used for teaching and learning in the colleges of education in Ghana.

5.1.2 To develop a suitable electronic media prototype to be used in the colleges of education in Ghana.

5.1.3 To find out how quality the electronic media developed is for teaching and learning in the colleges of education in Ghana.

The study adopted the Delphi technique. The main instruments used in the study were both close-ended and open-ended questionnaires. In selecting the research respondents, purposive sampling technique since the research demands experts in the phenomenon under investigation. After the third round, responses from the team of experts were compared and the instruments were reviewed for completeness and errors, and the questionnaires were then organized, coded, and fed into the computer for analysis using the Statistical Package for Social Science (SPSS). Descriptive statistics were used to analyze quantitative data by filling in frequencies and percentages depicted in tables, charts, and graphs.

5.2 Summary of the Research Findings

The study found out with regards to what types of electronic media are appropriate to be used for teaching and learning in the colleges of education in Ghana. The study concerned itself with the three rounds of questions. The first round sought to find out the general overview of the experts on electronic media and its usage for teaching and learning in the 21st century. After analyzing the responses of the first round from the team of experts, electronic media was created and was sent to the team of experts for observation and to offer recommendations in the round two questions for the betterment of the media for teaching and learning in the colleges of educations in Ghana.

Experts made various recommendations and suggestions about the media created. Various aspects such as the text, background accessibility, and relevancy of the content to teaching and learning in the colleges of education in Ghana were the areas experts made recommendations. The researcher, therefore, improved upon the media created after analyzing the round two data from the experts. The electronic media was finally sent to the experts and quality assessment questionnaires were sent to them, to assess the quality of its usage for teaching and learning in the colleges of education in Ghana. Seventeen experts from 10 colleges of education in Ghana were used for the research. The experts consisted of 7 administrators and 10 tutors from public colleges of education in Ghana. All 17 experts took part in all three rounds of the data collection.

The results from the data collected from the experts indicated that there is a need for the use of electronic media for teaching and learning in the 21st century. Again, the data indicated that the use of online media for teaching and learning is much needed for teaching and learning purposes in the colleges of education in Ghana in the 21st century. This is in line as stated by Kitaboo (2018), Electronic media makes people aware of worldwide things. Greater opportunities gained through this media sitting at one place is an advantage of media. All experts admitted that electronic media can improve academic performance tremendously.

The data also indicated that all the experts have various electronic devices to access electronic content. The data, however, showed that experts feel more comfortable with the use of a mobile phone to access electronic content. This recommendation by

the experts is in line with (Hashemi and M., Azizinezhad, 2011) who indicated that mobile phones and their networks are easy to be used and less expensive and as such it will be more prudent to use mobile phones for teaching and learning.

The quality of the media created by the researcher was also assessed by the experts. The data indicated that the media was quality enough for teaching and learning in the 21st century. All the experts indicated that the content will go a long way to help the tutors to be able to create their online media for teaching and learning in the colleges of education in Ghana.

Again, the data indicated that the media created by the researcher will highly be recommended to other tutors for teaching and learning.

Moreover, the data also showed that experts will recommend e-books to their students for teaching and learning purposes. This according to the experts will help in teaching and learning in Ghana in the 21st century.

Finally, the data showed that, on the issue of recommending the use of e-books for teaching and learning in the colleges of education in Ghana in the future, experts agreed with the researcher that, the e-book should be the most suitable electronic media used for teaching and learning purposes in the Colleges of educations in Ghana with (mean=4.294118 and SD=0.587868) over the scale of 5.

5.3 Conclusions

Based on the research findings it can be concluded that:

5.3.1 The use of electronic media for teaching and learning is very important in the 21st century and all levels of the educational ladder should be encouraged to use it.

5.3.2 Tutors in the colleges of education should create electronic contents that mobile phones can be used to access to enable all students to have access.

5.4.3 Most tutors and administrators in the colleges of education in Ghana have difficulty in creating and using online electronic media for teaching and learning.

5.3.4 E-book is a very convenient electronic media for teaching and learning in the colleges of education Ghana since it allows to blend of pictures, videos, and text at the same time, therefore tutors should be encouraged to use them for teaching and learning.

The e-book was chosen based on expert's recommendation and the researcher's thirst to search for an electronic media that could contain video, text and picture at the same time.

5.4 Recommendations

Based on the findings of the study, the following recommendations have been made for policy and practice:

5.4.1 In-service training should be organized for the tutors and administrators in the colleges of education in Ghana on how to create and use online electronic media for teaching and learning.

5.4.2 A course should be mounted in the colleges of education in Ghana, to teach teacher trainees how to use the various electronic media for teaching and learning at the basic level since the world is moving from analog to digital.

5.4.3 The ministry of education and NGOs should sponsor the use of electronic media for teaching and learning in Africa and the colleges of education in Ghana since it is capital intensive and leaving it in the hands of school administrators will make it unproductive.

5.5 Areas for Further Research

The researcher suggests that;

5.5.1 The study was conducted in colleges of education in Ghana, a similar study should be done in other countries to establish the need to use electronic media for educational purposes.

5.5.2 A study can be conducted on methods of improvising electronic media and models in schools

5.5.3 A study on the integration of ICT and e-learning to complement human resources in Ghana.

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APPENDIXS
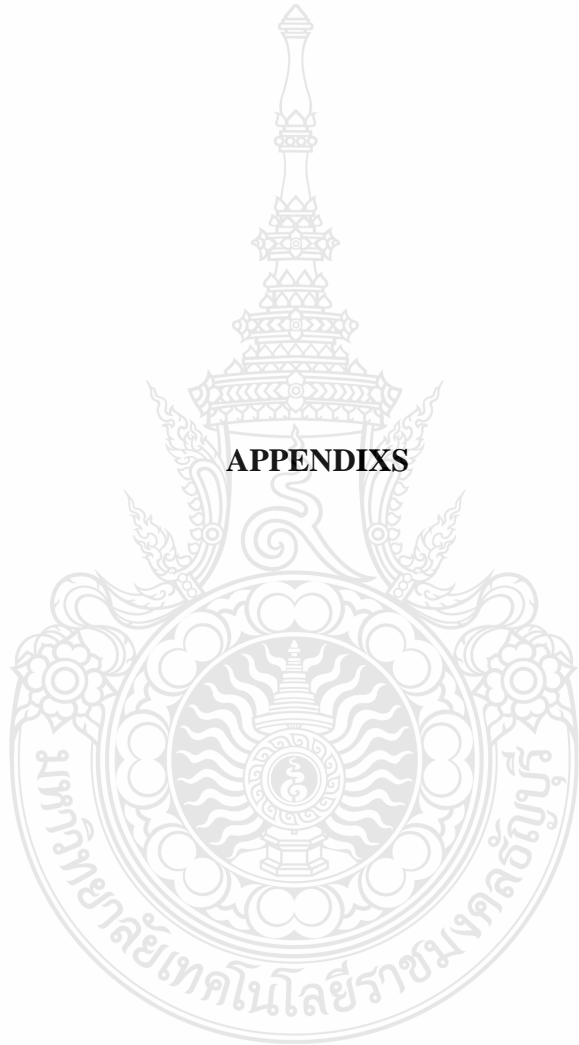
APPENDIX A
CONSENT FORM
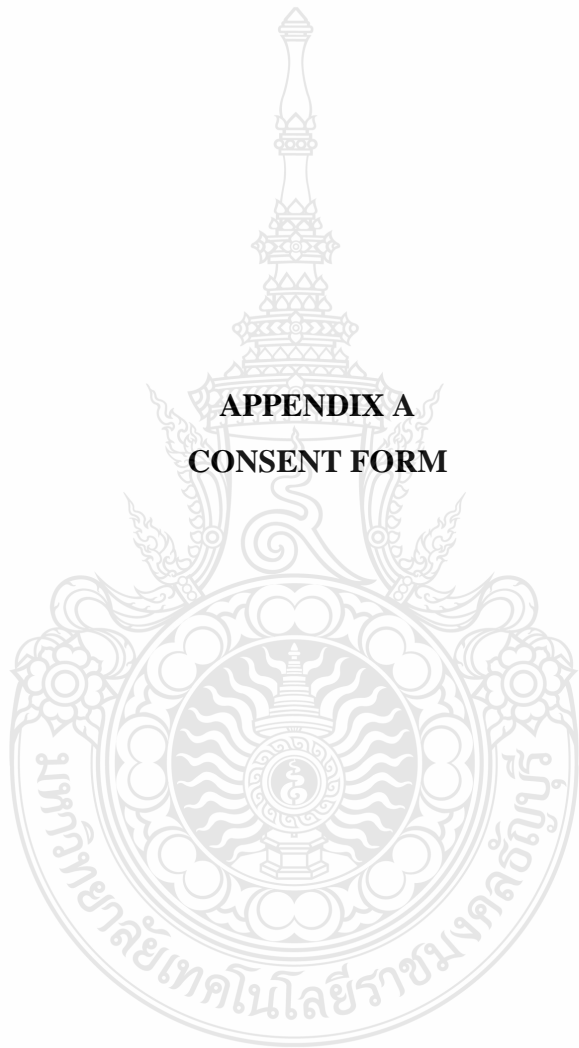
RAJAMANGALA UNIVERSITY OF TECHNOLOGY THANYABURI - RMUTT

DEPARTMENT OF EDUCATIONAL TECHNOLOGY AND COMMUNICATIONS

FACULTY OF TECHNICAL EDUCATION RAJAMANGALA UNIVERSITY OF TECHNOLOGY

CONSENT FORM FOR THE DELPHI QUESTIONNAIRE

Dear sir/ Madam,

Thank you for consenting to participate in a survey for this study. Your participation will be kept strictly secret, and you will stay entirely anonymous throughout the process. The information acquired in this survey will not be made public and will only be used for research purposes. The M.ED research intends to analyze the necessity for the use of electronic media for teaching and learning in the twenty-first century: a case study in Ghanaian colleges of education. The survey below is the first step of a Delphi questionnaire. This is intended to elicit your viewpoint on this critical topic. The Delphi process involves questioning you on three separate occasions:

Round 1: Some general open-ended questions will be submitted to you requiring your response. These are below for you to reply to now.

At a later date,

Round 2: Your answers (and those from the other panelists) from round 1 will be summarized and formulated into a series of more specific questions that you will be asked to respond to.

Round 3: Round 2's questions will be submitted to you again but this time you will also be able to see the average reply of the other panelists and you will then be asked if you would like to adjust your answer from the second round or not.

Be assured that, the identity of all panelists will remain confidential at all times.

Signed

Frank Ofori

Appendix II: Questionnaires for the three rounds.

RAJAMANGALA UNIVERSITY OF TECHNOLOGY THANYABURI - RMUTT

DEPARTMENT OF EDUCATIONAL TECHNOLOGY AND COMMUNICATIONS

FACULTY OF TECHNICAL EDUCATION RAJAMANGALA UNIVERSITY OF

TECHNOLOGY

This M.Ed. Research is on the use of electronic media for teaching and learning in the 21st century: A case study of the colleges of education in Ghana.

QUESTIONNAIRE FOR THE ROUND ONE

Name of College of Education……………………...……………………………….

Status of College……………………………………………………………………….

Status of Respondents……………………………………………………………………

1. What is electronic media?..

2. What is the most available electronic media in your institution and how often are they utilized?..

3. What electronic media will you recommend to be used for teaching and learning in the colleges of education in Ghana? ....

4. What type(s) of electronic media will you want your institution to have that is not currently available?...

5. What will be your best three (3) electronic media that you will want to be developed well for teaching and learning in Ghana in the future and why………………………….
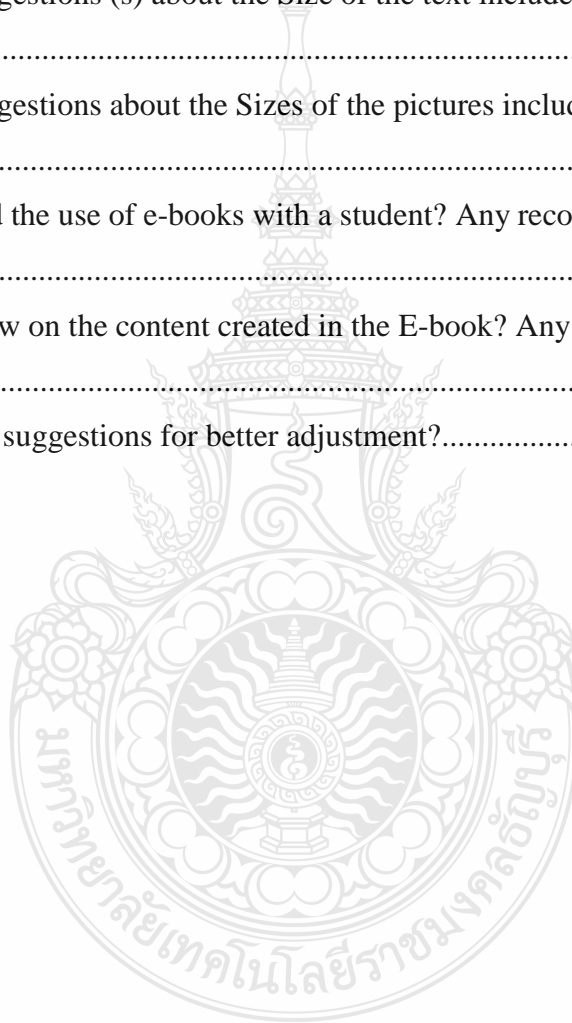
6. What do you say about instruction with electronic media and instructions without electronic media?..

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THE SECOND ROUND OF A DELPHI RESEARCH

Introduction

Your responses will help the researcher to be able to create a more suitable e-book for teaching and learning in the colleges of education in Ghana. Do not feel limited in your style of response

1) Please make suggestions (s) about the Size of the text included in the e-book, legible enough to be read?...

2) Please make suggestions about the Sizes of the pictures included in the e-book, clearer to see?..

3) How do you find the use of e-books with a student? Any recommendation on the usage of e-books?...

4) What is your view on the content created in the E-book? Any recommendation on the content created?...

5) Kindly state any suggestions for better adjustment?..

Hello:

This is the last round of the Delphi research.

Your participation in this study is completely voluntary. There are no foreseeable risks associated with this study. The researcher needs to learn from your opinions on the use of electronic media.

Your responses will be strictly confidential and data from this research will be reported only in the aggregate. Your information will be coded and will remain confidential. If you have questions at any time about the survey or the procedures, you may contact the researcher on [+233205853256]

Thank you for your time and support throughout this research.

1) How satisfied are you with the use of E-book?

   Very satisfied

   Satisfied

   Neutral

   Somewhat dissatisfied

   Very dissatisfied

2) How do you find the size of the text in the e-book?

   Very legible

   Legible

   Fairly legible

   Not legible

3) How does the colour of the text blend with the background?

   Very well

   Well

   Somewhat well

   Not well

4) Are the pictures on the e-book quality enough to be seen?

High quality

Normal quality

Fairly quality

Not quality enough

5) The size of pictures in the e-book is bigger enough to be seen.

Strongly Agree

Agree

Disagree

Strongly Disagree

6) How do you rate the background image quality of the e-book?

1   2   3   4   5

Please rate the following attributes of the E-book

Above average   Average   Below average   Well below average

7) Ease of navigation

8) Accuracy of information

9) Quality of content

10) Layout/design

11) Meeting needs of students

12) How likely are you going to use e-books for teaching and learning in the future?

Very likely

Somewhat likely

Neutral

Somewhat unlikely

Very unlikely

13) How relevant is the content in the e-book to you as a tutor or administrator in the college of education?

Very relevant

Relevant

somehow relevant

Not relevant

14) How likely are you to use this e-book as your primary source for information to create the content in the e-book?

    Very likely

    Likely

    Neutral

    Unlikely

    Very unlikely

15) How likely are you to recommend to colleague tutors the content in the e-book?

    Very likely

    Likely

    Neutral

    Unlikely

    Very unlikely

16) How likely are you to recommend e-books to colleague tutors in future?

    Very likely

    Likely

    Neutral

    Unlikely

    Very unlikely

17) How likely are you to recommend e-books to your students for teaching and learning purposes?

    Very likely

    Likely

    Neutral

    Unlikely

    Very unlikely
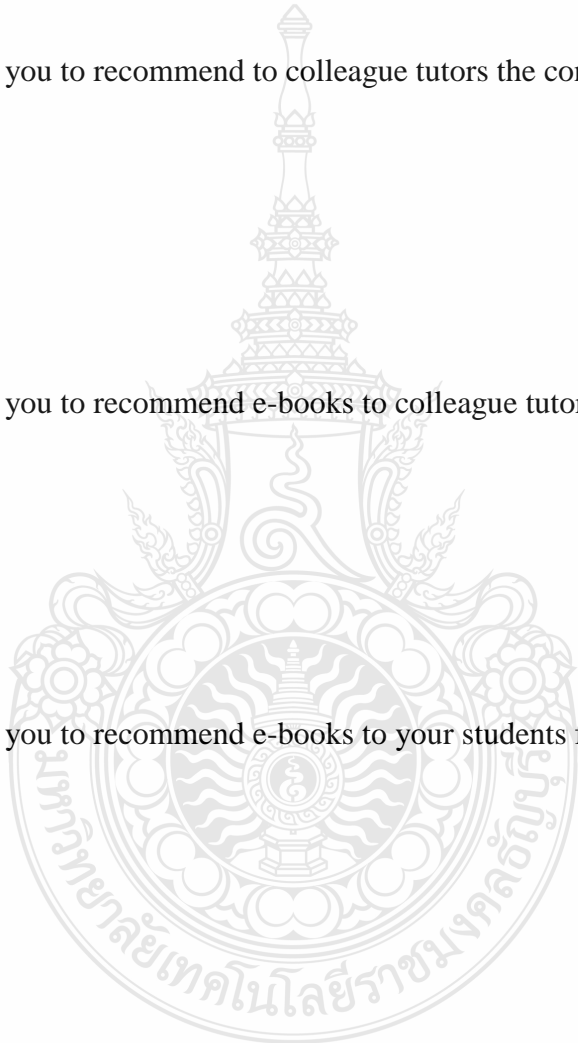
18) Based on this e-book, how comfortable are you to use it for educational purposes?

Very comfortable

Comfortable

Neutral

Uncomfortable

Very uncomfortable

19) How do you compare the e-book to other electronic media for teaching and learning?

Well Below Average

Below Average

Average

Above Average

Well Above Average

20) I will recommend the use of e-books for teaching and learning in the colleges of education in Ghana.
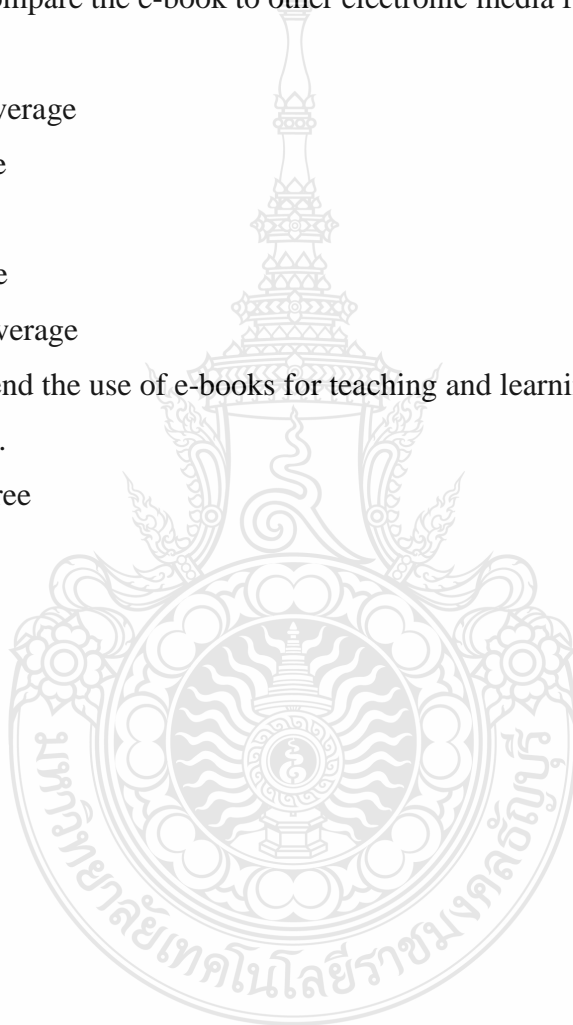
Strongly disagree

Disagree

Neutral

Agree

Strongly agree

APPENDIX B

PICTURES AND THE LINK OF THE E-BOOK

https://my.vsme.co/view/1j9jkodp-how-to-create-and-online-media-forteaching-and-learning-e-book

Creating online media for the teaching and learning in the colleges of education in Ghana

1st Edition

FRANK OFORI

MASTER OF EDUCATION (EDUCATIONAL TECHNOLOGY AND COMMUNICATION

RAJAMAGALA UNIVERSITY OF SCIENCE AND TECHNOLOGY

1

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Introduction

This document provides an inclusive most online for teaching and learning in this 21st century. contained in this work is systematic approach of creating online media for teaching and which includes, google classroom

- What do you know?
- Creating online media
- Importance of online media
- Contact

Google classroom

WHAT IS GOOGLE CLASSROOM?

Google Classroom is a free blended learning platform developed by Google for schools that aims to simplify creating, creating, distributing and grading assignments. The primary purpose of Google Classroom is to streamline the process of sharing files between teachers and students.

Within the Student section, you can also determine if your students are allowed to comment on the questions, announcements, and assignments you create or if they can only post. If you desire you can also choose to be the only one who can post and comment in your class.
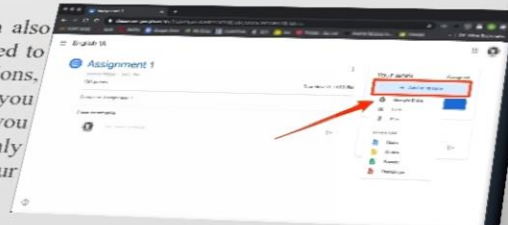
STREAM SECTION

In the Stream section you will find the assignments, announcements, and questions that you create. This is the section in which you'll spend most of the time after your classes are set up. When you create an assignment you can provide specific instructions for that assignment, a due date, and a topic. If you include a due date for the assignment, students will have until 11:59 PM on the date to submit their work for that assignment.

5

95
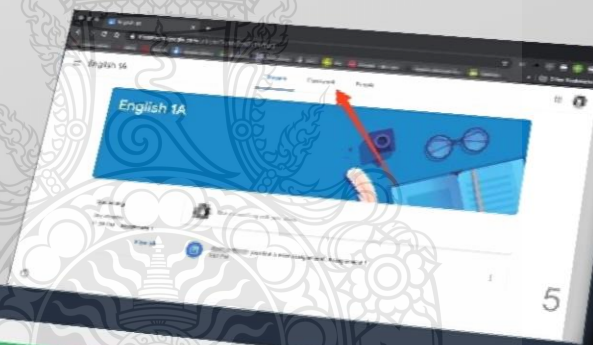
Why Google classroom.....?

Google Sheets

Google Documents

It integrates Google Documents, Google Sheets, Google Slides, Gmail and Google Calendar into a cohesive platform to manage student and teacher communication. Google Classroom allows you to create a unique class for every class that you teach. In just a few mouse clicks and a few keystrokes you can create a class. Google Classrooms are divided into different sections. The Stream (which is what comes up whenever you log into your classroom and contains a high-level overview of what's coming up), Classwork (where you'll find assignments, quizzes, and discussion questions), and People (which is a list of all students currently. In the Students section you can view all the students in your class. You can either add students to your class manually, or they can join your class on their own using their own Google account. When you create a class, Google Classroom provides you with a class code located on the left side of the screen. Share that class code with the students you want to join that class. From their computers, laptops, or Chromebooks, students log into their Google accounts and use the class code to join.
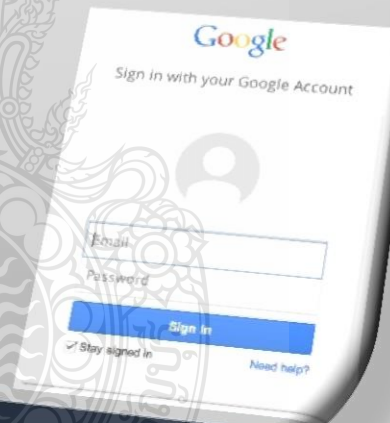
6

Procedure to create google classroom

STEP 1

Open a Web browser on your smart device connected to the internet

STEP 2

You have to sign in with your Google account
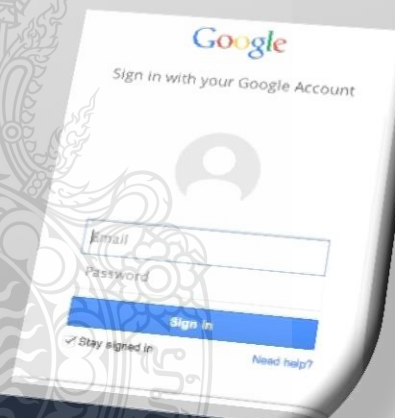
Procedure to create google classroom

STEP 1

Open a Web browser on your smart device connected to the internet

STEP 2

You have to sign in with your Google account

Google

Sign in with your Google Account

STEP 5
CLICK ON CREATE

Create class

Class name (required)
MCA

Section
B

Subject
Mathematics

Room

Cancel   Create

Biography

Name - Surname	Mr. Frank Ofori
Date of Birth	August 3, 1989
Address	number / street/ city/ country / code …+233……
Education	Bachelor's Degree in Education Institution
	University of Cape Coast, country-Ghana.
	Master of Education (M.Ed.) in the major of
	Educational Technology and Communications
	Rajamangala University of Technology Thanyaburi
Experiences Work	Teaching staff GES (Subject teacher Zebilla Senior
	High/Technical) (2020 to present)
	History and Ghanaian language (Twi) Teacher,
	GAG Blessed Home School (2019-2020)
	Guidance and counselling coordinator GAG Blessed
	Home School (2019-2020)
	Teaching assistant University of Cape Coast, Central
	Region (2018-2019)
	Subject Teacher, Berekum Presbyterian Senior High
	School Berekum, Brong Ahafo Region (2017-2018)
	Assistant Welfare Chairperson Kwame Nkrumah Hall
	University of Cape Coast, Cape Coast, Central
	(2015-2016)
	Assistant School Administrator, Emmanuel Methodist
	Preparatory school Berekum, Brong-Ahafo Region
	(2012-2014)
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Messenger	ofori frank