UNIVERSITY OF EDUCATION, WINNEBA

THE ACADEMIC IMPACT AND STUDENTS' PERCEPTION OF A FLIPPED CLASSROOM

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**A dissertation in the Department of Information Technology Education,
Faculty of Technical Education, submitted to the School of
Graduate Studies in partial fulfilment
of the requirements for the award of the degree of
Master of Science
(Information Technology Education)
in the University of Education, Winneba**

MAY, 2020

DECLARATION

STUDENT'S DECLARATION

I, Osborn Opoku Safo Kantanka, declare that this dissertation, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE: …………………………….

DATE: …………………………………….

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of dissertation as laid down by the University of Education, Winneba.

Dr. Samuel Adu Gyamfi.

SIGNATURE: …………………………….

DATE: ………………………………….

DEDICATION

This study is firstly dedicated to the Almighty God for granting me good health. Also to my mother, Mrs. Veronica Achiaa Boateng, my sister, Mrs. Ahyiaa Adu-Oppong, and heartedly to my father and Pastor, Obed Obeng-Addae, *Dr.Apol, PhD*, for their strong backings.

ACKNOWLEDGEMENT

Success in any field of endeavor usually depends on the contributions of others. It is only fitting that such contributions and support are recognized and duly acknowledged.

I am grateful to my supervisor, Dr. Samuel Adu Gyamfi, Dean of faculty of education and communication studies and former head of I.T.E Department for his unparalleled guidance to me as I prepared this report. He would always be remembered for his objective critiques and his unique way of offering assistance to me which helped me to minimize the challenges I encountered in the cause of producing this dissertation.

The financial support of my mother, Mrs. Veronica Achiaa Boateng and my elder sister and mentor, Mrs. Ahyiaa Adu-Oppong, was very helpful in seeing me through this work and I express many thanks to them.

My father in the Lord, Pastor Obed Obeng-Addae, *Dr.Apol, PhD* for his spiritual encouragement and prayers in backing me to make this work a success.

Friends and family with me through thick and thin as I carried out this work include Reggie Emmanuel, Afanu Emmanuel, Owusuwaa Asenath, Betty Opoku Safo Kantanka and my group members. I appreciate their encouragement and counsel in making this work a success. To the various authors, whose work provided immeasurable basis for this study, I express my deep appreciation.

I acknowledge the efforts of all who contributed in diverse ways to make this work a success.

God bless y'all.

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GLOSSARY

ICT – Information and Communication Technology

FC – Flipped Classroom

BECE – Basic Education Certificate Examination

WASSCE – West African Secondary School Certificate Examination

CG – Control Group

EG – Experimental Group

VCR – Video Cassette Recorder

STEM – Science, Technology Engineering and Mathematics

TL – Traditional Learning

AS – Average Score

ABSTRACT

The use of learning technologies, especially multimedia provides varied facilities for students' learning that are not possible with other media. Pedagogical literature has proved that individuals have different learning styles. Flipped classroom is a pedagogical approach which means that activities that have traditionally taken place inside the classroom take place outside the classroom and vice versa. The flipped classroom environment ensures that students become more active participants as compared with in the traditional classroom. The purpose of this paper is to fulfil the needs regarding the review of recent literature on the use of the flipped classroom approach in education. The contribution of the flipped classroom to education is discussed in relation to the changes in students' and instructors' role. Subsequently, flipped classroom applications in various disciplines of education are illustrated. The recommendations made in the literature for design specifications that integrate flipped classrooms with technology are discussed. The paper concludes that a careful consideration of the warnings and recommendations made in the literature can help to produce effective flipped classroom environments and also this paper attempts to inform those who are thinking of using new technologies and approaches to deliver courses.

CHAPTER ONE

INTRODUCTION

The most beneficial goal in education, is improving quality of teaching and with such, there are several modern ways of teaching methods that can be used to improve teaching and learning. These methods are focused on students' active work and how students can improve their learning strategies. (Roehl, Shweta, & Gayla, 2013). What then is a Flipped Classroom? A Flipped Classroom, as define by TeachThoughtStaff (2020), is a type of blended learning where students are introduced to the content at home and practice working through it at school. This method uses more of a learner-centered model strategy including discussions, working in groups and individual problem based learning. It helps students to read and solve problems in ways that will help sharpen their skills and creates meaningful learning opportunities. (Marie, 2015)

In a Flipped Classroom, lessons take different forms; often in video lessons. It has been shown that, the ideal time length for video lessons should be eight (8) to twelve (12) minutes long. (Abeysekera & Dawson, 2014). Teacher's interactions with their students in a flipped classroom can be more personalized and less lecturing and the students involved in knowledge acquisition can evaluate their learning. Therefore, the need to look at the use of a flipped classroom and the impact that it will bring.

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1.1 Background to the Study and General Concept

In this our present day of technological world, technology puts immediate attention to information and that, internet can be accessed easily through technological tools such as smart phones and personal computers. Today, most students use much of their time using technological tools, especially their smart phones (Ethan, 2018). By using a flipped classroom technology, it becomes highly possible to interact with teachers and learning contents, everywhere on the internet and also. Richter & McPherson (2012), asserts that, every student in today's digital age can access many free internet learning resources such as online video lectures, and can watch free contents everywhere and at their convenience.

Also, works by Staker & Horn (2012) stipulates that, traditional classroom activities such as teaching, labs, home works and examination can be moved to Web technology and students can study outside of the classroom.

1.2 Statement of the Problem

The best reason for every student to be in school is to excel in academics and to excel, there must be the need for quality education where more materials are needed to be taught. In view of this, there is less time for student interactions with instructors and amongst themselves. (Spilka, 2015) One of the problems noticed about teaching in a relatively rural school is that, many of the students are not able to catch up with the usual routine of studies in our present day teaching and learning in most African schools. (Roux, 2017). The Ghanaian student spend inordinate amount of time on buses traveling to school of which they may miss first or two lessons taught in the day. Thus,

student's struggles to catch up with subsequent lessons. In order for the student to be well prepared for external examination such Basic Education Certificate Examination (BECE) and the almighty West African Senior School Certificate Examination (WASSCE), it is important for them to be always present to use the instructional hours more effectively. (Cecilia, Akwasi, & Dickson, 2017). Uzunboylu & Karagozlu (2015), found flipped classroom as a pedagogical approach which ensures that students become more active participants compared to a traditional classroom.

1.3 Purpose and Objectives of the Study

The purpose of this study is to examine the impact a flipped classroom can have on students. It is expected by many that a flipped classroom will increase student academic achievement in schools. Supposing the flipped classroom method proves to be successful, schools and teachers will have an alternative method of teaching.

One justification of this work will be to investigate whether or not a flipped classroom improves retention of knowledge and improve greater student achievement. According to Zupon (2017), students who are actively engaged in higher-order thinking task, are most likely to take charge of their own learning.

The following are the objectives:

1.   To discover the impact of applying a flipped classroom to students learning.

2.   To discover students interest in using a flipped classroom.

3.   To discover the challenges of applying a flipped classroom approach to studying
          in the classroom.

1.4 Research Questions

The research questions are as follows:

1.   What are the impacts of applying flipped classroom to students learning?

2.   What is the interest of students in learning with a flipped classroom?

3.   What are the challenges of applying a flipped classroom approach

1.5 Significance of the Study

In this study, teachers will be given the opportunity to monitor students' performance and also help them improve their performance using a flipped classroom.

Moreover, it would help teachers adopt strategies in teaching and learning using a flipped classroom.

Similarly, suggestions from this study will remind teachers to identify the role of an interactive instructor in teaching and learning using a flipped classroom; this will make students eschew the idea that ICT is too technical and difficult to learn, and as such it would be a last option subject or program of study.

In addition, the study will also help reveal the needed benefits to students to help them make a choice of study in subsequent educational levels.

Last but not least, this study will enable students become computer literates by the frequent use of ICT tool in experiencing a flipped classroom.

1.6 Delimitations of the Study

This study was narrowed down in scope due to financial and time constraints. Therefore, the study is delimited to Palmar International School, Patasi. Which will mean that, for more complete evaluation of the findings of this research, all schools including educational centers in the country should be considered.

The audiences who will potentially find the study of interest are as follows:

1.   Students

2.   Teachers/Instructors

1.7 Organization of Study

This particular study is divided into five chapters:

Chapter one is the introduction. The introduction forms the beginning of the main body of the dissertation. Accordingly, the chapter contains the Background and General Concept, Statement of the Problem, Purpose and Objectives, Research Questions, Significance of the Study, and Delimitations of the Study.

Chapter two is the Literature Review. It shows aspects of literature others have done on the flipped classroom study.

Chapter three is the Methodology. It shows how clearly outlined my research design is done including other research methods. It also explains the instructions used in the data collection, data collection procedure and analysis

Chapter four is the Findings of the research. The outcome of this research is presented and explained in this chapter. The findings is made in prose and references made in tables and figures.

Chapter five is the Summary of findings, Conclusion and Recommendations. This chapter itemizes the major research findings, and indicate how the research work has contributed to knowledge.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, a review of related literature pertinent to the problem statement is presented. In other words, the theoretical framework of the study is presented here. Also, benefits and issues related to flipped classroom, with respect to points raised in the literature are presented in this chapter. Overview, related works, students' perception and achievement on a flipped classroom has also been presented in this chapter of the study. There's also a discussion on the research method that has been applied to the topic in relation to the reviewed literature.

This chapter is very much important to this study because it describes how the proposed research is related to prior researches and also show originality and relevance of the research problem.

2.2 Overview of Flipped Classroom

The inverse of a traditional classroom, where students are given materials before class and uses the in-class time/period to deepen their understanding through interactive exercises. They learn materials more deeply and how to apply their knowledge to real problems. (White, 2015)

Cynthia J. Brame (2013) stated in a journal that, there are four key elements of a successful flipped classroom. And they are;

- Students gain exposure before class lessons.

- An incentive for students to prepare for class.

- A mechanism to access student's comprehension.

- In-class activities that focus on higher cognitive behaviors.

Flip learning has been to work and measurably enhancing learning outcomes. Proving an incentive for students to do work before class and using feedback to make iterations will result in a more engaging classroom. (Kelly, 2017)

2.3 Flipped Classroom and Student's Perceptions

The Flipped Classroom is an instructional strategy that can provide educators with a way of minimizing the amount of direct-instruction in their teaching practice while maximizing one-to-one interaction. This strategy leverages technology providing additional supporting instructional material for students that can be accessed online. This frees up classroom time that had previously been used for lecturing. Students in three high school math classrooms where instruction was "flipped " were surveyed to examine their perceptions of the Flipped Classroom and to assess the role social media, educational technology, mastery learning, and self-pacing played in Flipped Classroom environments. The survey also addressed how the Flipped Classroom could support student learning and what could be done to improve Flipped Classroom implementations. The survey utilized both qualitative and quantitative research measures which provided a broader understanding of how students responded as a group and as individuals. The results revealed three major findings: students are doing less homework in a Flipped Classroom than in a traditional lecture-based classroom, students enjoyed learning in a Flipped Classroom environment, and students benefited from watching their lectures in condensed lesson videos. This research has implications

for instructional delivery in 21st century classrooms. The findings of this study illustrate that technology can provide a self-paced instructional setting that can effectively support mastery learning for students. (Graham , 2013).

2.4 Flipped Classroom and Student's Achievement

Student academics aims on twofold achievements. First, it aims to investigate the impact of the Flipped Classroom (FC) Model on students' academics. And second, it reveals the students' opinions about the model itself. They are put in two groups, the experimental group and the control group. (Chen, et al., 2014).

The students in the experimental group were taught in a blended learning context where the FC Model was applied, while the lessons in the control group were carried out through traditional blended learning.

The results showed that there was a significant difference between the two groups. The students in the Experimental Group scored higher marks than the students in the Control Group. Coming to classes prepared and completing the assignments in class, so that students did not need to do assignments at home, were among the positive aspects of the FC Model. (Cabi & Emine, 2018)

2.5 Benefits of the Flipped Classroom

Through the flipped classroom model, students prepare the contents individually at home with the resources previously provided by the teacher and employ the time in the classroom to consolidate knowledge, put it into practice and solve doubts. In this way, students and teachers use the time in the classroom more intelligently and they carry out group work.

But whoever entered a classroom knows that students are anything but passive. Their natural curiosity makes them actively seek new knowledge, and when they're passionate about a subject they try to learn all there is to be learned about it. And this is what the flipped classroom model supports: (Mihai, 2016)

1. When students watch or listen to lectures at home, and then solve problems and apply the new knowledge in the classroom, they get less frustration with their homework.

2. When they don't understand a new concept, they can ask questions and get immediate targeted answers.

3. The time spent in the classroom becomes not enough for all the conversations and collaboration that inevitably spur from exploring subjects in a deeper manner.

4. Last but not least, students who are absent due to illness, too long a commute, or any other reason, can catch up with their peers faster and easier with the flipped classroom model than with the standard one.

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2.6 Issues Related to Flipped Classroom

In "The Flipped Classroom: Assessing an Innovative Teaching Model for Effective and Engaging Library Instruction," Arnold-Garza points out some additional challenges to the flipped environment as well, including: (Chung & Khe, 2017)

1. Coordination with faculty member is necessary in order to assign pre-work to a class

2. Librarians or those producing videos will have to learn new technology

3. The self-paced nature of flipped classrooms, especially the component carried out outside of the traditional classroom, also poses a potential disadvantage for students who cannot work that way.

4. There is also a chance that not all students might have equal access to technological resources.

2.7 Related Works in the Article Reviewed

In all the articles read, most of them create the following as similarities;

1. Rather than learning in a traditional classroom setting, flipped classroom uses a more application-based approach for students, i.e hands-on and problem-solving activities.

2. The accessibility of flipped classroom is extremely convenient especially for students that would face difficulties in traveling to the physical classroom. Such students would still have the foundational information of the course at hand via online.

3. Communication is greatly emphasized in a flipped classroom setting essentially referring to student-student and student-teacher interactions.

4. Flipped classroom utilizes a student-centered teaching modeled in order to ensure that the course is primarily aimed at contributing to the student's overall success in obtaining a proper, effective education.

2.8 Theoretical Framework

In 2010, Alison King published "From Sage on the Stage to Guide on the Side" in which she focused on the importance of the use of class time for the construction of meaning rather than information transmission. While not directly illustrating the concept of "Flipping" a classroom, King's work is often cited as an impetus for an inversion to allow for the educational space for active learning. (King, 2010)

Harvard professor, Eric Mazur played significant role in the development of concepts influencing flipped teaching through the development of an instructional strategy he called peer instruction; a user's manual. He also found out that his approach, which moved information transfer out of the classroom and information assimilation into the classroom allowed him to coach students in their learning instead of lecture. (Mazur, 2010)

Lage, Platt and Treglia published a paper entitled "Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment" (2000), which discusses their research on flipped classrooms at the college level. In their research, focusing on two college

economic courses, Lage, Platt and Trgelia asserts that, one can leverage the class time that becomes available from the inversion of the classroom (moving information presented via lecture out of the classroom to media such as computer or VCRs) to meet the needs of students with a wide variety of learning styles. The University of Wisconsin-Madison deployed software to replace lectures in large lecture-based computer courses with streaming video of the lecture and coordinated slides.

In the late 90's, J. Wesley Baker was experimenting with these same ideas at Cedarville University. He presented a paper discussing what he termed the "classroom flip" at am education conference in the year 200 where maybe the first publication mentioned of the word "Flip" associated with this model of teaching and learning. (Baker, 2000).

Kaw and Hess published a paper to compare the effectiveness of four (4) instructional modalities for a single topic of a STEM course; (i) Traditional Lecture (ii) Blended (Web-enhanced lecture) (iii) Web-based self-study and (iv) Flipped Classroom. Statistical analysis of the assessment data indicated that, the second modality in which web-based modules for instruction were used during face-to-face lecture delivery mode, resulted in higher levels of student performance and satisfaction. (Kaw & Hess, 2007).

Perhaps the most recognizable contributor to the flipped classroom study may be Salma Khan. In (2016), Khan began recording videos at the request of a younger cousin he was tutoring because she felt that recorded lessons would let her skip segments she had mastered and replay parts that were troubling her. For some, Khan Academy has

become synonymous with the flipped classroom. However, these videos are only one form of the flipped classroom strategy.

The Wisconsin Collaborator for enhanced Learning has built two centers to focus on flipped and blended learning. The classroom structure houses technology and collaboration-friendly learning spaces and emphasis for those involved in the program is placed on individual learning through non-traditional teaching strategies such as flipped classroom.

Johnathan Bergmann, one of the originators of flipped learning, discusses when the invested learning model is applied in a more advanced way. Educators begin by organizing content around specific goals. Students work on courses content at their own pace and upon reaching the end of each unit, they must show mastery of learning objectives before moving on the next topic and so on. Students can show evidence of their learning through videos, worksheets, experimental stories, program, and projects amongst others. (Bergmann & Sams, 2012).

Gradually, flipped classroom can become one of the emerging technologies in education and it can be a standard of teaching and learning practice to foster students' active learning in higher education (Hamdan, McKnight, & Arfstorm, 2013).

A flipped classroom is an approach in teaching and learning activities where students watch a lesson videos outside of the class through distance learning and have hands-on activities in the class. Halili & Zainuddin (2015) states that, the flipped classroom or revers classroom is an element of blended learning, integrating both face-to-face

learning in the classroom through group distance learning outside the classroom by watching asynchronous video lessons and online collaboration. Blended learning is simply defined as the activity of teaching and learning which combined face-to-face activities with online learning (Heilesen, Lean, Newbery, & Poon, 2014). Blended learning was practiced by mixed face-to-face and distance teaching and learning or the integration of both modalities to deliver instruction.

A flipped classroom is also known as a "Student-Centered" approach to learning where the students are more active than the instructor in the classroom activity. In this case, the instructor acts as a facilitator to motivate, and give feedback on students' performance (Sams & Bergmann, 2012). Therefore, by applying the flipped classroom approach to teaching and learning activities, the instructor can move the traditional lecture talk to video and their own pace. This type of activity also increases students will not to spend so much time listening to long lectures in the classroom but rather have more time to solve problems individually or collaboratively through distance learning with peers.

Applying flipped classroom approach also contributes to better understanding of technology use in teaching and learning activities. Students will use various technologies in learning activities independently, while the lecturers also use various technologies in their teaching practices (Zainuddin & Attaran, 2015).

2.8.1 Agreements with Points Raised

With the issue of Blended Learning in flipping a classroom is very key and important. Blended learning is simply defined as the activity of teaching and learning which combines face-to-face activities with online learning which becomes the best and most effective modality to deliver and instruction which also results in higher level of students' performance and satisfaction.

Also the publication of Kaw and Hess to compare the effectiveness of some four (4) instructional modalities namely; Traditional Lecture Blended Web-based self-study and Flipped Classroom statistically analyzes the assessments data indicates in which Web based modules for instruction will be used during face-to-face delivery mode that will result in higher levels of student's performance and satisfaction.

2.8.2 Disagreements with Points Raised

The issue of flipped classroom been student-centered approach is a big disagreement to me. Student-centered approach is where the students are more active than the instructor in the classroom activities. In this case, the instructor only acts as a facilitator to motivate the students in their studies.

Students are mostly vulnerable when it comes to the use of technology so therefore with a very little push from the instructor will not aim at higher performance in their academia because they will be else from what you instruct them to do. Some students may struggle due to their developing personal responsibilities.

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In a self-directed home learning environment, students who are not well equipped with the tools and technology involved in a flipped classroom may fall rapidly behind their peers.

Teachers may find challenges with this model. Increase preparation time is initially likely needed as creating high quantity videos requires teachers to contribute significant time and effort outside for teaching for teaching responsibilities. Additionally, funding may also be required to procure training for teachers navigate computer technologies involved in the successful implementation of the inverted model.

2.9 Concepts and Theories Applied to the Review

The flipped classroom study was based on the theory of Blooms revised taxonomy of cognitive domain. The theory provides six (6) levels of learning which its explanation is arranged from the least/lowest level to the highest level.

1. **Remembering:** In this stage, the learners tries to recognize and recall the information given them. They also will try to understand the basic concepts and principles of the content they have learnt.

2. **Understanding:** Here, the students tries to demonstrate their understanding by interpreting the information and summarizing what they have learnt.

3. **Applying:** The students practices what they have learnt or they apply knowledge to the actual situation.

4. **Analyzing:** The students' uses their own critical thinking in solving the problem then debate with their peers, compare their answers with peers and

then produce a summary. The students obtain new knowledge and ideas as they do so after implementing critical thinking or debate in group activities.

5.   **Evaluating:** In this level of learning theory, we look at assessment or established peer-review knowledge, judge in relational terms. In this stage of learning, the students evaluate the whole learning concepts and they could evaluate or make judgment on how far they successfully learnt.

6.   **Creating:** The students are able to design, construct and produce something new from what they have learn. (Bloom, 1969)

In implementing flipped classroom. Remembering and understanding as the lowest or least level of cognitive domain are practiced outside of the class hours (Krathwohl & Anderson, 2010). While in the classroom, the learners focused on higher forms of cognitive work, including applying, analyzing, evaluating and creating. The following figure 1 illustrates the level of students learning in a flipped classroom according to Bloom's Revised Taxonomy.
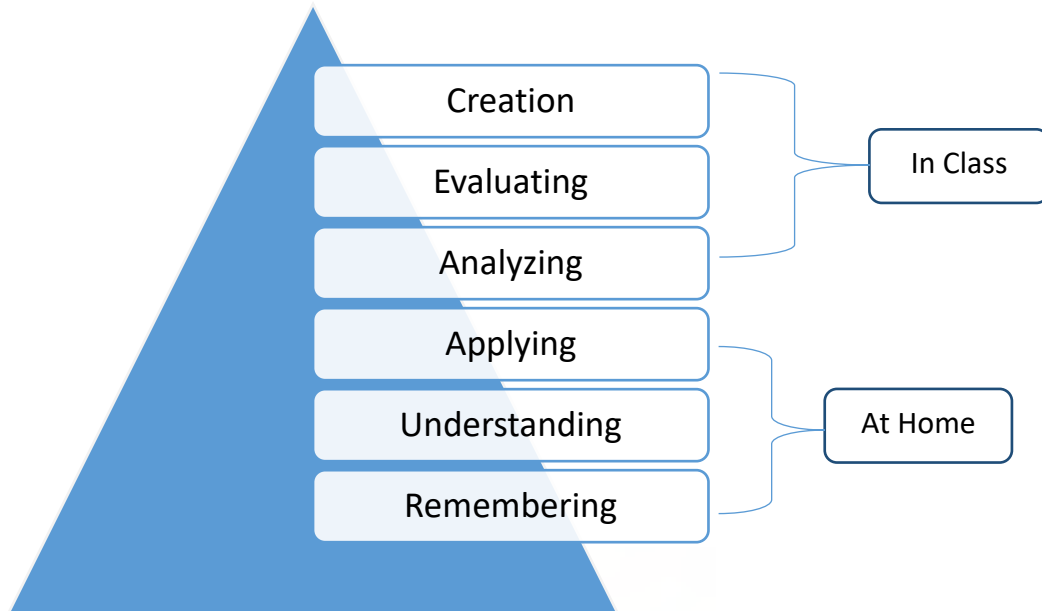
Figure 1. Bloom's revised taxonomy in the flipped classroom

With the flipped model, the lower levels are presented before class through recorded lectures and video. Readings, simulations, and other materials also provide this foundational support for learning so that in-class time can be spent working on higher levels of learning from application to evaluation. In flipped classrooms, students go from the lowest level (remembering) to achieve the highest level (creating). It is mentioned that the flipped classroom focuses on how to support the learners in achieving a higher level of the taxonomy domain (Lankford, 2013). Additionally, Nederveld and Berge (2015) added that in flipped learning, classroom activity is spent on application and higher-level of learning rather than listening to lectures and other lower-level thinking tasks.

In the Table below, implementing flipped learning allows the students to spend more time supporting higher-level learning tasks such as a group discussion, while lower-level tasks such as knowledge and comprehension are completed independently outside the class. The taxonomy compares the traditional classroom and the flipped classroom as shown in table 1 below.

Table 1: Implementing Flipped Learning.

Level of learning	Traditional classroom tools	Flipped classroom tools
Remembering	Face-to-face lecture	Pre-recorded lecture, reading material, and watching video lectures independently
Understanding	Question and Answer	Reflection, peer-to-peer discussion and collaboration
Analyzing	Homework	Classroom activities such as a group discussion
Applying, Evaluating, Creating	Homework or nothing	Student projects, presentations, peer-evaluation and instructor-evaluation.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the process of developing the research methods needed to complete the experimentation portion of this study. The chapter will discuss in details, the various stages of developing the methodology of this study. This includes a detailed discussion of the philosophical background of this research method chosen. In addition to this, the chapter closes with a discussion on the analysis tool that will be used to analyze the data collected. This study will be based on Saunders Research Onion.

Saunders et.al (2009) refer to the research process as onion. The research onion provides an effective progression through which a research methodology can be designed. Its usefulness lies in its adaptability for almost any type of research methodology and can be used in a variety of contexts (Bryman, Oxford, 2012). This essay will examine and describe the different stages of the research onion, and explain the concepts at each stage.

3.2 Research Process

The research onion was developed by Saunders et al. (2009) in order to describe the stages through which the researcher must pass when formulating an effective methodology. First, the research philosophy requires definition. This creates the starting point for the appropriate research approach, which is adopted in the second step. In the third step, the research strategy is adopted, and the fourth layer identifies the time

horizon. The fifth step represents the stage at which the data collection methodology is identified. The benefits of the research onion are thus that it creates a series of stages under which the different methods of data collection can be understood, and illustrates the steps by which a methodological study can be described.

3.3 Design of the Study

Hong & Espelag, (2012) while studying the differences between qualitative and quantitative mixed method research, state the two stages owes their varieties in the types of data. Quantitative data is been obtained through surveys whiles qualitative data are generally collected through interviews, focus groups and observations. This research design involves both a survey and an open-ended interview course delivery effectiveness amongst pupils at Palmar International School, as they are classified into two groups to access and identify learning outcomes.

The first group is called the experimental Group (EG) who are taught with the use of a flipped classroom (FC) Model and the second group is called the Control Group (CG) who are taught in a Traditional Learning (TL) Environment. This is shown in table 2 below.

Table 2: Achievement Test

Group	Pre-Test	Treatment	Post-Test
Experimental	Achievement Test	FC	Achievement Test-Focus-group interview
Control	Achievement Test	TL	Achievement Test-Focus-group interview

Note: FC = Flipped Classroom and TL = Traditional Learning.

In both groups, the subject was carried out in a blended learning environment where one hour of the lesson was done face-to-face and three hours was carried out online for one week. The students' academic achievements were measured by administering a test before and after the treatment.

This design is suggested by Saunders et al. (2009), in the research onion (Fig. 2) concept which occurs in layers.
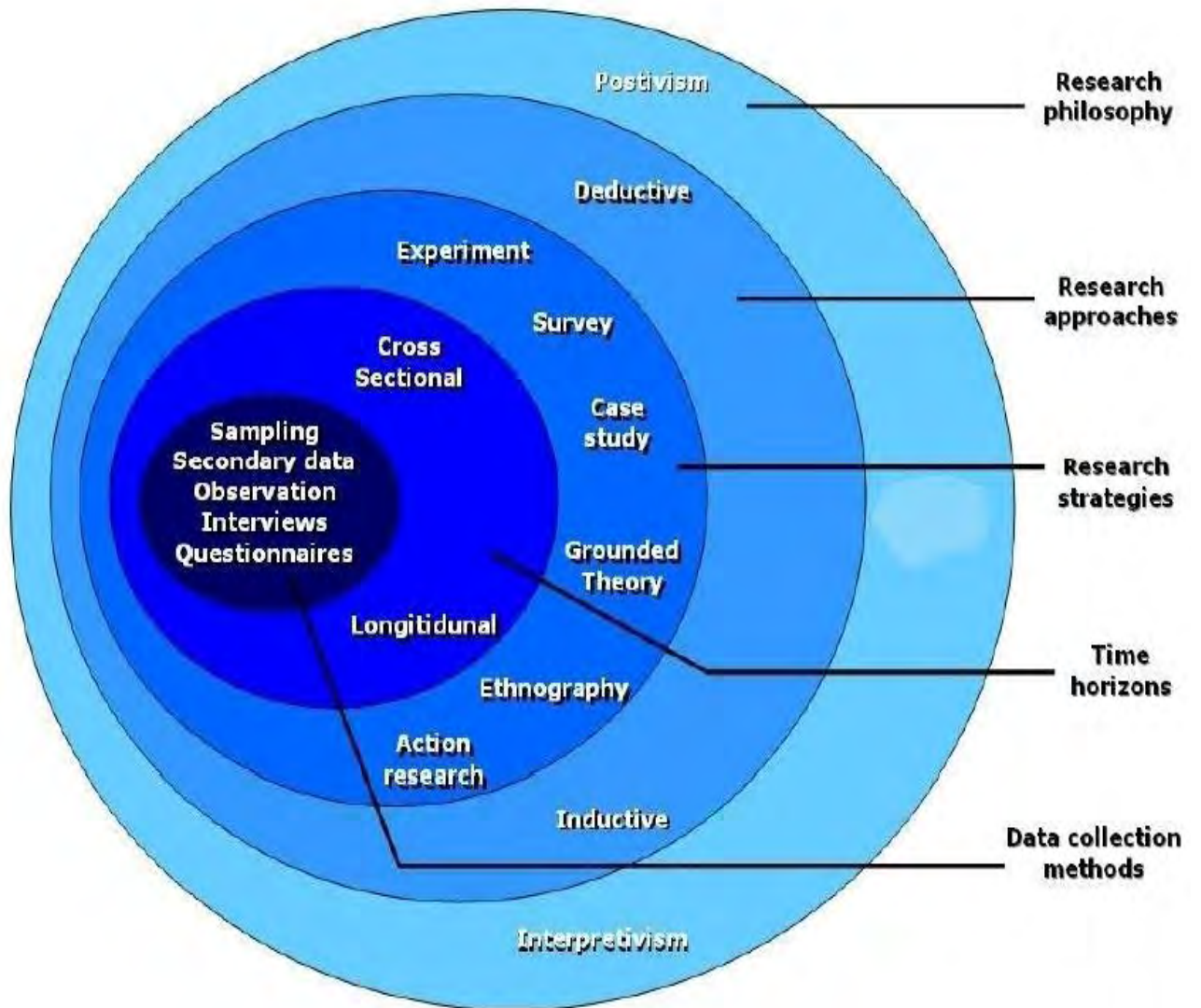
Figure 2: The Research Onion. Source: (Saunders, et al., 2009)

3.3.1 Research Approach

There are two types of the research approach namely: deductive approach and inductive approach. In this study, I used inductive approach to collect data.

The inductive approach is characterized as a move from the specific to the general (Bryman & Bell, 2011). In this approach, the observations are the starting point for the researcher, and patterns are looked for in the data (Beiske, 2010). In this approach, there is no framework that initially informs the data collection and the research focus can thus be formed after the data has been collected (Flick, 2011). Although this may be seen as the point at which new theories are generated, it is also true that as the data is analyzed that it may be found to fit into an existing theory (Bryman & Bell, 2011).

3.3.1.1 Participants of the Study

The participants of this study considered 46 Junior High School students of Palmar International School, to study Information and Communication Technology (ICT) for the treatment. Before the treatment, all the participants received training for basic computer skills to avoid possible problems in effective use of the computers throughout the experimental process. The students were also randomly assigned to both groups.

With the 46 students, 22 are in the experiments Group (13 female, 9 male students) and 24 in the Control Group (14 female, 10 male students). This is shown in table 3 below.

Table 3: The Information about the Participants of the Study

Information And Communication Technology (ICT)		
Treatment	**No. of Participants**	**Percentage (%)**
Experimental Group (Flipped Classroom)	24	53
Control Group (Traditional Learning)	22	47
Total	46	100

3.3.2 Research Strategy

The research strategy is how the researcher intends to carry out the work (Saunders, et al., 2009). The strategy can include a number of different approaches, such as experiment, case study, interviews, surveys, or questionnaires. In this study, interview and survey were adopted for data collection. The survey strategy is used to answer who, where, what, how much and how many questions. On the other hand, the interview strategy is a qualitative methodology that draws on an inductive approach whereby patterns are derived from the data collected (May, 2011). For example, interview data may be transcribed, coded and then grouped accordingly to the common factors exhibited between respondents. This means that the results of the research are derived fundamentally from the research that has been completed (Flick, 2011).

3.3.3 Choice of Method

The choice of method outlined in the research onion include the mono method, the mixed method, and the multi-method (Saunders, et al., 2009). As the names of these approaches suggest, the mono-method involves using one research approach for the study. The mixed-methods required the use of two or more methods of research, and usually refer to the use of both a qualitative and a quantitative methodology. In the multi-method, a wider selection of methods is used (Bryman, Oxford, 2012).

In this study, the mixed-method is applied, where qualitative and quantitative data procedure is used to answer research questions.

3.4 Research Philosophy

A research philosophy refers to the set of beliefs concerning the nature of the reality being investigated (Bryman, Oxford, 2012). It is the underlying definition of the nature of knowledge. The assumptions created by a research philosophy provide the justification for how the research will be undertaken (Flick, 2011).

My philosophy in this study as stated earlier is based on both ontological framework namely Constructionism which involves open-ended interview and Positivism which involves a survey, as a primary data collection method.

3.3.5 Time Horizons

The Time Horizon is the time framework within which the project is intended for completion (Saunders, et al., 2009). Two types of time horizons are specified within the research onion: the cross sectional and the longitudinal (Bryman, 2012). The cross sectional time horizon is one already established, whereby the data must be collected. This is dubbed the "snapshot" time collection, where the data is collected at a certain point (Flick, 2011). A longitudinal time horizon for data collection refers to the collection of data repeatedly over an extended period (Goddard & Melville, 2014). The time horizon selected is not dependent on a specific research approach or methodology (Saunders, et al., 2009).

In this study, as like most academic research, this research is a cross sectional study.

3.3.6 Data Collection and Analysis

Data collection and analysis is dependent on the methodological approach used (Bryman, 2012). The process used at this stage of the research contributes significantly to the studies overall reliability and validity (Saunders, et al., 2009).

In this study, multiple data collection tools were used. An achievement test was used to answer the first research question. Group interviews, on the other hand was also used to respond to the second and third question.

3.3.6.1 Achievement Test

In line with the time allocated to each topic, the appropriate number of questions was determined, and 25 multiple-choice items were written. These questions were compiled in a question pool and given to the 46 students and it was prepared in such a way that they distinguished between students who are knowledgeable, and those who are not.

3.3.6.2 Group Interview

The interview questions were developed after a detailed literature review in the relevant field, and piloting. After the treatment was completed, the researcher has already formed groups of four and asked them an open-ended question. To ensure reliability and validity of the group interview questions, expert options were also consulted. A total of 18 students participated in the group interview which consisted of 8 male and 10 female students. The interview was audio recorded and the duration was 5mins for each group. To reveal the opinions of the participants about the FC Model, the following questions were asked;

- How much study time (how many hours) did you allocate for your outside class lessons?
- What did you specifically do in order to learn the topics outside of the classroom?
- What are the positive aspects of the Flipped Classroom?
- Which application do you like most in this Flipped Classroom model?
- What are the problems you encountered in this Flipped Classroom Model?
- What solutions do you suggest to solve the problems experienced?

3.7 Data Analysis

The qualitative data gathered through the group interviews, however, were analyzed through descriptive analysis. In line with descriptive analysis techniques, the data were organized according to the themes (general themes and sub-themes) that emerged from the interview questions and research questions. Moreover, while listing the results of the study, direct quotations were also provided from the participants responses to the interview questions because in descriptive analysis it is important to make use of the direct quotations from participants and discuss the findings based on these quotations ensure validity (Yildirim & Simsek, 2010)

3.8 Conclusion

The study adopts constructionism and positivism research philosophy and inductive approach. The interview method is used for data collection as well as a survey that was conducted. The next chapter will discuss the data analysis carried out to answer the research questions.

CHAPTER FOUR

FINDINGS

4.1 Introduction

The outcome of the research shall be presented and explained in this chapter. The findings shall be made in prose and references made to tables and figures.

4.2 Achievement Test

An achievement test was performed to identify whether there were any statistically significant differences between the pre-test scores of the two groups. There was a group interview session that was used to collect data for the findings. Table 4 displays the results of the achievement test.

Table 4 – Achievement Test Scores of the Experimental and Control Groups.

Group	Pre-Test		Post-Test	
	AS	%	AS	%
Experimental Group	54.84	17.56	76.64	18.79
Control Group	58.33	18.976	35.29	14.11

Note. AS, Average Scores; %, Percentage of the Average Scores.

The findings related to whether the changes in the students' scores show statistically significant differences depending on the FC Model and traditional blended-learning is shown in the table above. As observed in Table 4, while the pre- and post-test average scores of the control group decreased (from 58.33 to 35.29), the average scores of the experimental group increased (from 54.84 to 76.64).

Accordingly, there was a significant difference found in the average score of the pre- and post-test scores of the two groups. In other words, the difference between the mean scores of the students learning through the FC Model and traditional blended learning was statistically significant. There was even a big increase observed in the average score of the students taught through FC as seen in Table 4.

4.3 Achievement Test Focus Group Interviews of the FC Model.

- How much study time (how many hours) per week did you allocate for your out-of-class lessons?

  The students were asked how much time they studied outside the classroom. Out of 18 students, 16 stated that they spent one to two hours studying outside the classroom, 1 student reported spending three to four hours, the other student four-five hours.

- **What did you specifically do in order to learn the topics outside the classroom?**

When the students were asked what they specifically did in order to learn the topics outside the classroom, 13 of them expressed that they watched videos, and 4 students stated they revised and summarized the topics and 1 stated doing nothing extra (See Table 5 below).

Table 5 – Learning Topics.

Question	Answer	N
What did you specifically do in order to learn the topics outside the classroom?	I watched the suggested videos.	13
	I revised and summarized the topics.	4
	I did not do anything extra.	1
What are the positive aspects of Flipped Classroom for you?	I come to the class prepared.	7
	I do not need to do assignments outside the class.	4
	I learn the topic outside the class and consolidate them in the class.	2
	It is fun to do the assignments as a group in the classroom.	4
	I do not think it has a positive aspect.	1
What is the application that you like the most in this model?	Watching online videos	7
	Moodle	1
	Group work	10

Note. N, number of students.

- **What are the positive aspects of the flipped classroom for you?**

When the students were asked about the positive aspects of the FC Model, seven students stated they could come to the class prepared. Following this answer, they expressed that other positive aspects included that they did not have to do assignments outside the classroom, and that they learned the topic outside the class and consolidated this learning in the class. Ten students emphasized the fact that doing assignments as a group in the class was more enjoyable than doing assignments individually outside the classroom. Furthermore, another student indicated that self-learning enabled her to increase her self-confidence by saying, "I gained the courage and pleasure that I myself can understand a topic which is totally new to me, and if I want to, I can comprehend and learn it better."

- **What is the application that you like the most in this model?**

As can be seen in Table 5 above, the application that students (7 students) liked the most in FC Model was online videos. These students found it enjoyable to log in this application through their smart phones or Internet-enabled computers at the end of each topic in the classroom to evaluate their own performances. Additionally, one student stated that he enjoyed using Moodle to answer online questions, and ten enjoyed the group works.

- **What are the problems you have encountered in FC Model?**

The students were also asked what problems they encountered while learning through the FC Model. The answers were categorized under three major themes. Accordingly, eight students stated they experienced motivation problems; five students encountered problems related to the lesson content, and three students encountered problems related

to learning. Two students said they did not experience any problems. (See Table 6 below)

Table 6 – Problems Encountered in the FC Model

Category	Problem	N
Motivation	I did not want to put an effort on it.	3
	I wasn't getting money from my parents to buy data bundle all the time.	3
	The topics were boring and unnecessary.	2
Content	Some of the topics were difficult, so I could not understand.	3
	The resources were not sufficient online.	2
Learning	I had time constraints, so I could not study for long hours.	2
	I had difficulty relating the topic to the lesson.	1
Other	I did not encounter any problems.	2

Note. N, number of students. Problems listed are direct quotes from participants.

- **What solutions do you suggest to solve the problems experienced?**

As for the possible solutions to the problems they experienced, fifteen students responded, "Instead of studying the topics inside the classroom always, I would like to learn on my own before I come to class." The other answers from three students are as follows:

- "Actually, I want to always learn with my friends in groups, it betters my understanding. Since it is a serious environment, I constantly concentrate. I am in favor of learning the lesson and doing the activities in groups."

- "Instead of video lecturing, the instructors can teach us in the classroom, then we can watch the videos later at home or the other way round, we watch the videos then the instructor further explains."

- "To engage us on more hands-on-activities in class so that our understanding on a topic becomes better."

Lastly, the students were also asked what their opinions were to further improve this model. Five students reported that the instructor should explain the topics to study at home, and three students stated that students should be provided with more resources for out-of-class study.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The main purpose of study was to investigate the impacts of the FC Model on students' academics. To this end, two study groups were formed: an experimental group including students learning through the FC Model, and a control group including participants taught through traditional blended learning. Before the treatment procedure, a relational achievement test was run, and it was found out that there were statistically significant differences between the two groups. The findings showed that the use of the FC Model yields significant impacts on increasing the students' academic achievement.

Alongside the positive and negative impacts of the FC Model, the reasons why the results of this study were not compatible with those of the previous research in the field were also identified by reviewing the focus-group interview. This interview revealed that the total study time of the students outside the classroom was only 1 to 2 hours. According to this finding, it is seen that the working time of the students outside the class is 1 to 2 hours. Besides, it was stated that they watched the videos assigned and suggested in order to learn the topics outside the classroom.

While studying, they used learning strategies such as revising and summarizing the contents. Learning strategies are the strategies which promote individuals' self-learning

process. They consist of behaviors and thoughts that are expected to affect the way learners choose, organize, and integrate the new information to learn.

As cognitive learning strategies, the rehearsal strategy involves repetition, and elaboration includes summarization. In line with this finding, Wiginton (2013) asserts that using learning strategies to ensure student responsibility, self-regulation, and autonomous learning are among the FC Model's advantages.

5.3 Summary of Findings

According to the students, coming to classroom prepared and completing the assignments in the class so that they do not have to do them at home are among the positive aspects of this model. Moreover, doing the assignments as a group under the guidance of the instructor motivates the students. Sun & Wu (2016) emphasized positive impacts of group work done in the class on the students' performances. In fact, they revealed that classroom interaction (within the context of group work) positively impacts students' academic achievements (Sun & Wu, 2016).

Studying autonomously and reaching their goals on their own help students gain the feeling of self-confidence. According to Chyr et al. (2017), for example, flipped learning practices could be helpful for students' participation, self-efficacy, and self-directed learning. Moreover, relating the contents to real life is likely to attract the students' attention (Kong, 2014).

With this information in mind, we suggest that images in the videos used within a FC reflect the classroom environment, and that activities should be organized on the basis of the learners' needs and interests.

The problems encountered in this model can be categorized under three main titles: Motivation, Content, and Learning. As reported by our participants, in a new learning environment, students who are typically willing to put effort into learning tend to have difficulty getting motivated. The students studying outside the classroom stated they experienced problems regarding the difficulty of the contents and insufficiency of the resources.

Among the other problems were lack of time to study outside the class, difficulty in understanding the topics, and learning difficulty. The research of Chen Hsieh et al. (2014), points out that many students had difficulties adapting to the FC Model since it is a new approach. Some of the students stated that the course included heavily-loaded requirements, and they did not have time to watch the videos outside the class (Chen, et al., 2014).
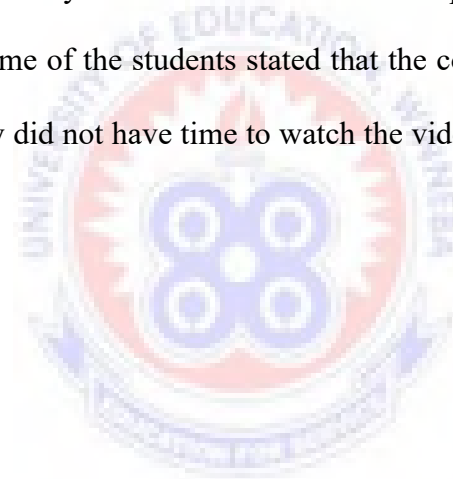
5.3 Conclusion

In summary, this research has clearly shown that the application of flipped learning has changed the culture of learning from a teacher centered to student centered, with more class activities for the students. This study has implications for students' learning activities, i.e. the students learn through hands-on and project based learning activities. Limited time is dedicated to the teachers, but the students have more time and occasion to practice the contents with colleagues.

The findings of this study has contributed to better understanding of technology use in teaching and learning activities.

Finally, the government and the ministry of education should determine the flipped classroom as a contemporary model to be implemented in teaching and learning activities for all level of education.

5.4 Recommendation

This study is limited in the sense that it was carried out with a small number of students. Similar research should be conducted with a larger sample, in different courses, so that it will be possible to generalize the findings.

Moreover, using different data collection tools in addition to the pre-test, post-test, and focus group interview may yield a more in-depth and multi-faceted analysis of the students' opinions and academic achievements.

More so, the flipped learning processes in informal and learning environments as well as for formal learning environment should have limited time to prepare the contents outside of the class. Hence, future flipped learning is not only practiced in higher education or college level, but also for primary and secondary level of education environments. I believe that if the flipped classroom is well and thoughtfully practiced, it will be an excellent instructional model which will promote the cognitive domain of students which is in line with the theory of Bloom's revised taxonomy for cognitive domain.

Additionally, I recommend that, in the future, flipped classroom studies may use a variety of research designs such as experimental research, case study, ethnography, and indeed design and developmental research (DDR) or design based research (DBR). The DDR research will produce a variety of models, techniques, and modules of flipped classroom practices.

Even more, future studies of flipped classrooms may not apply for only science studies, but also social studies such as English classes, history, physical education, drama classes, and humanities. Different online platforms or learning management systems (LMSs) may be used in applying the future flipped classroom approach; those tools can be used to share the content and establish interaction among students and between students and instructor outside the class. Web 3.0 also can be integrated in the future flipped classroom and it will have potential and useful to produce a new model of flipped classroom.

Also, it is recommended that students' motivation and readiness level to learn outside the classroom be identified and necessary arrangements be done before applying the FC Model.

Lastly, rich content videos should be chosen and produced specifically for students to consult for out-of-class studies.

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APPENDIX

INTERVIEW QUESTIONS FOR STUDENTS

My name is Opoku Safo Kantanka Osborn, a graduate student at the University of Education, Winneba-Kumasi. I am undertaking a study on the academic impact and student's perception of a flipped classroom. The information you will provide will be used for academic purposes only. Please assist through contribution of information towards this study by answering the following questions.

- How much study time (how many hours) did you allocate for your outside class lessons?

- What did you specifically do in order to learn the topics outside of the classroom?

- What are the positive aspects of the Flipped Classroom?

- Which application do you like most in this Flipped Classroom model?

- What are the problems you encountered in this Flipped Classroom Model?

- What solutions do you suggest to solve the problems experienced?