



HAWASSA UNIVERSITY

INSTITUTES OF TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

ASSESSMENT OF THE POTENTIAL OF FLIPPED CLASSROOM INSTRUCTION IN THE
CONTEXT OF HIGH SCHOOL INFORMATION TECHNOLOGY SUBJECT: AN EMPIRICAL
INVESTIGATION IN HAWASSA VICINITY RURAL SELECTED SECONDARY SCHOOLS.

MSC THESIS RESEARCH

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Assessment of the Potential of Flipped Classroom Instruction in the context of High School Information Technology Subject: An Empirical Investigation in Hawassa Vicinity Rural Selected Secondary Schools

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A Thesis Submitted to Department of Information Technology in Partial Fulfillment of the Requirements for the Degree of Master of Science

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List of Acronyms

HCED	Hawassa City Education Department
ICT	Information Communication Technology
IT	Information Technology
FCM	Flipped Classroom Model
TCM	Traditional Classroom Model
Df	Degree of freedom
SRBE	Student Result before Experiment
SRAE	Student Result after Experiment
LO	Learning Outcomes
MOE	Ministers of Education
LMS	Learning Management System
M-learning	Mobile-Learning
DSR	Design Science Research

Abstract

Currently traditional teaching methods focuses on knowledge transfer, ICT application merely confined in the presentation and demonstration and, no monitoring and evaluation mechanisms on delivery of instructions. The Dictionary of Educational Technology defined Flipped Classroom as a form of blended learning, which is the practice of students watching lecture material (usually in video form) at home, and then practicing their learning in an interactive environment in the classroom. The study aims to investigate the potential of flipped classroom instruction in the context of high school Information Technology subject in these days of fair abundance of Smartphone's in the hands of the students. The research was conducted in two Hawassa rural vicinity schools using Grade 10 students as experimental cases. The overall methods used in the research was design science research using teacher-created video-based lecture notes as an intervention for experimental groups while delivering the same content in a classroom-based delivery mechanism for control groups. Prior to this quasi-experimentation, a school survey was conducted in two Hawassa City vicinity rural schools to assess their level of readiness for flipped classroom.

Student participants for the experimental study were selected in a two stage process. Volunteer students who have access to Smartphone's are invited to register for research-based tutorial classes. Among those registered in two schools (Hawalla Wondo and Gemeto Secondary Schools), the first 20 registered students in each schools were given a pre-study tests based on the first Unit of Grade 10 Information Communication Technology (ICT) textbook. The two schools are found in two Kebeles in the rural part of Hawassa City built primarily to serve the respective Kebele communities. The Better performing 20 volunteer students (N=10 at each school) are then allowed to participate in a non-graded tutorial sessions by two teachers (the researchers and another ICT teacher). Students from the school where the researcher teach was taken as experimental group and are exposed to flipped classroom based teaching whereas another 10 from the other school are considered as control-group and participated in a lecture-based instruction. The two teachers were meeting on weekly basis to discuss the instructional and assessment activities of the week which are prepared by the teacher-researcher as a PowerPoint (PPT) presentation. The topics covered were taken from Grade 10 Word-processing Unit. The weekly teachers' meetings were also used to evaluate the previous week's activities and planning improvement for the forthcoming one. The tutorial-based quasi-experimentation was conducted for 4 weeks during December 2021. The intervention for the experimental groups involved in-advance sharing of materials in PPT and teacher-created video-lectures through Telegram channel and Xender usually on Thursday of Week3 for interactive classes in Week4. The Control Group tutorial classes were given in the same week and students were exposed to the PPT material at the same time (during Week4). An identical post-test quiz and laboratory tests were given for the two groups and their results was analyzed with independent samples t-test (using SPSS v26) to evaluate the difference between the two groups.

The readiness assessment was undertaken using a questionnaire survey by considering teacher and students factors in two rural schools in Hawalla-Tula Sub-City of Hawassa City. A checklist-based observation was also made to determine school (technology availability). Stratified sampling technique was used to select student and population level teacher participants. Response for open-ended questionnaire items as well as the checklist-based data was analyzed using content analysis method.

The main objectives of this study are to assess the readiness levels of flipped classrooms and compare flipped and traditional classrooms. Teachers and students' readiness levels are very high. In this experiment, flipped classroom teaching methods outperformed traditional teaching methods in student academic performance between groups but did not make a difference within a group

Key words: Flipped classroom, School-readiness, Instructional Designed for flipped classroom.

Chapter One

Introduction

1.1 Background of the study

The history of use of mass media technologies for education purposes in Ethiopia goes back to 1965, when it was started by broadcasting its first educational program within the radius of 20 miles of the capital Addis Ababa (Gubta, 2006). For many years in the Ethiopian school system the traditional teaching aids like chalk, blackboard, and textbooks had been in use as the chief means of transferring facts and information to students. But with the introduction of twentieth century teaching aids, conditions started changing in and around the capital Addis Ababa. Radio and television are now not only supplementing these traditional educational media, they are replacing them in most classrooms. Mass media, radio and television, have been playing a very important role in the formal education of Ethiopian children for a quarter of a century (Gupta, 1995).

Given these changes, numerous education stakeholders had varying opinions about the implementation of direct satellite broadcast education programs beginning with the 2004 academic year in Government secondary schools. Its importance of Technology in teaching has been defended by policy-makers using a variety of arguments. Among other things, educational technology helps the nation's education system align with international development, helps meet the demand for skilled labor nationwide, and helps create communities that use contemporary information systems (MOE 1998 & Abera,2013).

The instructional plasma TV is supposed to solve it all. Educational problems, however, most of the project's expectations were not achieved. The problems observed in the delivery of live education were students', teachers', and technical problems. Student-related problems, Students have various problems with live teaching plasma TV delivery. Problems related to teacher, the role of teachers is low after plasma. As a result, teachers lack commitment to teaching plasma education. Technical problems, There are frequent power outages in the country. If the interruption is predictable, teachers can prepare and cover it. And there is no repeat distribution for those. Students who missed the scheduled distribution time may explain as teacher respondents (Assefa, 2017b).

ICT has gradually been introduced in the country: starting with instructional TV (Plasma TV) followed by computer based instruction, ultimately, multi-modal or all ICTs that contribute to the

achievement of educational goals and targets in schools. For this reason, the government has launched the plasma mode of instruction since September 2004 in secondary educational system of the country and planned to implement other applications of ICT step by step. The government recognizes the benefit of ICT for education and makes some remarkable efforts to use it in education system of the country (*The Plasma-Channeled Instruction in Ethiopia: Utopia or Dystopia?*, n.d.).

The new technologies are incorporating into education as one of the solutions to rectify the deficiencies in current educational systems and inevitably, the educational reforms with the inclusion of new technologies are proliferating in the higher education sector around the globe. The growing educational research is also constantly emphasizing on the transformation of the traditional lecture-based course delivery model into a vibrant hybrid mode of teaching. One of such innovative modes of teaching is the ‘flipped classroom’.

(Assefa, 2017a) recommended an e-learning approach which is participatory and designed based on real educational problem. Instead of focusing solely on technology, (Assefa, 2017a) suggested a human emphasis in the intervention design. This is in line with a transformational approach towards integrating ICTs in African Education systems made by (Barakabitze et al., 2019). Barakabitze and his co-authors recommended an integrated living lab model for effective engagement of ICT in rural education in Africa that, among others, include flipped teaching and classroom. Flipped classroom, which when seen from the students' perspectives, is referred to as flipped learning. Flipped classroom (or learning) is a pedagogical approach in which direct instruction moves from the group learning space, or classroom in its traditional sense, to the individual learning space (or home), and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter.

One of the flipped learning methods is the use of technology by both students and teachers for educational purposes. For example, among these technologies is the mobile phone. It is becoming more and more practical to send different educational content to students through social media. Although not as much as in Ethiopia, students are now using notebooks for reading and writing PowerPoint presentations, and teachers are sending materials to students using social media.

The purpose of this study is therefore to investigate the potential of flipped classroom instruction in the context of ICT subject newly set up pedagogical implementation with teachers’, students and schools readiness.

1.2 Statement of the Problem

The use of ICTs within the developing country has a substantial potential benefit for the education. Regardless of the benefits of ICT for education in Ethiopia, The ICT materials in education like plasma-TV, internet labs, computers and digital libraries for ICT lessons are not available all schools or insufficient to students' number and need (Sani & Ranjan PANIGRAHI, 2013). Due to its design the ICT application merely confined in presentation and demonstration. It is not interactive, collaborative and practical. These might deteriorate the pedagogical makeup and student centeredness of the lesson.

(Assefa, 2017a) In the study we studied, the traditional teaching method that focuses on knowledge transfer is not appropriate to prepare students for a complex modern society. With plasma television, students spoke positively about the live instruction in the broadcast. Students cannot follow instructions properly. Educational problems can be fundamental, instructive, and motivating. There is no monitoring and evaluation mechanism in the delivery of the policy.

The integration of ICT is no efforts on teaching in secondary schools. It was only recently that ICT was included in the curriculum of secondary schools (Mequanint & Lemma, 2014).

Flipped learning is a new direction of educational instruction (Sánchez et al., 2019). flipped classroom best practice is one of the ways to best support student engagement and increase teach (Tomas et al., 2019).

In Flipped classroom instructions, Students studying flipped approach will stand higher in their achievement and have better attitudes toward learning and school (Jasim Mohammed et al., n.d.).

The flipped classroom learning model has produced positive results in primary and secondary education compared to traditional teaching methods. Through flipped learning, high school students are motivated to make learning more interesting and meaningful (Rahman et al., 2015). The flipped classroom is a teaching strategy that is a great way to structure learning experiences to improve student achievement (Cheng et al., 2019).

The flipped classroom is gaining acceptance in higher education as an alternative to traditional teaching methods, and the effects of student engagement are evident when students reflect on learning in a flipped classroom (Steen-Utheim & Foldnes, 2018).

Many of these studies have been not an investigating the potential of flipped classroom instructions in Ethiopia. There is no research on flipped classrooms instructional approaches in teaching and learning pedagogically where the previous researches didn't cover. This research will investigate these issues in integrations of ICT through pedagogically in Hawassa rural vicinity selected secondary school.

1.3 Research Questions

The study raised the following specific questions.

1. To what extend are the selected secondary schools are ready for integration of flipped classroom instructional approach?
2. What are the main challenges in the current instructional delivery?
3. How can flipped learning improve student learning in the classroom?

1.4 Objective

1.4.1 General Objective

The general objective of this study is to examine the potential of flipped classroom based on instruction in teaching of Information Technology subject.

1.4.2 Specific Objectives

Based on the above general objective we have the following specific objectives:-

1. To assess the school, teacher and students readiness for flipped classroom based instruction.
2. To assess readiness level of selected schools for flipped classroom based on ICT education.
3. To implement an experimental flipped classroom based teaching strategy with ICT subject lessons.
4. To analyse the comparative advantages, challenges and necessary measures that need to be taken for pedagogically-induced utilization of flipped classroom in the teaching and learning of ICT subjects.

1.5 Significance of the study

This research is deemed significant in the readiness of integration of flipped classroom instructional approaches for selected secondary schools in Hawassa vicinity rural schools. This is because teachers adopt flipped instructions in IT subject teaching in terms of approaches and resources needed. It will be used to implement the flipped classroom guidelines for selected secondary schools in Hawassa rural area.

The researcher believes that this study serves as an indication of how flipped classroom implementation be managed in the teaching-learning process. This will be a background for educational policy-makers to act and take action on the condition pedagogically. The research also serves as the basis for comparing the advantages of flipped classroom instructions in Hawassa rural Vicinity for selected secondary schools. The findings of the study also offer a profile of the ongoing realities of using flipped in ICT for further research on the area. The research can also be used for School leadership, ICT professionals, Instructional designers, subject teachers, IT technicians, and students.

The research goes a long way in helping to shape flipped classroom instructional approaches in educational policies. The study is thus expected to be helpful in planning, designing, developing, implementing, and evaluating instructional system design, ICT strategy, and programs for better learning integration in the curriculum by advancing flipped classroom instruction in our country.

1.6 Delimitation of the study

This study is only in two schools in rural area in Hawassa city management education department. Focused on the implementation of flipped learning, the evaluated the technological capacity of schools, the readiness of teachers and students, and the benefits of flipped learning. It would have been useful to have a balanced sample of four secondary schools in the rural area of Hawassa. However, the study was limited to two (2) selected schools.

1.7 limitation of the study

Flipped classroom requires educational websites, online resources like learning management system, video library to provide reverse learning. The researcher was only through the use of social media, and hand-held devices technologies like cell phones, and laptops.

1.8 Definition of Terms

1. Technologies that is useful for flipped classroom

- Internet Access in Home and school:
 - Posting teaching materials, (notes and videos), encourage Students, searching relevant materials.
- ICT infrastructure in school:
 - Include plasma, computers, laboratory rooms etc.

- Smartphone's:
 - Take notes, videos and audio atopic of concepts, searching materials, to use telegrams.
- Television:
 - Watching topic videos uses picture slideshow, presentation at work.
- Application Software's
 - e.g., telegram student communicates with Students, upload and download materials.
- Laptops:
 - Prepare and view lecture notes Students at home access information online, internet access etc.

2. Readiness for flipped classroom

Teachers

- To prepare lecture notes, videos, and visual PowerPoint
- Developing course content and in-class activities
- To teaches on social media for Students in hands of materials.
- To teach on school ICT infrastructure
- Attitude commitments to teaching for the flipping classroom.
- Prepare intentional content in the subjects

Students

- To learn lecture notes, videos, and visual PowerPoint's in anyplace, anytime
- Attitude commitment to learning flipping classroom
- To learns on social media in hands of materials.
- Do homework, assignments, and lecture notes online or on social Medias
- Motivation for Learning

3. Flipped classroom

Flipped learning is a methodology that helps Students to prioritize active learning during class time by assigning Students lecture materials and presentations to be viewed at home or outside of class. One of the most exciting advancements in the modern classroom is flipped learning. The flipped classroom allows Students to watch the video according to their preferred time and need, and they

can study at their own pace; this type of activity also increases Students' collaborative learning in distance education outside the class.

Difference between Traditional and Flipped classrooms

Table 1- 1 the difference between traditional and flipped classroom

	Traditional teaching methods	Flipped classroom methods
School	Content delivered	Work on problems
Home	Work on problems	Content delivered
Before class	Look over materials	Prepare to participate in class activities
During class	Attend lecture	Practice apply key concepts with feedback
After class	Attempts the homework	Check understanding and extend learning
	<ul style="list-style-type: none"> ➤ Students instruct ➤ Students take notes ➤ Teacher gives assessment ➤ Students follow guided instructions 	<ul style="list-style-type: none"> ➤ Students instruct lesson at home (videos//books/social media) ➤ In class student's deep understanding of concepts, applications, connection to content made. ➤ Students receive support as needed. Students have homework.

1.9 Organization of the Thesis

The first chapter of the study introduces the background of the research, problems of statement, research questions, objectives (General objectives and Specific Objectives), Significance, and Delimitation, limitation of the study and definition of terms. The second chapter deals with review of related literature; the third chapter focuses on the research design and methodology; chapter four deals with data presentation and discussion of the study. The last but not the least chapter stresses on the summary, conclusion and possible recommendations.

Chapter Two

Literature Review

2.1 Conceptual Framework

2.1.1 Definition of flipped classroom

The term flipping in Flipped Classroom is used to define the interchange of homework and classroom activities (Ngabret, n.d.)

A flipped classroom is an instructional strategy and a type of blended learning, which aims to increase student engagement and learning by having pupils complete readings at home and work on live problem-solving during class time.

Flipped classroom, students watch online lectures, collaborate in online discussions, or carry out research at home, while actively engaging concepts in the classroom, with a mentor's guidance.

Flipped classroom student's pre-learn lecture based material at home through watching short video clips before returning to school the next day (*The_flipped_classroom_article_2*, n.d.).

Flipped learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space. The resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter (*GibbsSyllabusSpanish2*, n.d.).

An "inverted class room" is a new educational pedagogy that is a manifestation of blended learning. Here the use of technology allows better utilization of class time as students go through the passive elements of the lecture before coming to class. Instructors utilize class time for guiding students to solve practical problems on the content that has been covered. Thus active learning of student replaces passive listening. Using this methodology students get a chance to practice in class what they have understood beforehand. Teachers also get a chance to focus on the students learning and can cater to each student's problem individually (Lage et al., 2000).

2.1.2 Advantages of flipped classroom

1. Increased Academic Performance

The flipped classroom resulted in a significant increase in students' academic performance across the course, improving students' motivation and self-directed learning (Kvashnina & Martynko, 2016), similar findings (Reza & Baig, 2015). (Nwosisi et al., 2016) Flipped instruction leads to better learning results.

(Masood et al., 2022) they investigated the effect of flipped classroom models for the students taking ICT course. Flipped classroom models to improved students' achievement and learning engagement.

(Mohamed, 2016) they concluded that the use of flipped learning imparts positive effects on the student's performance.

(Guy & Marquis, 2016) reported that students in flipped classrooms earned higher quiz and exam grades than students enrolled in traditional classrooms. (Adkins, 2014); Guy and Marquis, 2016; (Ngee MOK & Ngee Mok, 2014) they reported similarly findings and student-reported perceptions of their experiences that reported favorable preferences related to the flipped classroom (Guy & Marquis, 2016).

2. Increased Engagement

Many researchers finding in flipped classroom models students improved learning engagement (Masood et al., 2022). (Steen-Utheim & Foldnes, 2018) flipped classroom was increased student academic performance and student engagement. For example, Guy and Marquis (2016) observed that students in the flipped classroom demonstrated higher levels of commitment to studying course content and materials than students in the traditional classroom.

3. Develop Critical thinking

The intellectually disciplined process of actively and adeptly conceiving, applying, synthesizing, and evaluating data obtained from, or generated by, observation, experience, reflection, reasoning, and communication as a guide to belief and action is known as critical thinking. The flipped classroom is a powerful instructional strategy for fostering critical thinking in both high schools and institutions of higher learning. Flipped classrooms must be designed to promote active learning by selecting different learning activities both inside and outside the classroom, incorporating other teaching strategies, and leveraging technology in order to best foster the development of critical thinking (Nugraheni et al., 2022).

4. Increase attitudes towards learning

Better learning outcomes are the result of flipped education. This idea aids students in developing skills, information, and a positive outlook on learning in an efficient manner (Nwosisi et al., 2016).

(Rahman et al., 2015)

(Jasim Mohammed et al., n.d.) mentioned the benefits of flipped classrooms

- Self-paced learning
- Student learning more deeply
- Students are more active participants in learning
- Student-teacher interaction increases and student learn from one another
- Opportunities for real-time feedback
- More meaningful homework

2.2 Theoretical Frameworks

2.2.1 Integration of flipped classroom

(Yilmaz et al., 2022) thought about mobile learning mixed with a flipped classroom. They created a flipped classroom-based mobile learning design application as part of an integrated curriculum for medical faculty.

(Nugraheni et al., 2022) Students' learning activities are split into two categories—outside and inside the classroom—when they are integrated into flipped classrooms. The majority of learning activities outside of the classroom (pre-class) involve watching videos, along with some PowerPoint presentations, screencasts, podcasts, online readings like websites and articles, taking notes, taking online quizzes, completing computer simulations, and completing assignments. Additionally, there are those that learn by reading online, creating a mind map using audio and text, summarizing what they have learned, asking questions, coming up with inquiries, looking through resources, contemplating the learning process, and coming up with topic scopes. (Zhao et al., 2021) to communicate the meanings of Chinese traditional culture, ICT and mobile technologies In order to study online, students acquired the fundamentals of ICT and mobile technologies through the course's open online course platform.

2.2.2 Readiness of resources in flipped classroom

In order to assess the level of resource preparation needed to deploy the flipped classroom at public universities, (Thowfeek & Nawaz, 2019) used a survey method. The term "survey research" is used to describe almost any type of descriptive, quantitative research. It is the most popular research

methodology since it enables the collecting of a large amount of data from a sizable population. In this study, data were gathered from the 581 teaching staff members who work at these two institutions and represent the colleges of social sciences, humanities, and pure and applied sciences. 112 valid surveys covering the four factors of equipment, technology, human resources, and training were obtained by the researchers. Questions with multiple items are used on a 5-point Likert scale, ranging from 1 for strongly agree to 5 for strongly disagree, to assess the preparedness of resources. As a result, the technology and equipment are completely prepared to move forward with the adoption of the flipped classroom. However, in order to do so at these universities, the other two resources—human resources and training—need to be enhanced.

2.2.3 Teachers readiness for flipped classroom

Flipped classrooms are one technological strategy that shows potential for raising student involvement but may not be used by teachers due to a lack of understanding and trust in their technological skills. Effective technological integration was not possible for teachers.

In order to create and validate an instrument, the Flipped-Classroom Teacher Scale, researchers (Chou et al., 2020) studied the aspects of junior high school teachers' readiness for using a flipped classroom method (FCTS). The elements of the FCTS model suggested by this study were investigated and confirmed using two sets of samples, 170 and 495 junior high school teachers. Exploratory factor analysis (EFA) and confirmatory factor analysis were used to experimentally evaluate the model. The participants in the study came from various Taiwanese regions. Institutional support, technology self-efficacy (TSE), teacher beliefs, and instructional strategies make up the FCTS (TS). The outcomes demonstrate the validity and dependability of the FCTS paradigm. The FCTS can be used by teachers to learn more.

Regarding flipped classrooms especially, (Chou et al., 2020) highlighted additional studies; researchers have recognized many teaching principles (eg, Chiang, 2017; De Araujo et al., 2017; Strayer, Hart, & Bleiler, 2015). The fundamental premise behind flipped classrooms is that lecturers produce video lectures that can instruct students on a particular issue before a real class ever begins. The advantages of personalized, technology-based curriculum delivery or the increased opportunities for using class time may be factors in teachers' acceptance of the flipped classroom (De Araujo et al., 2017). As a matter of fact, some academics have noted that teachers organize courses, which serve as the setting for interesting activities involving problem solving, collaborative learning, and knowledge development (Awidi & Paynter, 2019; Milman, 2012).

"Self-efficacy in controlling learners, technological self-efficacy, self-efficacy for arranging classroom time, readiness for preparatory work, and being open-minded" were explored as the five main components of their preparedness to conduct flipped classroom instruction. Overall readiness was determined to be favorable for young teachers who had just entered the field. The ability to adopt the flipped classroom approach was more likely to be viewed favorably by teachers who possessed computers and believed themselves to be competent users of information and communications technology (Kazu & Kurtoğlu, 2022).

2.2.4 Students readiness for Flipped classroom

(Wut et al., 2022) Self-directed learning, online communication, self-efficacy, technology readiness, learner control, and motivation in the classroom are the components of student readiness that were measured. The student's perception is improved by the flipped classroom. Many researchers studied ((Limniou et al., 2018), they investigation aimed to study the teaching approaches in relation to the integration of technology (learning material, learning activities and teachers' contribution to learning approach) under the student perspectives whether or not were assisted to develop high order of thinking skill. The flipped classroom approach is based on the general principle that it provides an opportunity to develop higher order of thinking compared with the traditional way of teaching.

(Tomas et al., 2019) they investigating how a flipped learning approach supported students' engagement and learning in Foundation of Sustainable Education, two particular aspects were focused upon. They proposed flipped learning continuum that fosters different levels of student-centered learning and autonomy, depending on students' learning needs and their readiness for a flipped learning approach. In the context of the first year experience, specifically, some teacher-led instruction may be appropriate in a flipped classroom to support students' transition to learning in higher education.

(Steen-Utheim & Foldnes, 2018) the first-year mathematics course with 235 (52% women, 48% men) registered students in a Norwegian business school. Mean student age was 21.1 years with a standard deviation of 3.3 years at the beginning of the course. The general level of mathematical skills at the beginning of the course was moderate, with many students having poor secondary education achievement in mathematics. The course was taught over two semesters.

2.3 Empirical framework

2.3.1 Methods to study flipped classroom Integration

(Yilmaz et al., 2022) Throughout the 2017–2018 academic years, 359 students enrolled in two-credit courses. A mobile application was used to implement the five-Lecture-five (5L5) instructional design. Pre-, during-, and post-lecture components are included in this design, which combines flipped classroom and mobile learning strategies. Chi-square, Mann-Whitney U, and Kruskal-Wallis tests were used to evaluate the data. Course observations and open-ended questions were examined thematically and reported jointly.

Numerous scholars have used this methodology to investigate how a flipped classroom approach might be incorporated into higher education for various fields. The concept of the human circulatory system was taught at MAN 2 Banda Aceh using a flipped classroom combined with Google Classroom and conventional methods. Some researchers have studied Quasi Experimental (Putri et al., 2022), a method used quasi-experimentally, with a Pretest-Posttest design, to determine the differences in students' learning motivation. The 120 participants in this study were all IPA MAN 2 Banda Aceh class XI students. Purposive sampling was used to determine the sample method in this investigation. They came to the conclusion that adopting the flipped classroom approach in conjunction with Google Classroom is successful in boosting students' motivation to study in comparison to applying traditional methods.

(Ahmad, 2016), in flipped classroom models, they used quasi-experimental methodology to improve the listening comprehension of Egyptian EFL students. they used a single-group pre-posttest and analyzed the variance between the two. Independent variables and listening comprehension served as his variables (flipped classroom approach). He draws the conclusion that the flipped classroom model helped EFL students' listening comprehension. (Steen-Utheim & Foldnes, 2018), they looked into how well students engaged in a mathematics course that was taught in a flipped classroom. they had a use participants were exposed to two models of teaching in two semester long introductory mathematics course, during first semester they participated in flipped classroom while second semester they participated in lecture based classroom. Then participants compare the two instructional models as implemented in the same course. Both lecture-based and flipped classroom formats have a significant amount of active learning components in person. Their findings showed that when students re-

reflect on their learning in the flipped classroom, the affective dimension of student engagement is particularly noticeable.

(Kazu & Kurtoğlu, 2022), To determine the association between secondary school teachers and students' readiness for adopting a flipped classroom, they used descriptive models. 233 teachers and 745 students from Elazığ, Turkey's secondary schools were randomly chosen from the fifth and eighth grades. They came to the conclusion that most teachers and students are prepared to use this paradigm. The association between professors and their pupils' technology self-efficacy is also favorable. Additionally, the children with open-minded professors have more favorable views of the flipped classroom.

They figured the study would help boost the use of the flipped classroom in educational settings by addressing the preparation of both teachers and their pupils. It has pedagogical repercussions for teachers to receive further training and model knowledge, as the more knowledgeable the teacher is about the flipped classroom, the more pupils will benefit from it.

2.4 The research gap and conceptual framework

2.4.1 The research gap

(Thowfeek & Nawaz, 2019), they measured four variables in resource readiness (technology, equipment, training, and human resources). The objective of measuring the level of resource readiness of the public universities to implement flipped classroom concept, a survey was conducted among the lecturers attached to the two universities in the non metropolitan area in Sri Lanka.)

(Wut et al., 2022) they measured the student readiness components are self-directed learning, online communication, self-efficacy, technology readiness, learner control, and motivation in learning.

(Katsa et al., 2016) they investigate the potential of flipped classroom model in K-12 mathematics teaching-learning. (Kazu & Yalçın, 2022), they examined the relationship between high school teachers and students in flipped classroom readiness. My research also explores the distinct benefits of flipped learning beyond readiness. (Thowfeek & Nawaz, 2019) conducted a study on the readiness of flipped learning resources. This study focused on dividing the resources into four. But using flipped learning requires the readiness of students, teachers, and schools. My research explores this.

(Katsa et al., 2016) research on the potential of flipping in Algebra course, their basic question is that students' cognitive learning, students' motivation levels, and students' results depend on flipping,

while my research is on ICT subject and the readiness of schools for the flipped classroom, ICT teachers' adopt of flipping learning in terms of approach and required resources. My basic idea is that flipped learning has advantages over the traditional education system.

This study's conceptual framework is centered on how ready teachers and students are to learn from school technology and resources. A flipped approach is centered on student activities both inside and outside of the classroom, study packets, and sending and receiving educational information via social media. models of the experimental group's intervention. Additionally, the t-test is used to compare the two groups' differences before and after the test.

The flipped classroom models employed by Kiernan (Sankey & Emeritus, 2013) using these models are included in the models of intervention in the Experiment group (Segura-Robles et al., 2020). This model is based on combining and the readiness assessment.

2.4.2 Theoretical Framework of the study

Our hypotheses are therefore as follows

- H0: There is no statistically significant difference between student performance, engagement, and learning interest in the control and experiment groups after the intervention.
- H1: There is no statistically significant difference within student performance, engagement, and learning interest before and after intervention.
- My significance level alpha is 0.05

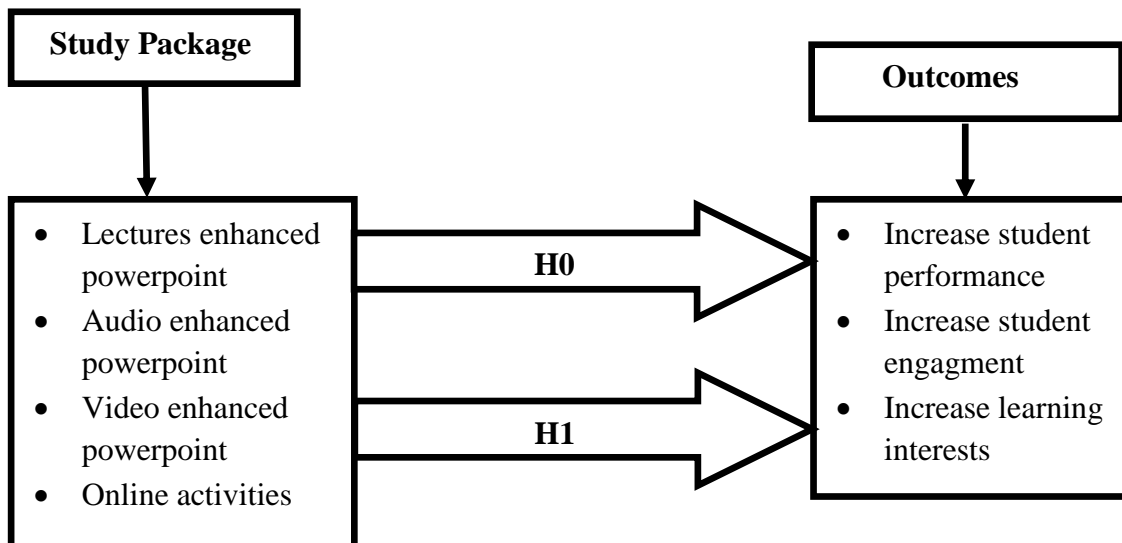


Figure 2-1 Hypothesis with conceptual model

Chapter Three

Research Methodology

This chapter highlights the research design, research method, sample and sampling techniques, instruments of data collection, and methods of data collection for a flipped classroom.

3.1 Research design

A research design data gathering strategy is outlined in the study design. It is a "blueprint" for research that outlines at least three procedures: data collecting, instrument creation, and sampling. Its goal is to provide answers to specific research questions or test certain hypotheses (Bhattacharjee, n.d.). to fulfill the goals of this research.

Design science research (DSR) is problem-solving paradigm that seeks to enhance human knowledge via the creation of innovative artifacts (vom Brocke et al., 2020). Design science research is a qualitative research approach in which the object of study is the design process, i.e. it simultaneously generates knowledge about the method used to design an artifact and the design or the artifact itself.

The entire research design was one of design science because I came up with the subjects and contents and set up unique classroom and time arrangements in addition to creating online groups on social media for communication and material sharing. In light of the aforementioned logic, the research will provide novel approaches to investigating the experiment. Design Science and true experimental research were applied. Video lectures, audio lectures, and online activities are independent variables, but student academic performance, student engagement, and learning interests are dependent variables. In a true experiment to prove my hypothesis, True Experimental Research Design: True experimental research relies on statistical analysis to prove or disprove my hypothesis, making it the most precise type of research. A true design can establish a cause-and-effect relationship within a group. There is a control group (traditional) that is not exposed to the lecture videos and online activities, and an experimental group (flipped) that is exposed to the lecture videos and online activities to measure student academic performance, student engagement, and student learning interests. a variable that the researcher can control and distribute at random.

The hypothesis that there is a substantial difference between the exam score means of the students in the flipped classroom and the ones in the traditional one was tested using an experimental methodol-

ogy. Participants in this study were divided into two groups: control and experimental. Pre- and post-tests were given to both groups. The experimental group was subjected to the Flipped Classroom method between the delivery of the two exams, while the control group received the traditional educational approach. The two teaching approaches used in the study served as independent variables, and the exam results of both the control and experimental groups served as dependent factors.

3.2 Research Model

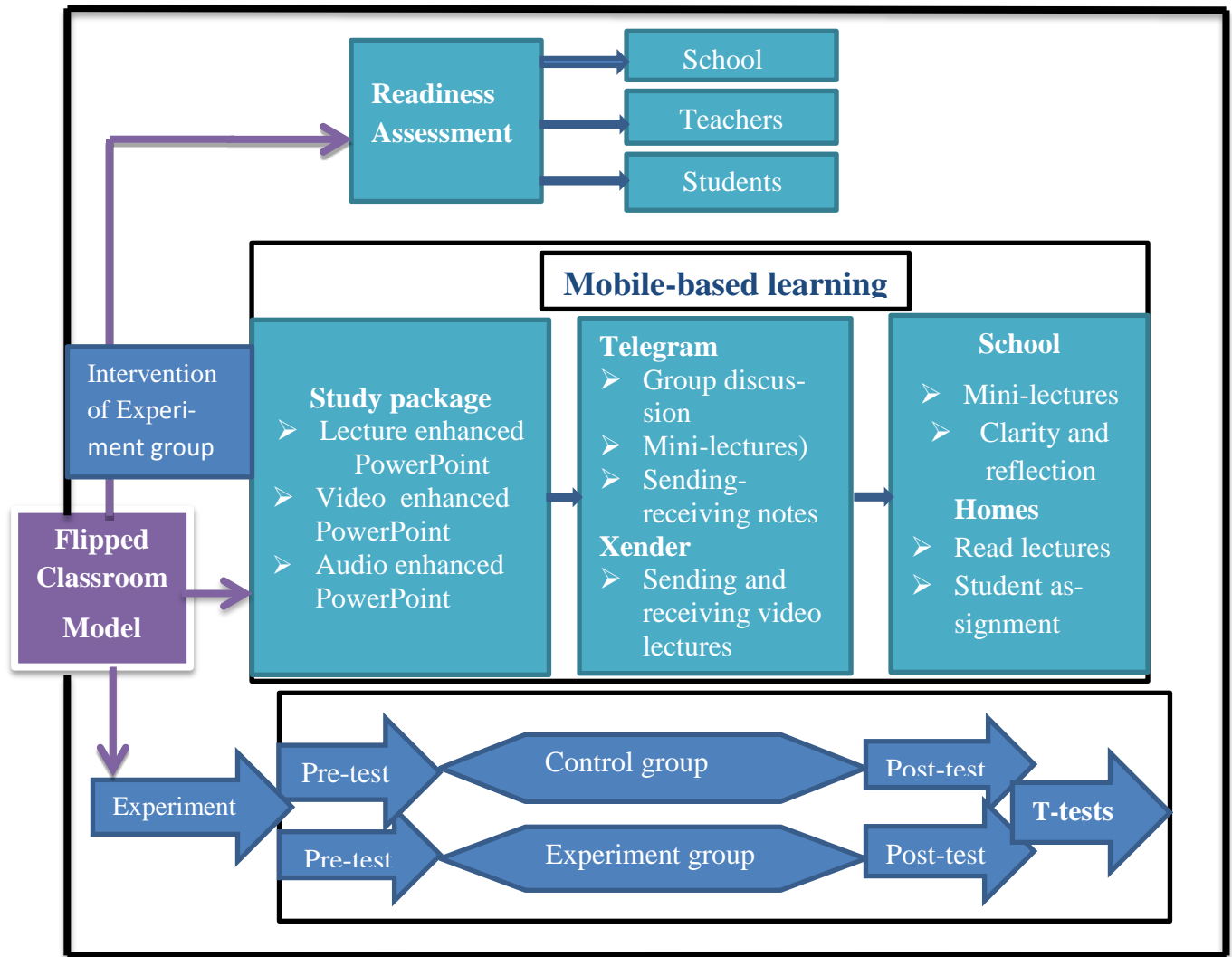


Figure 3-1 Research Model

3.3 Samples Group

Sample schools in the rural area of Hawassa were specifically chosen based on their actual performance in terms of teaching, learning, and school infrastructure using data that was gathered on simi-

lar performance in the rural area of Hawassa (Hawassa City Administration Department 2013E.C. Then, for the study, 2 secondary schools were specifically chosen.

The sample in this study was second level students in high schools in the City of Hawassa, vicinity of rural, Ethiopia. Participants in this study came from two different high schools and were selected through a stratified sampling method by sex and grade level. The numbers of participants in this study were 386 Students. The sample size determined by Yemane’s formula $n = N / (1 + N(e)^2)$, n = Sample Size, N = Population Size and e = levels of precision or Sampling of Error which is ± 5 .

Table 3-1 Numbers of Students selected

School name	Sample size	Total numbers of Students
Hawalla Wondo	186	350
Gemeto	200	400

A total of 61 teachers from two different secondary schools selected for flipped classrooms in Hawassa Vicinity rural were enrolled in the study conducted in the 2021-2022 academic year. All Teachers have participated in two schools. But only used voluntary teachers who participated for the questionnaire were 42.

Table 3-2 Numbers of Teachers selected

School name	Sample size (volunteer)	Total numbers of Students
Hawalla Wondo	20	21
Gemeto	22	40

3.3.1 Sample group selection process for experiment

The participants consisted of 20 Students from Grade 10 who participated in the ICT subject. Two schools were included in this study, which took place on December 2021 four weeks. The student selected for flipped classroom they had smart phones, technology access, those who got technology at home and same view to take pre exam tests. Both schools are located in different kebeles’. Selected students cannot communicate with each other.

Selection Process: For Experimental and Control Group

- Students selected for experimental group to register volunteer students enrolled smart Students and found 20 Students. Those who scored more than 10% were selected on a 20% test.

- Similarly, Students who were selected for control groups to volunteer 20 Students by registering as they had smart phones. Those who scored more than 10% were selected on a 20% test.

Table 3-3 Instructional approaches and student selection

School name	Instructional Approaches	No. of Students	No. of Students take test
Hawalla Wondo	Flipped(Experimental)	10	20
Gemeto	Traditional(control)	10	20

Setting Classroom Arrangements flipped and traditional classroom methods



Figure 3-2 Traditional classroom



Figure 3-3 Flipped classroom

3.4 Research Instrument

In this study, both quantitative and qualitative data were collected using different data collection tools. The researcher used four data collection instruments such as questionnaires, checklist observations, interview, and experiment. These methods enable the researcher to obtain adequate information for the study.

3.4.1 Contents for Experiment

In traditional and flipped classrooms were selected the same purposive content. Both schools were teaching at the same time. Two school ICT teachers were communicated one day (Thursdays) per week. And develop a common lesson plan to teach both the control and experiment groups. Hawalla Wondo was firstly a teacher who prepared teaching materials videos in zoom applications and PowerPoint, secondly created student groups in telegram. Thirdly teacher sent materials before Students coming classes in file sharing telegram, Xender, and Bluetooth. The fourth teacher arranged classrooms and the teacher was teaching students in classes.

In Gemeto High school teacher was not sent materials before Students coming classes. The teacher was teaching directly in classes.

Table 3-4 Lesson plans in two schools in Gemeto and Hawalla Wondo

Month	Date	Main contents	Content	Teaching method	Evaluation
December	<ul style="list-style-type: none"> • Dec5-9 • Dec12-16 • Dec19-23 • Dec26-30 	Key features of Word processor	<ul style="list-style-type: none"> ▪ Importance of word processor <ul style="list-style-type: none"> ➤ Creating documents ➤ Editing Documents ➤ Formatting Documents ➤ Printing Documents ➤ Saving Documents 	Traditional and Flipped learning	Lab Exams Test Exams

Table 3-5 Learning outcomes and teaching strategy

Learning Outcomes(LO)	Teaching strategy		Assessment
	Hawalla Wondo	Gemeto School	
(LO1):understand the application of word processing, and Importance of word Processing;	Flipped learning	Traditional learning	Lab and Test
(LO2):understand how to open word processing software, and create, and save a document;	Flipped learning	Traditional learning	Lab and Test
(LO3):recognize how to format a document in a desired way;	Flipped learning	Traditional learning	Lab and Test
(LO4):recognize how to create a tables in a desired way;	Flipped learning	Traditional learning	Lab and Test

3.4.2 Experiment

The research follows a quasi-experimental design with two schools of Hawassa city administration education department 2014 (EC) (2021/2022) students. The study focused on science track classes, including topics and content relating to the subject. As the study’s independent variable, there is a learning method with two levels: one school that interacted with flipped classroom instruction, and another school that interacted with traditional classroom instruction. The study-dependent variable was the student's result.

The research data obtained from the pre-test and post-test results in each learning class (experimental, and control class). The test given is an exam test, which consists of 20% exam, 10% lab and the total (overall) result was 30% before the experiment. After experiment the test given Exam 30%, lab, Lab 20% and total (overall) result was 50%. In addition to passing the test, the research data were also collected through Excel and using project-flipped classroom instruction. Data were analyzed using comparison means tests (an independent sample t-test to compare between groups and a paired t-test to compare within groups); flipped and traditional groups were exposed to 4 weeks of learning.

Table 3-6 Exam and groups

Groups	Before Experiment exams	After experiment
Both control and experiment	Exam 20%	Exam 30%
	Lab 10%	Lab 20%
	Overall 30%	Overall 50%

3.3.3 Observation checklist

Observation checklist was used in school technologies availability for flipped classrooms. In check list formats checked ICT infrastructures in two schools, and also used in observation to checked technologies availability for flipped classrooms. Direct observations were made in the availability of technologies in school like Internet connectivity, and computer laboratory, Electricity, printers, Desktops (laptops), Hardware and software and plasma Television classrooms. The researchers hold the observations in the Teachers and the Students’ technologies in their school. In addition to this, it enables the researcher to analyze and reach a fair conclusion about the real-world implementation of and challenges to flipping classrooms in ICT subjects. And it provided a readiness to suggest ideas that should be done to improve flipped classroom the use of ICT subject.

3.3.4 Questionnaire

Data collection instruments were developed from previous literature. The teachers and students questionnaires were used by adopting them from flipped learning network (Flipped Learning Network, 2014) and student readiness in blended learning survey carried out in 2017 (Osman & Hamzah, 2017).

Table 3-7 Questionnaire for teachers

Constructs	Operational definition
Flexible Environment	I can prepare classroom arrangements and time managements (Flipped Learning Network, 2014).
Learning culture	I give students opportunities to engage meaningful activities without the teachers being central (Flipped Learning Network, 2014).
Intentional contents	I can prepare relevant contents and prepare pre reading materials for my students (Flipped Learning Network, 2014). I can differentiate to make accessible and relevant for all students (FLN, 2014).
Professional	I collaborate and reflect with other educators and take responsibility for transform-

Educators	ing my practice (Flipped Learning Network, 2014).
Usage technology	I am open and ready to use my technologies for educational purposes(Osman & Hamzah, 2017). I am ready to send lectures using file sharing mechanisms(Osman & Hamzah, 2017).

Table 3-8 Questionnaire for students

Constructs	Operational definition
Usage technology	I am open and ready my own technologies for educational purposes (Osman & Hamzah, 2017). I am ready to receive educational materials using file share mechanisms(Osman & Hamzah, 2017).
Self- efficacy	I can learn conformably from educational materials videos, sounds (Osman & Hamzah, 2017). I can take note while watching educational videos, sounds (Osman & Hamzah, 2017).
Group- efficacy	I am ready for classroom based on discussion and student interaction (Osman & Hamzah, 2017).
Learning Motivation	I am ready to study new materials to preparing for coming class (Osman & Hamzah, 2017).

The questionnaires were designed and made to include both closed-ended and open-ended items (only Teachers). And they were distributed to teachers and students. In this study, two sets of questionnaires were utilized for the data gathering process. The first set of the questionnaire was for students to availability of technologies in their home, readiness of flipped classrooms and the second set was for the teachers to availability of technologies in their home, readiness for flipped classrooms.

Table 3-9 Values assigned for the likert-scale in the questionnaire

Likert-scales	Factors	Impacts
5	Very high	Very high impact
4	High	High impact
3	Medium	Medium impact
2	Low	Low impact
1	Very low	Very low impact

3.4.5 Interview

The interview was designed for only ICT teachers from Hawassa rural vicinity selected secondary schools. The Interview used three ICT teachers in Hawalla Wondo and Gemeto gale secondary schools. This is basically to know how to adopt flipped classrooms based on ICT subjects as a resources needed. The teachers interviewed face-to-face and some interviews to call phones.

3.5 Data Collection

Both open-ended and closed-ended questions could be asked during an interview or on a questionnaire for gathering data. The chosen teachers and students were given surveys to complete, and an average score was then calculated.

Exams, labs, and overall scores were included in both the pre- and post-exam comparisons of the students in the two schools. Results used to compare the effectiveness of traditional and flipped learning methodologies. With the aid of teachers and students, the researcher gathered data. For successful data collection, the cluster education office and target school principals were consulted.

The pre-exam was prepared using materials used to assess the basics of ICT topics for students by experienced teachers. Thus, it adequately examined the students in the relevant areas. Similarly, the post-exam was also prepared using materials used to assess Microsoft Word application software for students by expert teachers. In groups of ICT students, two teachers were asked to assess the quality of the post-test questions. After quite some modifications and rectifications, the post-test was approved by these teachers as sufficient for the assessment of students in the areas of word processor application, problem-solving, and theoretical knowledge. Experiments and questionnaire measures were performed through the Statistical Package for the Social Sciences (SPSS) software version 26.0.

3.6 Factors of Data Collection

Table 3-10 Factors and variables of data collection methods

Factors	Variables	Data and Data Source	Data collection and Analysis method
School readiness	Technology Equipment	Checklist Observation	Qualitative content analysis
Adopt flipped classroom	ICT teachers	Interview	Qualitative content analysis
Readiness	Student Teacher	Questionnaire	Descriptive(Mean)
Traditional and Flipped classroom	Pre Exam Post Exam	Exam Results	T-tests

3.7 Methods of Data Analysis

The primary goal of this study was to present the findings of an investigation of the potential of flipped classroom instruction in the context of high school ICT subjects in Hawassa vicinity rural selected schools. Checklist observations and interviews are administered in qualitative content analysis. The data is organized and the information is analyzed using excel computer software. Additionally, descriptive and inferential statistics were used in this study to examine qualitative data. Therefore, to find a difference between the means of two or more variables, descriptive statistics like mean and inferential statistics like independent sample t-test and paired sample t-test were used (dependent and independent variables). The information is then arranged, shown, and discussed as the primary results using tables and graphs. The two groups (control and experiment group) are compared using independent sample t-tests, and the experiment group alone is compared using paired sample t-tests before and after the experiment. The presence of a significant connection at $p < 0.05$, which is considered significant, was tested using the independent sample t-test and the paired sample t-test.

3.8 Ethical consideration

The department of information technology at Hawassa University provided the researcher for the introductory letter. The goals and objectives of the study were explained to the participants. It is important to understand their selection criteria, as well as their viewpoints, interviews, observations, and experiments. The researcher explained the goals of the study to the participants and let them know they might choose whether or not to take part in it. Participants signed a consent form before the experiment, which was entirely voluntary. Participants were instructed not to include their identities in the surveys, experiments, and interviews, and all information was kept confidential.

3.9 Pilot Study

The development of data collection tools was inspired by prior publications (see table 33, 34). Ten teachers and 20 students who were prepared for flipped classrooms were provided the instrument after it had been developed as part of a pilot research. Instrumental reliability for teachers and students was higher than 0.70, at 0.86 and 0.75, respectively (Fidell et al., 2013).

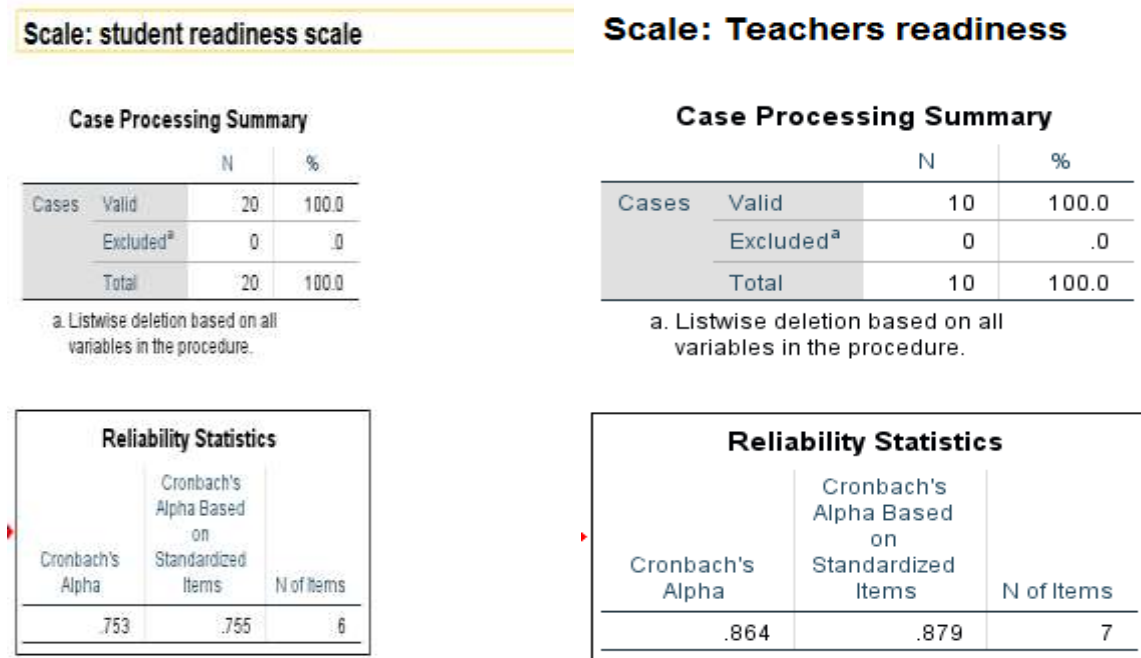


Figure 3- 4 Student and teachers reliability

Pilot testing's primary goals were to evaluate the validity of the content, the reliability of the instruments, and the format of the questionnaire. On other high school students and teachers who were not participating in the study, a pilot test of the questionnaire was undertaken. Twenty students and ten

teachers from Murrero Sodo High School took part in the pilot study. The students were made aware that the research was voluntary and that the data collected during the pilot phases would not be used in the study's conclusions. By clearing up any ambiguities that were discovered in the questionnaire, the pre-goals testing's were to verify its validity and reliability. Pre-testing aided the researcher's familiarization with the procedure for gathering data. The researcher can accept complaints and ideas by speaking with my adviser in light of the findings from the questionnaires given to instructors and students. Additionally, my advisor provided input in November 2022. The sample students and teachers are used by the researcher to check each item's validity and reliability. In order to reduce measurement error, the instruments were examined for validity and reliability because the most effective tool is both of these.

Chapter Four

Data Presentation and Discussion

This study investigated availability of technologies for teachers and student at home and in school, as a measure of readiness for a flipped classroom and an experiment of flipped and traditional instructional approaches. This chapter presents the result from the quantitative and qualitative analyses of data from teachers and students readiness for flipped classroom.

4.1 Characteristics of Respondents

4.1.1 Characteristics of Student Respondents

The characteristics of student respondents are presented in table 4-1. The table shows the student participants of the study were 248 (i.e., 64.2%) female and 138 (35.8%) were male. In grade levels, 194 (50.3%) students were grade 10 and 192(49.7%) are grade 9. They came school Hawalla Wondo (N = 186 (48.2%) and Gemeto (N= 200(51.8%). The ages distribution shows that the majority of the students is between 14 and 17 with N=254(65.8%).

Table 4-1 Demographics information about Students

Categories	Variables	No. of respondents	Percentages (%)
Student respondents by sex	Female	248	35.8
	Male	138	64.2
Student respondents by school	Hawalla Wondo	186	48.2
	Gemeto	200	51.8
Student respondents by grade levels	Grade 9	192	49.7
	Grade 10	194	50.3
Student respondents by age	14-17	254	65.8
	18-20	116	30.1
	Above 20	16	4.1

4.1.2 Characteristics of Teachers Respondents

Table 4-2 shows the general information of teachers in females 19 (45.2%) and males 23 (54.8%). Hawalla Wondo were 20(47.6) teachers and Gemeto 22 (52.4). Educational level 37 (88.1%) teachers were BA/BSC and 5 (11.9%) teachers were MA/MSC. teacher positions 6(14.3) Beginner, 7(16.7%) junior, 16 (38.1%) teachers, 6 (14.3 %) higher Teachers and 7 (16.7 %) leader Teachers. Teaching Experience's 11 (26.2%) % 5years or less, 18 (42.9%) were experienced 6-10 years, 7 (16.7%) 11-15 years, 4 (9.5) 16-20 years and 2 (4.8) 21-25 years experienced. 17 (40.5%) teaches Grade 9, 21 (50%) teacher grade 10 and 4(9.5%) teachers were teacher both grade 9 and 10.

Table 4-2 Demographics information about Teachers

Categories	Variables	No. of respondents	Percentages (%)
Gender	Female	19	45.2
	Male	23	54.8
School Name	Hawalla Wondo	20	47.6
	Gemeto	22	52.4
Educational Level	BA/BSC	37	88.1
	MA/MSC	5	11.9
Your position as a teacher	Beginner	6	14.3
	Junior	7	16.7
	Teacher	16	38.1
	Higher Teacher	6	14.3
	Leader Teacher	7	16.7
Teaching Experience	5 years or less	11	26.2
	6-10 years	18	42.9
	11-15 years	7	16.7
	16-20 years	4	9.5
	21-25 years	2	4.8
What grade levels you teach	Grade 9	17	40.5
	Grade 10	21	50.5
	Both 9 and 10	4	9.5

4.2 Availability of technologies in the school

Technologies in a school were checked by a checklist observation of ICT tools and facilities in the school (Educational technology infrastructure, equipment, and services in the schools) used for the flipped classroom.

4.2.1 Availability of Technologies in Hawalla Wondo

Table 4-3 shows the listed seven ICT tools participants responded ‘Yes’ for two and the remaining five answered ‘No’. Hawalla Wondo High school has no availability of ICT tools and facilities such as Computers, Microsoft Applications, Social Media Applications, Computer laboratory rooms, and Plasma TVs. Therefore this school is not preferable for the flipped instructional approach.

Table 4-3 Technology and Equipment in Hawalla Wondo highschool.

ICT Tools and Facilities	Hawalla Wondo high school
Computers(laptops , desktops)	No
Internet Connection	No
Microsoft Application	No
Social Media Application	No
Printer and Photocopier	Yes
Electricity	Yes
Computer laboratory room	No
Plasma TV	No

4.2.2 Availability of Technologies in Gemeto high school

Table 4-4 show the listed seven ICT tools participants responded ‘Yes’ for two and the remaining five answered ‘No’. Gemeto Galle High school has no availability of ICT tools and facilities such as Computers, Microsoft Applications, Social Media Applications, Computer laboratory rooms, and Plasma TVs. Therefore this school is not preferable for the flipped instructional approach.

Table 4-4 Technology and Equipment in Gemeto High school.

ICT Tools and Facilities	Gemeto High school
Computers(laptops , desktops)	No
Internet Connection	No
Microsoft Application	No
Social Media Application	No
Printer and Photocopier	Yes
Electricity	Yes
Computer laboratory room	No
Plasma TV	No

4.3 Availability of technologies in a Home

4.3.1 Availability of technologies at home for Teachers

Accordingly, Table 4-5 shows the mean value for each technology available to teachers. For the listed five technologies participants responded ‘0’ for not accessible and 1 accessible SPSS reported. The mean values that approach one or above the fifty percent that is electricity, Smartphone’s, application software, and computers are 0.95, 0.86, 0.69, and 0.52 respectively, to mean the teachers have sufficient availability of electrical power, computers, tablets, and application software. However, the teachers have less internet connection because the mean value for the internet is less than fifty percent or 0.36. The calculated total mean is more than fifty percent or 0.68 which defines that the teachers had better technology availability for the flipped instructional method.

Table 4-5 Technologies availability for teachers

Equipment and Technology	Mean
Electricity	0.95
Internet Connection	0.36
Computers(laptops, Desktops)	0.52
Smart phones(tablets)	0.86
Application software	0.69
Calculated total mean	0.68

4.3.2 Availability of technologies at home for Students

Table 4-6 shows the mean value for each technology available to students. For the listed six technologies participants responded ‘0’ for not accessible and 1 accessible SPSS reported. The mean values that approach one or above fifty percent are electricity, television, and Smartphone’s 0.87, 0.77, and 0.51 respectively, to mean the students have adequate availability of electrical power, Smartphone’s, and television. However, the students have no sufficient access to the internet connection, computers, and application software because the mean values for these ICT tools are less than fifty percent or 0.25, 0.09, and 0.43 respectively. The calculated total mean is less than fifty percent or 0.48 which describes that the students have fewer technologies accessibility for the flipped instructional method.

Table 4-6 Technologies availability for students

Equipment and Technologies	Mean
Electricity	0.87
Internet Connection	0.25
Computers(laptops, Desktops)	0.09
Smart phones(tablets)	0.51
Application software	0.43
Television	0.77
Calculated total mean	0.48

4.4 Readiness of flipped classroom

4.4.1 Readiness of teachers for flipped classroom

Table 4-7 for the listed eight surveys of readiness participants responded with “1” for very low, “2” for low, “3” for medium, “4” for high, and “5” for very high SPSS reported. The teacher’s survey on the readiness of flipped learning obtained the total calculated mean of 3.95 which indicates most teachers are ready to implement the flipped instructional approach. As the result of the survey, most teachers can create relevant content and prepare pre-reading materials for the students, can prepare classroom arrangements and Time arrangements, are open and ready to use their technology for educational purposes, ready to send lectures using file sharing tools, able to make content accessible and relevant for all students, able to prioritize concepts used in direct instruction for learners to access their own, able to give students the opportunities to engage meaningful activities without the teachers

being central and finally most teachers can collaborate and reflect with other educators and take responsibility for transforming their practice.

Table 4-7 Readiness of teachers for flipped classroom

No.	Questions	Means
Q1	I can create relevant contents and prepare pre reading materials (lectures, videos, power points, sounds) for my students.	3.29
Q2	I can prepare classroom arrangements (the position of the chair for group activity) and Time arrangements (before class, in class, and after class).	4.10
Q3	I am open and ready to use my own technology (like hand held devices) for educational purposes.	3.86
Q4	I am ready to send lecture using file sharing mechanisms like telegram.	4.05
Q5	I can differentiate to make content accessible and relevant for all students.	3.98
Q6	I can prioritize concepts used in direct instruction for learners to access their own.	4.07
Q7	I give students opportunities to engage meaningful activities without the teachers being central.	4.00
Q8	I collaborate and reflect with other educators and take responsibility for transforming my practice.	4.24
	Calculated total mean	3.95

4.4.2 Readiness of students for flipped classroom

Accordingly, Table 4-8 shows the student’s survey on the readiness for flipped learning. For the listed six surveys of readiness, participants responded “1” for very low, “2” for low, “3” for medium, “4” for high, and “5” for very high SPSS reported. From the survey, the study attained the total calculated mean of 3.86 which indicates most students are ready to implement the flipped learning method. As the result of the survey, most students can take notes while watching educational materials, can learn conformability from educational materials, are ready to receive educational materials

using file sharing tools, are ready to study new materials to prepare for coming class, and open and ready to use their technologies for educational purposes, and finally most students are ready for classroom based on discussion and student interaction.

Table 4-8 Readiness of students for flipped classroom

No.	Questions	Means
Q1	I can take note while watching educational videos, lectures power point and sounds.	3.52
Q2	I can learn conformability from educational videos, sounds.	3.85
Q3	I am ready to receive educational materials using file sharing mechanism's, like Telegram	3.51
Q4	I am ready to study new materials to prepare for coming class.	4.02
Q5	I am open and ready my own technologies (like telephone) for educational purposes.	3.78
Q6	I am ready for classroom based on discussion and student interaction.	4.46
	Calculated total mean	3.86

4.4.3 Qualitative Results

There were two open-ended qualitative response questions at the end of the survey. The questions were as follows:

1. what are the challenges of implementing to send files (lecture, videos & sounds) for your Students in your subject?
2. What do you think are the opportunities to send files (lectures, videos & sounds) for your Students in your subject?

Each of these questions, in addition to the quantitative Likert-scale questions, assessed teacher perceptions of the Flipped Classroom. Common themes in teacher responses were put into a spreadsheet then coded and identified.

4.4.3.1 Challenges to send files (lecture, videos & sounds)

Teachers surveyed responded that the challenges of to send files (lecture, videos & sounds) file sharing Mechanisms. Teachers mentioned that they liked how they were shortages of technologies mate-

rials to sending lectures notes, videos and sounds. Teachers responded that lack of internet accesses for school and home, Wi-Fi (wireless networks) and the school is rural area.

In addition, a number of teachers responded not familiar our school, Students lack of materials, not ready Students to receive material's, not accessible Smartphone's, lack of student technology acceptance and lack of use telegram and emails.

4.4.3.2 Opportunities to send files (lectures, videos & sounds)

An opportunity to send files (lectures videos & sounds). Teachers mentioned that they liked how they were easy learning teaching process to sending lectures notes, videos and sounds. Teachers responded that Students easily participate in the classroom, time saving, increase student learning interest in the subject and Students to achieve high scores. In addition, a number of teachers responded the following responses,

- Work effectively and efficiently
- Develop student learning skills
- Easily to cover topics
- Develop teachers and student's computer skill
- Increase student learning motivation
- Smart teaching and learning activities
- To develop the students mind
- Better understanding with subject
- To be competitive
- Very good learning and teaching process

Table 4-9 Challenges and opportunity for flipped classroom

Challenges	Opportunities
<ul style="list-style-type: none"> ➤ lack of internet accesses for school and home ➤ Wi-Fi (wireless networks) and the school is rural area ➤ Students lack of materials, ➤ not ready Students to receive material's, not accessible Smartphone's, ➤ Lack of student technology acceptance and lack of use telegram and emails. ➤ Not all students will be centered 	<p style="text-align: center;">Students easily participate in the classroom</p> <ul style="list-style-type: none"> ➤ Work effectively and efficiently ➤ Develop student learning skills ➤ Easily to cover topics ➤ Develop teachers and student's computer skill ➤ Increase student learning motivation ➤ Smart teaching and learning activities ➤ To develop the Students mind ➤ Better understanding with subject ➤ To be competitive, Time saving ➤ Very good learning and teaching process ➤ increase student learning interest in the subject and to achieve high scores

4.5 Flipped classroom by ICT teachers

Based on the questions prepared for ICT teachers, the interview was conducted by telephone and in person.

1. Are there technologies in the home and hands?

For this specific question we have collected interview data from three ICT teachers. According to the collected data all the three ICT teachers have the access of electricity supply, Internet connection, laptop computer, smart phones or tablets, application software and television. This implies that all the ICT teachers are able to implement the flipped instructional approach in the school.

2. What technologies and Materials do you use In ICT Subject?

According to the interview data all the three ICT teachers have listed the following technologies and materials to use in ICT subject: - electricity supply, Internet connection, laptop or desktop computer, smart phones or tablets, application software and flash disk from interview.

3. How do you teach ICT Subjects with resources needed?

As the collected data by the interview, the selected ICT teachers answered different ideas to this particular enquiry. The teachers use lecturing method in the classroom, assisting students in the computer laboratory, sharing both hardcopy and softcopy textbooks and recommending necessary reference books in the library to teach ICT subject.

4. How do you teach on ICT without a computer laboratory room?

For this interview question, the selected ICT teachers responded in different ways. The teachers answered, as the situation is difficult, but they teach students by giving short notes on the blackboard from the textbook, by sharing softcopy materials for the students’ individual social media accounts such as telegrams, or by using the teachers’ individual laptop computers for the practical session. An ICT teacher1 told me “to give lessons in the absence of a computer lab by connecting my own laptop to plasma via a VG cable”. Similarly, an ICT teacher 2 “teaches in this way once a month, but directly from the book”. The third teacher said that “I prepares a PowerPoint for each chapter and gives priority to the students who have phones a week in advance so that they come prepared”.

5. How many times a week does you teach students in a laboratory?

The selected ICT teachers for the interview replied this question in two different ways. The first two teachers answered that they teach students in their own devices once a week whereas the last teacher replied that he teaches students in a laboratory twice a months because of the insufficient availability of the computer laboratory.

6. As ICT teachers, have you done the following activities in teaching and learning?

As the above Table, the selected ICT teachers for the interview are not adopting to use flipped instructional approach to teach the ICT subject in the school. Most teachers answered Negative or “No” to the methods of flipped instructional approach because most teachers are not agreeable to give students a note on their phones, to prepare PowerPoint lecture, to send lecture materials before students’ coming class and adopt to teach using cell phones in ICT Subject.

Table 4-10 Interviews for ICT teachers

No	Interview Questions	Responses		
1	You give students a note on their phones in ICT lessons.	Yes	No	No
2	You prepare PowerPoint lecture notes on ICT lessons.	Yes	No	No
3	They send learning materials to students before they arrive.	No	No	No
4	You teach using cell phones in ICT Subject.	Yes	No	No
5	You give students homework on their cell phones.	Yes	No	No

4.6 Students Result Before Experiment analysis

Based on table 4.10 shows the following results

- The Exam result students scored in Experiment group mean (16.60), standard deviation (3.596) and Control group was (15.60), standard deviation (0.966),
- Lab Result students scored in Experiment group mean (8.80), standard deviation (1.135), and means Control group was (9.00), standard deviation (0.943).
- Overall Result students scored in Experiment group mean (25.30), standard deviation (3.653) and Control group was (24.70), standard deviation (1.252) see table 4.10

Table 4-11 SPSS results before experiment

Group Statistics										
	School	N	Mean	Std. Deviation	Std. Error Mean					
Exam results	Hawela Wondo	10	16.60	3.596	1.137					
	Gemeto Gale	10	15.60	.966	.306					
Lab Result	Hawela Wondo	10	8.80	1.135	.359					
	Gemeto Gale	10	9.00	.943	.298					
Overall Result	Hawela Wondo	10	25.30	3.653	1.155					
	Gemeto Gale	10	24.70	1.252	.396					

Independent Samples Test										
		Levene's Test for Equality of Variances			t-test for Equality of Means			95% Confidence Interval of the Difference		
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Exam results	Equal variances assumed	49.021	.000	.849	18	.407	1.000	1.178	-1.474	3.474
	Equal variances not assumed			.849	10.292	.415	1.000	1.178	-1.614	3.614
Lab Result	Equal variances assumed	1.125	.303	-.429	18	.673	-.200	.467	-1.180	.780
	Equal variances not assumed			-.429	17.413	.673	-.200	.467	-1.183	.783
Overall Result	Equal variances assumed	23.385	.000	.491	18	.629	.600	1.221	-1.965	3.165
	Equal variances not assumed			.491	11.085	.633	.600	1.221	-2.085	3.285

The results as follows from SPSS statistical table (see table4.10)

- Exam Result: $p=0.407, t(18) = 0.849$.
- Lab Result: $p=0.673, t(18) = -0.429$.
- Overall Result: $p=0.629, t(18) = 0.491$.

Therefore,

- ❖ Exam Result: the difference in means (difference=1.000) was not statistically significant different in two groups ($t(18) = 0.849, p=0.407$) (see table 4-10). The upper and lower limits of the

95% confidence interval tell us that there can be 95% confidence that the population mean differences between two groups is between -1.474 and 3.474(see table 4-10).

- ❖ Lab Result: the difference in means (difference=-0.200) was not statistically significant different in two groups ($t(18) = -0.429$, $p=0.673$) (see table 4-10). The upper and lower limits of the 95% confidence interval tell us that there can be 95% confidence that the population mean differences between two groups is between -1.180 and 0.780(see table 4-10).
- ❖ Overall Result: the difference in means (difference=0.600) was not statistically significant different in two groups ($t(18) = 0.491$, $p=0.629$) (see table 4-10). The upper and lower limits of the 95% confidence interval tell us that there can be 95% confidence that the population mean differences between two groups is between -1.965 and 3.165(see table 4-10).

4.7. Students Result after Experiments Analysis

Based on Table 4-11 shows the results of the following

- The Exam result students scored in Experiment group mean (24.50), standard deviation (3.779) and Control group was (19.90), standard deviation (1.853).
- The Lab result students scored in Experiment group mean (16.90), standard deviation (1.197) and Control group was (14.50), standard deviation (0.850).
- The Overall result students scored in Experiment group mean (41.40), standard deviation (4.477) and Control group was (34.40), standard deviation (2.503).

Table 4-11 SPSS results after experiment

Group Statistics					
	School	N	Mean	Std. Deviation	Std. Error Mean
Exam Result	Hawela Wondo	10	24.50	3.779	1.195
	Gemeto Gale	10	19.90	1.853	.586
Lab Result	Hawela Wondo	10	16.90	1.197	.379
	Gemeto Gale	10	14.50	.850	.269
Overall Result	Hawela Wondo	10	41.40	4.477	1.416
	Gemeto Gale	10	34.40	2.503	.792

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Exam Result	Equal variances assumed	5.590	.030	3.456	18	.003	4.600	1.331	1.804	7.396
	Equal variances not assumed			3.456	13.092	.004	4.600	1.331	1.727	7.473
Lab Result	Equal variances assumed	6.000	.025	5.169	18	.000	2.400	.464	1.425	3.375
	Equal variances not assumed			5.169	16.233	.000	2.400	.464	1.417	3.383
Overall Result	Equal variances assumed	2.853	.108	4.315	18	.000	7.000	1.622	3.592	10.408
	Equal variances not assumed			4.315	14.126	.001	7.000	1.622	3.524	10.476

The results as follows from SPSS statistical table (see table 4.11)

- Exam Result: $p=0.003$, $t(18)=3.456$.
- Lab Result: $p=0.000$, $t(18)=5.169$.
- Overall Result: $p=0.000$, $t(18)=4.315$.

Therefore,

- ❖ Exam Result: the difference in means (difference=4.600) was highly statistically significant different in two groups ($t(18) = 3.456, p = 0.003$). The difference between the means of the result control and experiment group) with 99% confidence. There is strong evidence ($t = 0.003, p < 0.01$) that the flipped classroom model or the intervention of teaching improve results in two groups (see table 4-11). The upper and lower limits of the 95% confidence interval tells us that can be 95% confident that the population mean differences between two groups is between 1.804 and 7.396(see table 4-11).
- ❖ Lab Result: the difference in means (difference=2.400) was highly statistically significant different in two groups ($t(18) = 5.169, p = 0.000$). The difference between the means of the result control and experiment group) with 99% confidence. There is strong evidence ($t = 0.000, p < 0.01$) that the flipped classroom model or the intervention of teaching improve results in two groups (see table 4-11). The upper and lower limits of the 95% confidence interval tells us that can be 95% confident that the population mean differences between two groups is between 1.425 and 3.375(see table 4-11).
- ❖ Overall Result: the difference in means (difference=7.000) was highly statistically significant different in two groups ($t(18) = 4.315, p = 0.000$). The difference between the means of the result control and experiment group) with 99% confidence. There is strong evidence ($t = 0.000, p < 0.01$) that the flipped classroom model or the intervention of teaching improve results in two groups (see table 4-11). The upper and lower limits of the 95% confidence interval tells us that can be 95% confident that the population mean differences between two groups is between 3.592 and 10.408(see table 4-11).

4.8 Paired sample t-test

Table 4-12 shows that the summary statistics the two variables tested.

The mean of the result before experiment is 25.40 whilst the result after experiment is 25.30. Hence the means of result before experiment the same as result after experiment and the t-test now established if the difference is not statistically different. The numbers of valid observation in two variables are 10. The standard deviation for result before experiment is 3.534 whilst the result after experiment is 2.983, There is slightly more variability for result before experiment than the result after experiment. The standard error mean of for result before experiment is 1.118 whilst the result after experiment is 0.943.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Results before experimnet	25.40	10	3.534	1.118
	Results after experiment	25.30	10	2.983	.943

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Results before experimnet & Results after experiment	10	-.403	.249

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Results before experimnet - Results after experiment	.100	5.466	1.729	-3.810	4.010	.058	9	.955

Table 4-12 Paired Samples Statistics of results before and after experiment

Paired sample t-test (table 4-12)

The t statistics (t) is 0.058, and p-value (Sig. (2-tailed)) is 0.955. Therefore we can accept the null hypothesis (of no difference between the means of the result before and after experiment) with 99% confidence. There is evidence (t=0.058, p<0.01) that the flipped classroom model or the intervention of teaching no improve results in the same groups. The upper and lower limits of the 95% confidence interval tells us that can be 95% confident that the population mean differences between before and after experiment is between -3.810 and 4.010.

4.9 Benefits and challenges during flipped learning

4.9.1 Benefits of during flipped learning

1. Students' desire to learn is greatly increased. They read the educational material given to them, so they freely ask and answer educational questions.
2. Increased interaction between students and teachers. We discussed the lesson closely and freely with the teacher.
3. Students have shown good activity in discussing, asking, approaching and explaining in class.

Four of the students who have been attending their flipped classes said this

1. It is better if they have a broad understanding of ICT and it is given in this form without a computer at all.
2. Better results will be obtained if other teachers teach subjects that require labs in this way.
3. We study a lot during exams; this kind of teaching and learning process has reduced our time.
4. If we learn Microsoft Excel and Microsoft Access in this way, we will get good results.

4.9.2 Challenges encountered during flipped learning

1. Students are not familiar with the use of their phones, and although they have a better version of the phone, they do not use it much other than for games, music, and photography.
2. During the study session, students spend more time talking side by side than learning.
3. Students are used to reading from books, so it took time for them to understand quickly by watching different notes and videos.
4. It was difficult for the teacher to deliver lesson notes and videos as not all students opened Telegram. Also, students had difficulty downloading the sent videos due to the internet connection.

4.10 Major funding

The finding revealed the assessment of the potential flipped classroom instruction in the context of ICT subject in Hawassa rural vicinity secondary schools. This summary is in agreement with the basic research question. These include the extent of the ready for integration of flipped classroom instruction, teachers adopting flipped classroom instruction In ICT subjects in terms of approach and resources needed, and advantages of the flipped classroom over traditional teaching methods. Implement flipped classrooms has many factors

1. No Technologies and Equipment for flipped classrooms in both selected secondary schools to observe.
2. The total calculated mean of 0.68 which indicates most teachers have technologies used for flipped learning in their hands or at home.
3. The total calculated mean of 0.48 which indicates most students do not have technologies used for flipped learning in their hands or at home.
4. The total calculated mean of 3.95 which indicates most teachers are ready to implement the flipped instructional approach.
5. From the survey, the study attained the total calculated mean of 3.86 which indicates most students are ready to implement the flipped learning method.
6. After flipped classroom the experiment group high significantly different than the control group (between groups).
7. After flipped classroom the experiment group has not high significantly different before experiment result (within group).
8. The advantages of increased student academic performance, learning engagement, learning motivation, and teacher-student interaction.
9. The challenges to the flipped classroom are student discipline, students' lack of technology, and their lack of familiarity with the technology they do have.

4.11 Additional finding

There were many findings of teachers' readiness for flipped classroom.

1. They can create and developing content intentionally

In terms of preparing early reading materials and creating related materials, the mean was 3.29. In terms of making content accessible and relevant to all learners, the mean was 3.98.

2. They can create flexible Environment

The mean was 4.10 regarding teacher's classroom preparation and time management arrangements.

3. They can change learning culture

The mean was 4.00 in terms of providing opportunities for students to engage in meaningful activities without teacher guidance.

4. They can be professional Educator

The mean was 4.24 regarding of sharing experience with other teachers in coordination and cooperation.

5. They uses of technology

The mean was 3.86 in using their own technology such as phones for educational purposes. The mean was 4.05 in readiness to use information sharing methods such as Telegram to send educational content.

For flipped classroom Students' readiness

1. Group-efficacy

The mean was 4.46 when asked about preparation through discussion and interaction with students.

2. Motivation for learning

The mean was 4.02 in studying new materials and teaching aids.

3. self-efficacy

The mean was 3.70 to take what is suitable for education by seeing and hearing educational videos, voice and to take notes by watching educational videos.

4. Regarding the use of technology

In terms of using their own technology for educational purposes the mean was 3.78. When we look at their readiness to receive educational materials through technologies such as telephones, the mean was 3.51.

When we compare the results of the school before the experiment

1. Exam result

In Experiment group, the average score of 20% was taken from 16.60%, while that of Control group was 15.60, which shows that the results of both groups were close. T-test of p value=0.407 is not less than .05, this not significant difference between groups.

2. Lab result:

Based on a comparison of 10%, they scored 8.80% in Experiment group and 9% in Control group. This shows that the lab results were not different. T-test of p value=0.673 is not less than .05, this not significant difference between groups.

3. Overall result:

Based on the assessment taken from 30%, Experiment group scored 25.3% and Control group scored 24.7%. Looking at the difference, it's not far off. T-test of p value=0.629 is not less than .05, this not significant difference between groups.

When we compare the results of the group after the experiment

1. Exam result:

Based on the assessment taken from 30%, Experiment group scored 24.5% and Control group scored 19.9%. This shows that flipped learning can produce better results. T-test of p value=0.03 is less than .05, this is significant difference between two groups

2. Lab result:

In the comparison taken from 20%, Experiment group scored 16.90% while Control group scored 14.50%. That means a difference of two points. There is also a change. T-test of p value=0.00 is less than .05; this is significant difference between two groups.

3. Overall result:

In the assessment taken from 50%, Experiment group scored 41.40%, while Control group scored 34.40%. This has a 7% difference. T-test of p value=0.00 is less than .05; this is significant difference between two groups.

Chapter Five

Conclusion and Recommendation

5.1 Introduction

Throughout this research, an attempt has been made to assess the potential of flipped classroom instruction in the context of a high school ICT subject. This final chapter of the thesis contains three main parts: a conclusion, the contribution of the study, and recommendations. The conclusion part gives a summary of the results obtained in the course of this research work, whereas the recommendations part suggests directions for future research.

5.2 Conclusion

The main objective of this study was to assess the potential of flipped learning in selected schools, and based on the major finding, most teachers have the tools and technology to implement flipped learning, but most students don't have equipment or technology for flipped classroom methods other than electricity and televisions. There were a lack of tools and technology to run flipped learning in selected schools. Schools have no sufficient technology and equipment implement a flipped classroom method.

In selected schools, students and teachers are found to be ready for flipped classroom methods. The flipped classroom readiness scale is validated in this study. From the survey, the total calculated mean of teachers is 3.95 and students are 3.86, which indicate that they have high levels of readiness for flipped classrooms.

According to the data from the interviews, two out of three ICT teachers from the selected schools do not integrate the flipped teaching method with ICT education.

From the comparison result, the overall result shows that the mean difference =7.000 is a significant difference between groups of traditional and flipped classrooms ($t(18) = 4.315, p = 0.00$). It is evident that a significant difference exists in student academic performance between flipped teaching methods and traditional teaching methods after the experiment. The highest mean scores were obtained by the flipped teaching methods, and thus flipped teaching methods are thus suitable for student academic performance in grade 10 students in ICT subjects. However, within the group, the mean difference = 0.100, and there is no significant difference between traditional and flipped classrooms (t

(9) =0.058, $p=0.955$). Flipped classroom instruction encourages students to be more active and involved.

The major benefits of flipped learning in ICT education over traditional teaching are increased student results, student participation, student-teacher relationships are increased, and interest in learning is increased. The challenges of flipped classrooms are problems related to internet connection, students' lack of discipline, and students' not being familiar with the use of their cell phones. Flipped learning has advantages over traditional teaching methods.

5.3 Contribution of the study

1. The first contribution of the study is that flipped teaching methodology is a type of educational system designed to benefit students and teachers. Students can access the original information at home, often learning through video content, which allows them to adapt to the self-study process and learn at their own pace, increasing student achievement. On the part of teachers, it allows them to create new creative content, give students a better understanding of concepts, and have a better relationship with their students.
2. The second contribution of this thesis is the implementation of flipped classroom instructional approaches as an educational policy in our country. Particularly in ICT subjects. In our country's current situation, ICT infrastructure and plasma are inaccessible in all areas.
3. The third contribution of this study is to the research community in the sense that the work of this research can also be used as a starting point for flipped classroom instructional approaches that involve pedagogical education strategies in Ethiopia. Therefore, the beneficiaries of this research include students, teachers, schools, the minister of education, and other researchers.

5.4 Recommendation

Although the results of this research are encouraging, it is assumed that there is still much work that can be done to assess the flipped classroom instruction of high school ICT subject in this research. As a result, the following recommendations should be prioritized in future works to assist users with their information needs:

- ❖ In order to implement the flipped classroom methods successfully, schools' teachers and students require access to necessary technology and equipment. Teachers should make their students use the technology they have, such as phones, laptops, for the purpose of flipped learn-

ing and give them awareness. Students and teachers who find they are lacking in using technology should be supported with appropriate training.

- ❖ In Ethiopia's existing situation, where there isn't an ICT infrastructure for education that is accessible at all times and from anywhere, In the absence of this, using the Internet (including social media) as a teaching medium is one of the remaining feasible options. Another option is to connect students' BYOT or BYOD devices to the in-class technology. This can be done to extend classroom ICT services to educators' homes and other points of online content (Bati & Workneh, 2021).
- ❖ ICT teachers will be effective if you combine the lesson with flipped classroom instruction, and you will get a better experience from the fact that the lesson is a practical lesson.
- ❖ This study was conducted in rural schools in Hawassa and since schools in urban areas have better ICT infrastructure, it would be more plausible if the study is repeated in these schools.
- ❖ Teachers and students should use flipped classes on their own devices. Schools are a need to facilitate ICT infrastructure to use flipped classroom instruction as a continuing education policy.
- ❖ In this study small sample size and the fact that the students were not randomly assigned to two different teaching methods, it is recommended to increase the number of samples and select from various subjects and grade levels.
- ❖ This study was conducted in a short period of time, and only one content lesson per chapter was conducted owing to the limitation of time. Other studies may refer to the study in other secondary schools, subjects, and grade levels, and such future studies should be conducted long-term to determine the validity and reliability of the findings.
- ❖ The school, teachers, and students who are not familiar with these methods of the flipped classroom instruction should be made aware of these approaches and their implications. To determine flipped classroom readiness, additional experiment studies may be conducted.
- ❖ In this experiment, flipped classroom instruction students' results did not show a significant difference within groups (the same groups); future studies should be carried out on these methods.

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Appendixes

Hawassa City administration education department Secondary School Grade 10 ICT Pre Exams

Please fill the following information.

School Name		Date	
Student Name		Phone no.	
Sex		Grade and section	

Say True or False (5%)

1. The motherboard is the main circuit board in the system unit.
2. The CPU is often referred to as the “brain” of the computer.
3. The power supply is a device that converts DC to AC.
4. The speed of a computer means the capacity of storage.
5. Random Access Memory (RAM) is a volatile form of storage.

Multiple Choice Questions (5%)

6. Which of the following is not a characteristic of valuable information?
A. Irrelevant B. Up-to-date C. Accurate D. Reliable
7. Which of the following is not enclosed in System Unit of a PC?
A. UPS B. Hard disk C. Motherboard D. Power Supply
8. Which of the following is another name for primary storage?
A. CPU B. ROM C. RAM D. CD drive
9. Information can be used for a variety of purposes, not just one this refers to.
A. Complete B. Economical C. Flexible D. Relevant
10. Which one of the following is a not Web browser?
A. Internet Explorer B. MS-Word C. Opera Mini D. Google Chrome

Match the Following (5%)

- | | |
|-----------------------------------|---|
| <u>A</u> | <u>B</u> |
| 11. Motherboard | A. Convert Alternative current to Direct Current |
| 12. Power Supply | B. The main circuit in the system unit |
| 13. Hard Disk | C. The “brain “of computer |
| 14. CD-ROM Drive | D. Storage device to read data from optical disks |
| 15. CPU (central processing unit) | E. Data to be held in the form of magnetized spots. |

Answer the Following (5%)

- 16. Write types of networks and explain (2 points).
- 17. Identify and explain the components of ICT (3) Points.

Answer Sheet

1. _____	6. _____	11. _____
2. _____	7. _____	12. _____
3. _____	8. _____	13. _____
4. _____	9. _____	14. _____
5. _____	10. _____	15. _____
16. _____	17. _____	
_____	_____	
_____	_____	

Lab Part (10%)

- 1. Customizing computer desktop
 - A. Arranging Icons on the desktop by size
 - B. Change desktop background
 - C. Change screen saver on the desktop
 - D. Change the appearance of desktop

Appendix 1-1 Pre-Test questions

Hawassa City administration education department Secondary School Grade 10 ICT Post Exams

School Name		Date	
Student Name		Phone no.	
Sex		Grade and section	

Say True or False (5%)

1. MS-Word is not a member of MS-Office family provided by Microsoft.
2. Headers are the white spaces on all four sides of the text block.
3. A word processor, in general, can be used to manipulate the text in a variety of ways.
4. The Undo command cannot allow us to change our mind and restore text that we have just deleted.
5. Formats are used to make a document both more attractive and easier to read.

Multiple Choice Questions (5%)

6. Microsoft Word is an example of a/an?
A. Operating system B. Application software C. Processing device D. Input Device
7. What program is used in MS Word to check the spellings??
A. Outlook Express B. Spelling checker C. Thesaurus D. Templates
8. Which of the following companies developed MS Office 2007?
A. Corel B. Microsoft C. Apple D. Lotus
9. Which of the following is not a part of a standard office suit?
A. Database B. Spreadsheet C. File manager D. Word processor
10. Which is changing the text appearance by changing the alignment, style, font and font color?
A. Formatting text B. Editing text C. Inset tables D. None of these

Match the Following (5%)

- | <u>A</u> | <u>B</u> |
|------------|-----------------------------------|
| 11. CTRL+A | A. Paste the text |
| 12. CTRL+C | B. Copy the text |
| 13. CTRL+X | C. Open A file you have stored in |
| 14. CTRL+V | D. Cut the text |
| 15. CTRL+O | E. Select All the text. |

Fill the blank Space the following alternative words (5%)

Delete-Key Backspace Grammar-checker Bullets Saving-Documents

16. We can use _____ to set off lists where the order is not important.
17. Pressing _____ key deletes characters to the right of the insertion point.
18. _____ means storing, or preserving, a document as an electronic file permanently on hard disk.
19. _____ are programs that check the grammar incomplete sentences and awkward phrases.
20. Pressing _____ key deletes characters to the left of the insertion point.

Answer the Following (10%)

21. What is the importance of Word Processing? Discuss (5 points)
22. What are the advantages of using a word processor to create documents over typed documents?(5points)

Lap Exams(20%)

Please read carefully the instruction and do the following tasks.

1. Create folder “Tourism Ethiopia” in my documents
2. Open Microsoft word
3. Discuss the exploring word 2010(2007) Environment
4. Creating Documents in MS word Tourism Ethiopian

Tourism Ethiopia has adopted the international travel protocol introduced by the World Travel and Tourism Council (WTTC) that promotes safe travel during the COVID-19 pandemic. The international safety standard helps to minimize the risk of exposure to infection. The protocol promotes the wellbeing of tourists during travel starting from the airports all the way to tourist destinations

5. Saving the new document word 2010(2007) Environment My Document/ Tourism Ethiopia
6. Create tables and write the following

Sr. No	Tourist places in Ethiopia
1	Addis Ababa
2	Bahir Dar
3	Gondar
4	Lalibela
5	Axum

7. Closing documents.
8. Closing Microsoft word
9. Search the folder (Tourism Ethiopian)

Good Luck!!!!

Appendix 1- 2 Post-Test questions

This shows that students before Experiment (this difference between two schools before flipped classroom)

Student Name	Sex	Exam Result (20%)	Lab Re-sult (10%)	Overall Result (30%)	School
Control 1	Male	18	8	26	Group2
Control 2	Male	16	8	24	Group2
Control 3	Male	16	8	24	Group2
Control 4	Female	16	10	26	Group2
Control 5	Female	15	10	25	Group2
Control 6	Female	15	10	25	Group2
Control 7	Male	15	10	25	Group2
Control 8	Female	15	9	24	Group2
Control 9	Male	15	8	23	Group2
Control 10	Female	15	9	24	Group2
Experiment 1	Male	20	8	28	Group1
Experiment 2	Male	20	8	28	Group1
Experiment 3	Male	20	8	28	Group1
Experiment 4	Male	19	8	27	Group1
Experiment 5	Male	19	10	29	Group1
Experiment 6	Female	12	10	22	Group1
Experiment 7	Female	12	7	19	Group1
Experiment 8	Female	13	10	23	Group1
Experiment 9	Female	18	10	28	Group1
Experiment 10	Male	13	9	22	Group1

Appendix 1-3 Students result before Experiment

This shows that students after Experiment (this difference between two schools before flipped classroom and Traditional classroom) Hawalla Wondo used Flipped classroom and Gemeto Gale used traditional classroom

Student Name	Sex	Exam Result (30%)	Lab Result (20)	Overall Result (50)	School Name
Control 1	Male	21	15	36	Group2
Control 2	Male	21	14	35	Group2
Control 3	Male	17	14	31	Group2
Control 4	Female	23	16	39	Group2
Control 5	Female	20	14	34	Group2
Control 6	Female	21	14	35	Group2
Control 7	Male	18	14	32	Group2
Control 8	Female	21	16	37	Group2
Control 9	Male	19	14	33	Group2
Control 10	Female	18	14	32	Group2
Experiment 1	Male	20	18	38	Group1
Experiment 2	Male	26	16	42	Group1
Experiment 3	Male	26	16	42	Group1
Experiment 4	Male	29	18	47	Group1
Experiment 5	Male	19	16	35	Group1
Experiment 6	Female	28	18	46	Group1
Experiment 7	Female	24	16	40	Group1
Experiment 8	Female	24	18	42	Group1
Experiment 9	Female	20	15	35	Group1
Experiment 10	Male	29	18	47	Group1

Appendix 1-4 Students result after experiment

In Experiment Group Student results before and after four weeks

Student Name	Sex	SRBE	SRAE	School	Difference
Experiment 1	Male	28	23	Group 1	-5.00
Experiment 2	Male	28	26	Group 1	-2.00
Experiment 3	Male	28	26	Group 1	-2.00
Experiment 4	Male	27	29	Group 1	2.00
Experiment 5	Male	29	21	Group 1	-8.00
Experiment 6	Female	22	28	Group 1	6.00
Experiment 7	Female	19	24	Group 1	5.00
Experiment 8	Female	23	26	Group 1	3.00
Experiment 9	Female	28	21	Group 1	-7.00
Experiment 10	Male	22	29	Group 1	7.00

SRBE = Student Result before Experiment,

SRAE = Student Result after Experiment,

Difference = SRAE-SRBE

Appendix 1-5 Student result only experiment group

Hawassa University
Institute of technology
Department of Information Technology
Checklist formats

Table1: ICT tools and facilities in the school

(Educational technology infrastructure, equipment and services in the schools)

ICT Tools and Facilities	School Name	
	Hawalla Wondo high school	Gemeto High school
Computers(laptops , desktops)		
Internet Connection		
Microsoft Application		
Social Media Application		
Printer and Photocopier		
Electricity		
Computer laboratory room		
Plasma TV		

Appendix 1-6 School checklist observation formats

Hawassa University

Institute of Technology

Department of Information Technology

Questionnaire for Students

Dear respondent, my name is Endale Alemayehu and I am working my MSC degree at Hawassa University (HU). The purpose of this questionnaire is to collect data for the study entitled “**investigation of the potential of flipped classroom instructions in the context of it subjects in Hawassa vicinity rural secondary schools**”, which is intended to investigate the opportunities and challenges to adopt the flipped classroom for ICT subject in Hawassa vicinity rural schools. Therefore, I kindly request you to provide the necessary information and complete the questionnaire.

There is an objective type of questions. The objective questions are presented with alternatives, so you can put a ‘√’ tick mark in the provided boxes in front of the choice that describes. **You do not need to mention your name. And be informed that your responses will be kept confidential.** I appreciate your concern and willingness to share time for the questionnaire.

Instruction: Please, read and tick (‘√’) Mark for your response in the box for each question.

Section I: Personal details (for students)

1. Name of school:
2. Gender: - Male Female
3. Age: - below14 14-17 18-20 above 20
4. Your grade: -9 10 11 12
5. Your stream:- General Natural science Social science
6. How much does you achieved in ICT subject 2013 E.C?
<50 50-74 75-85 >85

7. Are there technologies in the home?

No.N	Technologies in Home	Accessible	Not Accessible
1	Electricity supply		
2	Internet connection		
3	Laptop, desktop computer		
4	Smart phones, tablets		
5	Application software		
6	Television		

8. The following set of questions asks you about your willingness to learn with technology. Answer the questions by putting ‘√’ marks? (1=Very low, 2=low, 3=medium, 4=high, 5= Very high)

No.	Questions	1	2	3	4	5
		(very low)	(low)	(medium)	(high)	(very high)
1	I can take note while watching educational videos, lectures power point and sounds. (ትምህርታዊቪዲዮዎችን እና ድምጽ ችን እያየ ሁሉንም ታወሻ ማድዘል ችላለሁ።)					
2	I can learn conformability from educational videos, sounds. (ከትምህርታዊቪዲዮዎች፣ ድምጽ ችየ ማስማማት ተቻልኩልሁ።)					
3	I am ready to receive educational materials using file sharing mechanism's, like Telegram. (እንደቴሌግራም ለፋይል ማጋራት ዘዴዎችን በማጠቃለያ)					
4	I am ready to study new materials to prepare for coming class. (ለቀጣይክፍል ለመዘጋጀት አዳዲስ ቁሳቁሶችን ለማጠቃለያ)					
5	I am open and ready my own technologies (like telephone) for educational purposes. (ለትምህርታዊ ዓላማ ራሴን ቴክኖሎጂዎች (እንደስልክ) ለማጠቃለያ ለማጠቃለያ ማድረግ ማዘጋጀት ማለት ነው።)					
6	I am ready for classroom based on discussion and student interaction. (በወይይት እና ከተማሪዎች ጋር ተገናኝቶ ለማጠቃለያ ለማጠቃለያ ማድረግ ማዘጋጀት ማለት ነው።)					

Thank You Again for Taking Your Valuable Time to Complete the Questionnaire!

Contact information Email: endalealemayehu009@gmail.com

Appendix 1-7 Student questionnaires'

Hawassa University

Institute of Technology

Department of information Technology

Questionnaire for Teachers

Dear respondent, my name is Endale Alemayehu and I am working my MSC degree at Hawassa University (HU). The purpose of this questionnaire is to collect data for the study entitled “**investigation of the potential of flipped classroom instructions in the context of it subjects in Hawassa vicinity rural secondary schools**”, which is intended to investigate the opportunities and challenges to adopt the flipped classroom for ICT subject in Hawassa vicinity rural schools. Therefore, I kindly request you to provide the necessary information and complete the questionnaire.

There is an objective type of questions. The objective questions are presented with alternatives, so you can put a ‘√’ tick mark in the provided boxes in front of the choice that describes. **You do not need to mention your name. And be informed that your responses will be kept confidential.** I appreciate your concern and willingness to share time for the questionnaire.

Section I: Personal details (for teachers)

Instruction: Please, read and tick (‘√’) Mark for your response in the box for each question.

1. Name of school
2. Gender:- Male Female
3. Age: 20-30 31-40 41-50 51-60
4. Education level:- Diploma BA/BSC MA/MSc
5. Your position as a teacher: Beginner Junior Teacher
 Higher teacher Leader teacher
6. Teaching experience: 5years or less 6 –10years 11-15years
 16-20years 21-25years 26years and more
7. What grade do you teach? (Select more than one if necessary)
 9 10 11 12

8. How many students achieved in your subject in year (2013 E.C)?

<50 50-74 75-85 >85

9. Are there technologies in the home?

N	Technologies in Home	Accessible	Not Accessible
	Electricity supply		
	Internet connection		
	Laptop, desktop computer		
	Smart phones, tablets		
	Application software		

10. The following set of questions asks you about your willingness to learn with technology. Answer the questions by putting '√' marks? (1=Very low, 2=low, 3=medium, 4=high, 5= Very high)

No.	Questions	1 (very low)	2 (low)	3 (medium)	4 (high)	5 (very high)
1	I can create relevant contents and prepare pre reading materials (lectures, videos, power points, sounds) for my students.					
2	I can prepare classroom arrangements (the position of the chair for group activity) and Time arrangements (before class, in class, and after class).					
3	I am open and ready to use my own technology (like hand held devices) for educational purposes.					
4	I am ready to send lecture using file sharing mechanisms like telegram.					
5	I can differentiate to make content accessible and relevant for all students.					
6	I can prioritize concepts used in direct instruction for learners to access their own.					
7	I give students opportunities to engage meaningful activities without the teachers being central.					
8	I collaborate and reflect with other educators and take responsibility for transforming my practice.					

11. What are the challenges in implementing to send files (lectures, videos & sounds) for students in your subject?

12. What do you think are the opportunities to send files (lectures, videos & sounds) for your Students in your subject?

Thank You Again for Taking Your Valuable Time to Complete the Questionnaire!

Appendix 1-8 Teachers' questionnaire

Hawassa University
Institute of Technology
Department of information Technology

Interview for ICT Teachers

Dear respondent, my name is Endale Alemayehu and I am working my MSC degree at Hawassa University (HU). The purpose of this interview is to collect data for the study entitled “**investigation of the potential of flipped classroom instructions in the context of it subjects in Hawassa vicinity rural secondary schools**”, which is intended to investigate the opportunities and challenges to adopt the flipped classroom for ICT subject in Hawassa vicinity rural schools. Therefore, I kindly request you to provide the necessary information and complete the interview.

General Information

School: _____

Grade you teaches: _____

Age: _____

Sex: _____

1. Are there technologies in the home and hands?

	Technologies in Home	Accessible	Not Accessible
1	Electricity supply		
2	Internet connection		
3	Laptop, desktop computer		
4	Smart phones, tablets		
5	Application software		
6	Television		

2. What technologies and Materials do you use In ICT Subject?

3. How do you teach ICT Subjects with resources needed?

4. How do you teach on ICT without a computer?

5. How many times a week does you teach students in a laboratory?

6. As ICT teachers, have you done the following activities in teaching and learning?

No.	Interview Questions	Responses
1	You give students a note on their phones in ICT lessons	
2	You prepare PowerPoint lecture	
3	You send lecture materials before students' coming class.	
4	You teach using cell phones in ICT Subject	
5	You give students homework on their cell phones	

Thank You Again for Taking Your Valuable Time to Complete the Interview!!

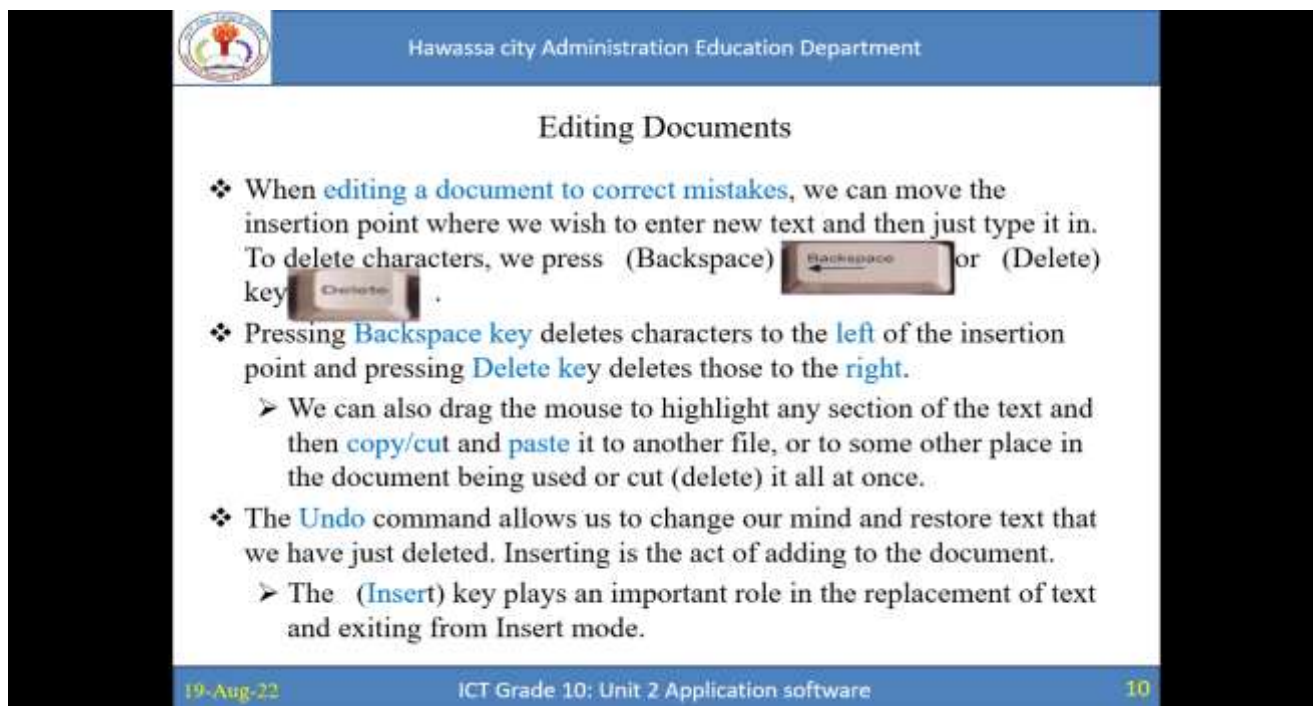
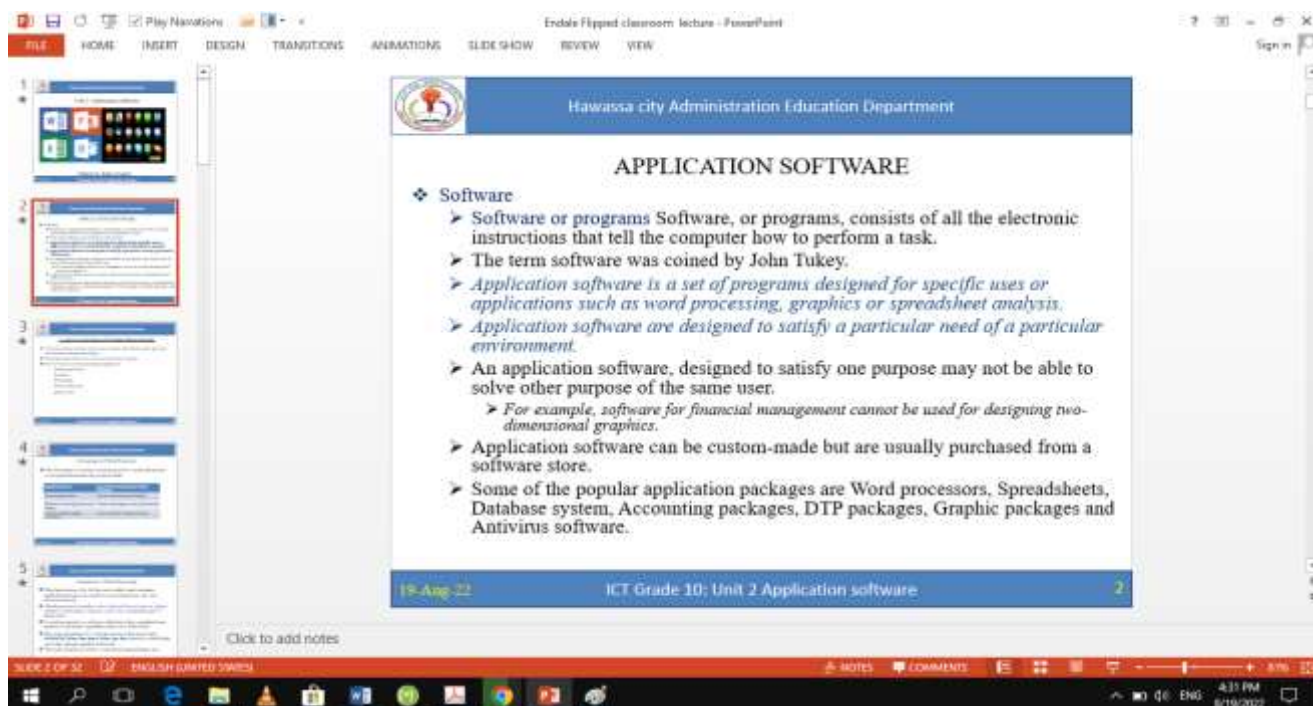
Appendix 1-9 Interview for ICT teachers



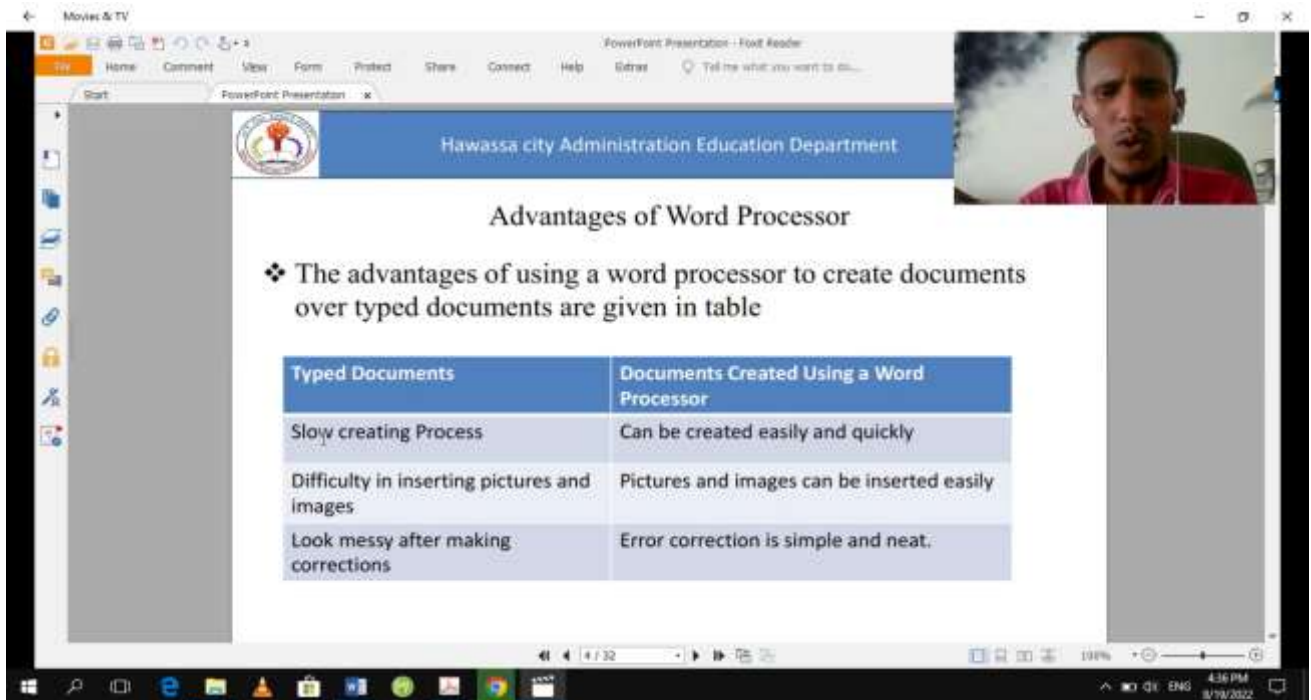
Appendix 1-10 Student exam setting in traditional classroom



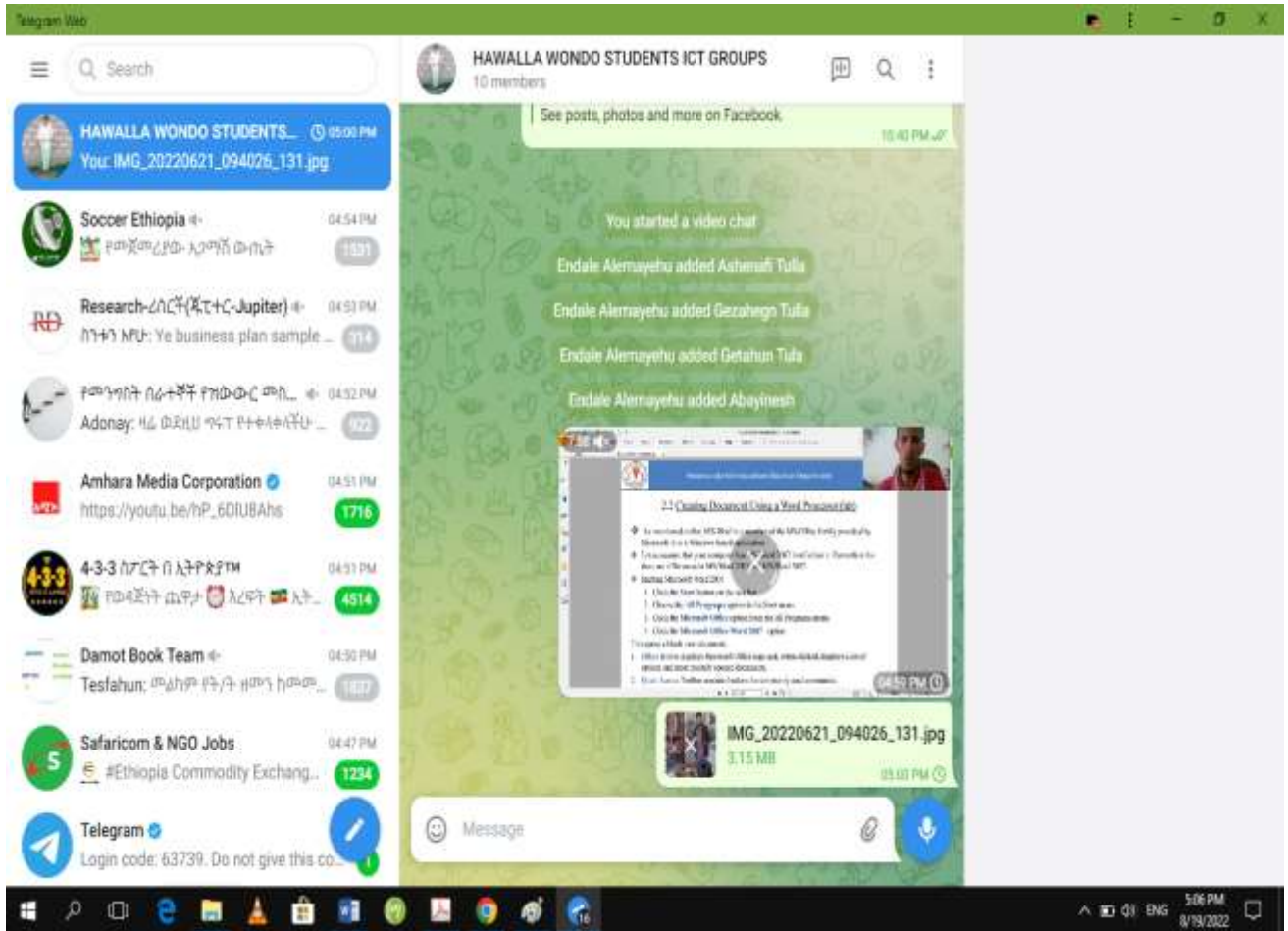
Appendix 1-11 Student class setting in flipped classroom



Appendix 1-12 PowerPoint lecture for flipped classroom



Appendix 1-13 Sample videos lecture for flipped classroom



Appendix 1-14 Flipped classroom group in telegram