ASHESI UNIVERSITY COLLEGE

EXPLORING THE USE OF TECHNOLOGY TO IMPROVE ADULT LITERACY IN GHANA

LEONARD NII ABOE ANNAN

2014

Thesis

Exploring The Use Of Technology To Improve Adult Literacy in Ghana

By

Leonard Nii Aboe Annan

Dissertation submitted to the Department of Computer Science

Ashesi University College

In partial fufillment of Science degree in Computer Science

April 2014

DECLARATION

I hereby declare that this dissertation is the result of my original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: …………………………………………………

Candidate's Name: …………………………………………………

Date: …………………………………………………

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision laid down by Ashesi University College.

Supervisor's Signature: …………………………………………………

Supervisor's Name: …………………………………………………

Date: …………………………………………………

ACKNOWLEDGEMENT

Contents

ABSTRACT

Adult literacy is not given much attention in Ghana. This can be clearly seen by the low number of institutions that provide adult literacy programs in Ghana. According to the Ghana Statistical Service, the literacy rate is only about 63.7%. This indicates the gap in literacy that needs to be filled in order to increase the literacy level in Ghana. Although some literacy programs exist, I believe that there must be alternative ways of providing these literacy programs to the citizens of Ghana. One solution I propose is the use of technology and that is my motivation for the study.

The aim of this project is to explore the use of technology in improving adult literacy programs in Ghana. In this study I developed an Android tablet-based tool that adopts a popular reading program called DISTAR. DISTAR is an acronym for Direct Instruction System for Teaching Arithmetic and Reading. In this study, this application was tested in comparison with two other learning methods to find out if a mobile application can compliment the learning process in adult literacy programs in Ghana. The study was conducted in using students from an adult literacy program called Adesua Ye, located in Berekuso in the Eastern Region of Ghana.

CHAPTER 1: INTRODUCTION AND BACKGROUND

"No country can really develop unless its citizens are educated."

-Nelson Mandela

"If you talk to a man in a language that he understands, that goes to his head, but if you talk to him in his language, that goes to his heart"

-Nelson Mandela

1.1 Overview

Literacy is important in our everyday lives. According to the Center for Literacy in the United States of America, "Literacy is a complex set of abilities needed to understand and use symbols and systems of a culture – alphabets, numbers, and visual icons – for personal and community development" (Center For Literacy, 2012). "The nature of these abilities, and the demand for them, vary from one context to another. These skills are clearly being found necessary in our everyday lives" (Center For Literacy, 2012). Several years ago, being literate meant being able to read and write a little. Now, being literate means being able to read and write at a level to be successful in today's world and also being proficient at math, knowing how to use technology, and knowing how to solve problems and make decisions.

The power of literacy lies not only in the ability to read and write but also in the individual's capacity to put those skills to use in shaping the

course of his or her life. Literacy is required for daily activities such as reading the post, filling in a job application, and helping children with their homework. This research seeks to identify some key issues in providing Adult literacy and how technology can play a role to help solve these issues.

In many countries, illiteracy is a national problem. According to the National Adult Literacy Survey, approximately 44 million people in the United States cannot read well enough to fill out an application, read a food label, or read a simple story to a child (Literacy Mid-South, 2012). According to the Ghana Statistical Service, the literacy rate in Ghana stands at 67.3% in 2013 (GSS, 2013). "The Non-Formal Education Division of the Ministry of Education took on the implementation of a national literacy programme due to the large numbers of non- literate adults in the country" (Ghana Statistical Service, 1987).

According to Dr. Hernandez from the U.S Department of Education, low literacy levels, especially in adult learners, can pose a public health challenge. "Current estimates from the National Centre for Education Statistics of the U.S. Department of Education suggest that 40 million adults in the United States posses only the most basic and concrete literacy skills. Increasing demands placed on literacy can limit opportunities in the workplace and access to health-related resources, negatively affecting public health" (McCardle, Hernandez, Miller, 2012). Some of these negative impacts can be seen across many nations. Some of the issues that illiterate adults face includes: inability to give the right

dosage of medicine to their child or themselves as a result of their inability to read the dosage label. Taking the wrong dosage with medicine can be severe and possibly lead to death. Another problem that illiteracy has caused in some countries worldwide is crime. According to Pro Literacy, there is a clear correlation between adult literacy and crime. Their statistics show that more than 45 percent of all inmates, 40 percent in state facilities and 27 percent in federal correction institutions in the United States did not graduate from high school (Pro Literacy). This point emphasizes the importance of education, especially adult literacy, because adults are in control of most of these social vices.

1.2 Background

There is an array of public, community and private adult literacy programs all over the world to help people who are in need of literacy skills. Some of these literacy programs include Pro Literacy, Centre for Literacy, and Institute of Continuing and Distance Education of the University of Ghana, Tools of a life time and many more. Although there is a need for literacy in the world, some of the adult literacy programs have expressed that people do not attend these programs. Most people who enroll as tutors or volunteers in literacy programs, especially adult literacy programs, do not participate in the whole curriculum. Part-time teachers and volunteers provide most of the instruction. As such, the agencies and organization that provide literacy services must deal with a host of persistent challenges, including insufficient and unstable funding, complex administrative requirements, multiple funding sources, and inadequate mechanisms for identifying and sharing effectives practices (Tools of a

Lifetime, 1993). What can be done about this situation? One possible answer is the use of technology to address these challenges (Tools of a Lifetime, 1993).

"Tools of lifetime" is an adult literacy program in the United States of America that makes use of technology to improve the illiteracy rate. They believe that technology can help in keeping people who are passionate about technology in the program. Also according to Tools of lifetime, providing learning materials in the form of videos can serve as a learning platform for busy mothers who spend most of the time at work. Multimedia technology like sound, intriguing graphics, and live action can provide a rich palette of resources for learning. For example a study requested by the House Committee on Education and Labor and the Senate Committee on Labor and Human Resources in the United States of America, sought to solve this problem of low literacy.

Ghana Institute of Linguistics, Literacy and Bible Translation (GILLBT) is an organization that works mostly in the Northern part of Ghana. GILLBT's Literacy and Development Department (LADD) promotes mother tongue and English reading, writing and numeracy among all people in Ghana. The LADD works in collaboration with non-governmental organizations such as the Gender Promotion Programme, Education and Training Section (GILLBT, 2011). The LADD literacy project focuses on Ghana's northern and central areas where poverty rates are highest and education levels lowest. The LADD literacy program is designed for adults

and young people and is taught at four different levels. These programs are listed below:

- Basic mother tongue: basic literacy skills in the mother tongue.

- Advanced mother tongue: consolidation to develop fluency and comprehension.

- Oral English: Introduction to spoken English (Ghana's official language).

- Written English: reading and writing English as the language of wider communication (LWC).

These programs help to increase the literacy level in communities in that region (GILLBT, 2011).

Center for Literacy is an adult literacy program that organizes classes to improve the skills of learners as a pipeline in preparing them for a national examination in the United States of America called the GED test. GED (General Education Development) tests are a group of subject tests which, when passed, certify that the test taker has American or Canadian high school level academic skills. The Center for Literacy organizes classes to improve the learners' reading, writing, language and math or technology skills. The classes are designed in small groups or as a whole class and address specific objectives that are defined during the orientation process (Center For Literacy, 2013). This adult literacy program, similar to the other programs listed above, aims to use literacy to empower the lives of adults through programs such as reading, writing, math and the use of technology.

1.3 Problem Statement

Adult literacy plays a key role in the development of the country as whole. The Non-Formal Education Division (NFED) of the Ministry of Education of Ghana is concerned with providing and coordinating non-formal education in Ghana (NFED, 1998). However as a result of the exigencies of the time, the Division took on the implementation of a national functional literacy programme due to the large number of non-literate adults (5.6 million adult Ghanaian illiterates (GSS, 1987) in the country (Berdie, 2012). Some of the programs that have been established to promote literacy among adults are GILLBT and the Department Community Developments of the then Ministry of Social Welfare (Berdie, 2012). Today there are a number of Adult Literacy providers in Ghana, for example GILLBT, Literacy Bridge (Literacy Bridge, 2013), and the newly established Adesua Ye Literacy Foundation[1] , but there is still a low level of literacy in Ghana. According to Susan Berdie, NFED attributed the low literacy to some challenges. Some of these challenges are listed below;

- Sustainability of learning outcome: Ghanaian adult learners are able to achieve better in reading whilst weaker achievements are recorded in numeracy and writing skills respectively (NFED, 2007). NFED refers to the four blocks of partners in the education environments described by Dr. Atengdem as important stakeholders in sustaining education. He described these stakeholders as self; parents/guardians; policy makers/

[1] www.adesuaye.org

administrators/government and society and the educationist/ school system (Atengdem, 2012).

- Weak policy and legislative framework.

- Remuneration and training of facilitators- Facilitators and teachers in this particular sector of the Ghana Educational Service are not properly trained for the sessions. According to Berdie Susan, they are not paid well; therefore most of the people who facilitate these programs are volunteers who work for free. This affects the performance and credibility of their teaching strategies.

Addressing these problems is essential to improving adult literacy in Ghana. According to the NFED, the government plays a key role in solving issues related to Adult Literacy Programs in Ghana. With these problems listed by NFED in mind, this research paper seeks to suggest a design that would help students to learn on their own without tutors.

1.4 Objectives

The general objective of this study is to investigate the role of technology in adult literacy and to explore how technology can improve literacy in Berekuso.

The specific objectives of this study are outlined as follows:

- To investigate the traditional methods of teaching literacy.

- To investigate some existing types of technology-based learning tools that incorporate mobile, tablet and computer for both adult literacy programs and other literacy programs.

- To examine the effectiveness of some of these tools in facilitating adult literacy programs.

- To develop an Android-based tutor for adult literacy programs in Ghana.

1.5 Significance and rationale of study

During my research, I discovered that there was not much research conducted in relation to the role of technology in adult literacy. I realized that most of the articles, books and journals I found which talked about technology in adult learning were directed towards students learning how to use tools such as Microsoft Office. Hence:

- This thesis will serve as a foundation for further research on using applications on platforms such as Android to improve the quality of learning methods for adult literacy programs. The research paper considers three different learning methods and measures the impact. These methods are: the DISTAR program, a self-guided learning method and lastly a tablet based learning tool that incorporates the DISTAR program's learning method in a native Android application. DISTAR is an acronym for Direct Instruction System for Teaching Arithmetic and Reading (Engelmann, 1983). The DISTAR program has been used extensively in many literacy programs for children, and has extensively is described in Chapter 3.

- This research will introduce new innovative solutions in technology that can be used to increase the level of literacy in Ghana.

1.5 Research Questions

1. What are some of the issues that compromise the effectiveness of adult literacy programs?

2. What are some of the success stories of approaches that have worked and have been found in the adult literacy programs?

3. How can these elements be merged with technology to enhance adult literacy in Berekuso?

1.6 Target Group

Berekuso is a small town with a population of about 2000 people in the Eastern Region of Ghana. The town has two basic schools, a community hospital, a mosque and quite a number of churches. The research will focus on the people of Berekuso. I sampled a group of people that I advocate the view that it would be good focus groups because the current adult literacy program that runs in Ashesi University targets this group of people. The focus group will be selected from the list below;

- Young adults in Berekuso who dropped out of school because of financial reasons.
- Full-time homemakers who want to help their children with their homework
- People who need to improve their mathematics or English skills to gain employment or be promoted at work.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This literature review will provide research that has been done on the use of technology in literacy programmes with focus on adult literacy. The review will begin by exploring adult education. Secondly, the review will give insights on research that has been done on adult literacy programs that use technology. The positive and negative impact of technology in adult literacy programs will also be discussed. Lastly the review will analyze the connection between educators and their views and experiences using technology in adult literacy programs.

2.2 Adult Education

According to UNESCO, the aim of education for children, adults and seniors is to train them in spirit, to enable them to freely judge. Education also has some practical aim, however, its ultimate aim is humanistic (UNESCO, 2013). There is a need for literacy programs in Ghana to help people learn how to read and write. According to statistics from the World Bank, as of 2009, there was about 66.62 percent of people aged 15 years and above who could read and write simple statements (Trading Economics, 2009). The need for higher literacy cannot be understated especially because, it has an influence on the development of a nation.

2.3 Adult Literacy Programs that use Technology

One technology that has been used to promote literacy among adults especially farmers in rural areas is Talking Book[2]. Talking Book is an innovative low-cost audio computer designed for the learning needs of illiterate populations living in the poorest areas in the world. A farmer named Gbare- Naa Avielezie was a user of the Talking Book, which he used to help him manage his farm. This farmer was later named the Best 2013 Farmer in millet cultivation in Ghana (Literacy Bridge, 2013). This success story can be related to the role technology has played in distributing key information to farmers and many more illiterate adults.

Project ABC is another literacy program that uses technology. Project ABC stands for Alphabetization de Base par Cellulaire. It is a mobile phone-based literacy and numeracy program in Niger in the Sub-Saharan Africa. The program uses mobile phones to provide literacy and numeracy tutorials via voice and SMS (Project ABC, 2010). After running this technology-based program for about year, assessments done by Project ABC showed that the platform helped to increase the literacy ability of its users (Project ABC, 2010). This second example of an adult literacy-learning tool that integrated technology emphasizes that technology is significant to expanding the learning methods of adults that need in to acquire literacy skills. The impact that these two technology based literacy learning tools This is one way that I believe technology can be a platform to improve literacy.

---

[2] www.literacybridge.org

Although only a minimal amount of research has been done on technology in literacy programs, the current trends from the research that has been conducted show that integrating technology as part of learning of literacy programs will cause a huge improvement in every day classroom activities (Northrop & Killeen, 2013). Records show that, approximately 82 percent of adult literacy programs use technology for administrative purposes however technology is not often integrated in facilitating teaching and learning (Hopey et al, 1996). Although technology is not largely integrated in literacy programs, it has been suggested that, integrating technology in adult literacy programs can increase student engagement and motivation (Chiong, Ree, Takeuchi & Erickson, 2012). To facilitate students learning on their own technology is a good platform to facilitate that learning process. Devices such as tablets can be used to enhance independent level learning (Duke & Pearson, 2002; Pearson & Gallagher, 1983).

2.4 Impact of Integrating Technology in Literacy

Integrating technology into literacy programs has become necessary because, technology is now an important component of a globally linked classroom (Suarez-Orozco, 2007). Technology creates a platform for students not only to share information but also to enhance the relationship between the elementary classroom and the global classroom. Today's technology offers enormous potential for substantially transforming the adult literacy, in order to improve learning methods that are applied in teaching students.

Traditional learning methods can be improved with the aid of technology. For example technology can be used to cause students to engage in more critical thinking, and prompt tutors to question and modify previous assumptions about the ways of teaching and learning (Fisher, Dwyer & Yocam, 1996).

Research has shown that some adult literacy educators advocate the view that incorporating technology is valuable means of facilitating the learning process in literacy programs (Langille, 2004). Askov and Bixler (1998) further suggest that integrating technology in adult literacy programs helps adult learners to enhance their use of technology, as well as develop skills in logic and problem solving. Therefore, the integration of technology is making it easy for adult learners to adapt to the fast moving innovation in technology in the today's world. It is for this reason that it is believed that the self paced, student-directed learning experience that computer integration offers is beneficial for adult learners since they are able to take ownership of their own education" (Osei, 2011).

According to Fox, statistics in 1998 shows there were fewer than four million mobile phones in Africa. However, there has been an increase by 500 million (Fox, 2011). This shows that a mobile application may have the potential to effectively support adult literacy because it can reach a lot of people who need improvement in their literacy level in the continent.

2.5 Arguments Against The Use Of Technology

Several adult literacy educators have not integrated technology into their program for different reasons. Some of these reasons include: lack of funds, technology and time (Langille, 2004). Despite findings about the positive impact of computers on writing, there also exist some arguments that computers have the potential to have a negative impact on writing for some people (Langille, 2004). For example Ragsdale (1997) argues that some people experience difficulty when their first writing experience is done using computers.

2.6 Conclusion

Technology has a potential to benefit adult learners enrolled in literacy programs; however this literature review shows that there is not enough research that has been done to test the effectiveness of technology use in the context of adult literacy programs in Ghana.

From Fox's (2011) report about the increase in the use of mobile phones. Adult learners retaining control of their learning process can serve as a motivation for people who cannot get access to adult literacy programs. Using technology within these literacy programs does not mean it must be used in a classroom but it can be designed in a way that will allow the learners to use it outside of the classroom as well. For example a mobile application may be a good platform for use both in the literacy program and in daily life in order to help low level literate adults become improve their literacy. This is because with a device that can be carried

around, it will be easy to get access to the learning materials, with suitable teaching methods.

The literature shows that there has been some discussion about integrating technology in adult literacy. Not much research discussed applications or software that are used in adult literacy programs to improve reading. My research seeks to investigate if a tablet-based application will help improve the reading skills of adult learners.

This literature review shows that there are some barriers that are responsible for this lack of technology integration.

CHAPTER 3: METHODOLOGY

3.1 Introduction

The objective of this study was to explore the role of technology in adult literacy programs and to find how technology can improve literacy in Ghana, specifically Berekuso. . As such, this study sought to use three learning methods to measure the impact of technology, in order to achieve the objectives of this research.

The three learning methods include: lessons from an android based learning tool that adopts some lessons from the DISTAR Reading program, the already existing textbook "*Teaching your child how to read in 100 easy lesson*" for the DISTAR reading program and lastly a self guided learning method.

The android application called the Adesua Ye Learning Tool adopted some lessons for the DISTAR reading program as a tablet based application. It was designed and developed to serve as an alternative tutor to adults, in order to facilitate the teaching and learning process in the ongoing literacy program in Berekuso, which has been set up by the Adesua Ye Literacy Foundation.

The application was tested using students that were selected randomly from the Adesua Ye literacy program. The research strategy was to do a random sampling and data collection was done through a qualitative and quantitative approach.

3.2 DISTAR Reading Program

This chapter focuses on using technology to adapt a popular reading program called DISTAR. DISTAR is a very scripted direct instruction program for teaching phonetics.

Siegfried Engelmann, the author of "*Teaching Your Child to Read Using 100 Easy Lessons*" advocates that, the DISTAR Reading Program is one of the best approaches to help people read regardless of their ages (Engelmann, 1983). This has been proven through some studies about the effectiveness of DISTAR program.

3.2.1 Relevant Study On The Effectiveness Of DISTAR

DISTAR has been involved in more than a dozen comparative studies. "The largest single study in which DISTAR was involved was the comparison of the US Office of Education Follow Through sites – the largest educational experiment ever conducted" (Engelmann, 1983). During this experiment, various geographic sites in the United States selected a specific educational program from a list of programs. The experiment was for each site to select a program for teaching children in kindergarten through grade three. This program consisted of more than ten thousand children from the University of Oregon.

DISTAR programs have proven to be more effective than other programs because these programs control more of the details that are important to successful teaching. I hold the position that, this reading program can be an effective way to teach adults how to read. It is for this

reason that this program was incorporated into the design of lessons for the Adesua Ye Learning tool.

3.3 Research Strategy

The research approach employed for this study was qualitative and quantitative.

The quantitative approach was applied in order to measure the effectiveness of the Adesua Ye Learning tool. Before talking about the variables, it makes sense to explain that the students were assessed before and after using one of the three methods for a 2-week period. During the assessments, the following three variables were measures: the total number of words read correctly, the total number of tries of each word and time taken to read the words and sentences. I looked at the pre-test and the pro-test to determine the effectiveness of the Adesua Ye Learning Tool.

The qualitative approach was chosen in order to have an in-depth understanding of how each student performed during the experiment. The tutors that monitored the students recorded an overall score to gauge the performance of the students based on their observation of how well the students performed. This qualitative recorded overall performance of each student during the test based on the tutor's view of how well the student performed.

3.4 Sample Selection

In this research, I gathered the impact of three learning methods on a current adult literacy program called Adesua Ye Literacy Foundation. There are two divisions in the program: the Advanced and Beginners class. Adesua Ye, which stands for "Education is good", is a non-governmental organization that is aimed at educating the youth in Ghana to use critical thinking, ethics and technological competence to transform their respective communities. I chose the Adesua Ye program because it is an Adult Literacy program that is currently running for the people of Berekuso. In addition, since my target group is Berekuso doing my test in Adesua Ye will be the best platform to test the research.

To ensure that the selection of the sample was not biased, I used a random selection of the population of the beginner's class. Nine (9) students from the beginner's class of the Adesua Ye program were randomly assigned to one of the three learning methods for testing. These three learning methods are: include the Adesua Ye Learning tool that was developed by the researcher, DISTAR Reading program and self-guided tutoring system.

The group I chose for the test was the Beginners class for the following reasons:

- Students were not able to pronounce words and letters accurately.
- Students are not able to identify words they are taught in class.

The students were selected to provide feedback on the effectiveness

of these learning methods on their reading abilities. There was be a balance of both males and females.

The participants were grouped into three from the Beginners' Adesua Ye class. In order to compare the three learning methods, the nine selected students were grouped into three equal groups. Table 1.1 clearly shows a summary of the distribution of students for the three learning methods that were investigated.

Table 1.1 The number of students for each learning method

Methods	Number of Students
DISTAR	3
Tutor	3
Adesua Ye Learning Tool	3

3.6 Data Collection

3.6.1 Pre – Test & Post Test

The performance of students was recorded both before and after the learning methods were introduced to them collected data. As such, there was a pre-test and post- test that was designed for this purpose. The pre-test was conducted first. Ten working days after the learning methods were introduced to the students, the post-test was conducted. Both the pre-test and post-tests were divided into two sections: Part A and Part B. Part A of the test dealt with questions that use the first two lessons of the DISTAR reading program and some of the materials they were learning in class. Part B of the test included sentences constructed with combinations of letters from the DISTAR reading program and

materials from class sessions. The scores from both the pretest and posttest were compared to know if technology can be an alternative to support facilitating reading in adult literacy programs.

3.7 The Three Measuring Variables

The learning methods were used during the last 30 minutes of the class for ten days. To measure each learning methods I used three variable for the pre-test and post-test. The three measuring variables included the following:

- Number of words read correctly – Tutors of the Adesua Ye program monitored students to read each word. A score of one point was given for each word/sentence that was read correctly. Half a point was given when the person was close to pronouncing the word correctly. The total number of words read correctly was collated for both pre and post-test.

- Number of tries to read each word – Tutors also monitored the number of tries each student used to read each word. The number of tries allowed was indefinite until the student chose to skip the word. The total numbers of tries to read each word was collated for both the pre and post-test.

- Time – While the students were reading the words, tutors kept a timer to track the length of time it takes each student to pronounce a word correctly. The time was recorded for the whole test.

21

These three variables were chosen because I hold the position that they are good measurements that can inform me about the reading abilities of an adult learner.

3.8 The Three Learning Methods

3.8.1 Using DISTAR Program

Participants that used this method were directed to follow the steps in the textbook called "Teaching Your Child to Read in 100 Easy Lessons". This textbook adopted the DISTAR reading program. Three students had a tutor to guide them through the DISTAR Reading program. These one-on-one sessions took place after the already existing class schedule, for about 30 minutes each day. This learning method required a tutor to guide the students through the reading program. Tutors from the Adesua Ye program helped the student to practice reading using the reading program. The DISTAR reading program uses phonemes to teach people how to read. It takes a step-by-step approach to pronounce each letter at a time. For instance a word like "me" is read by with emphasis on 'e'.
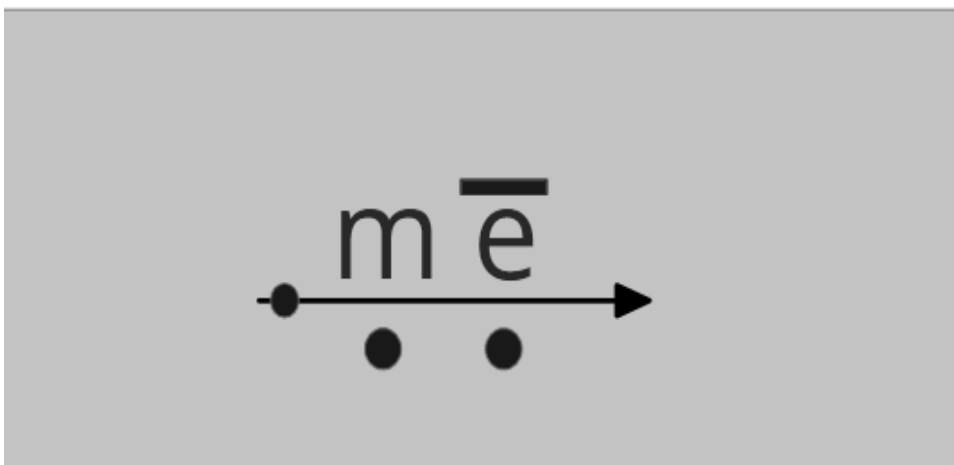
Sample Lesson from DISTAR Reading program (Engelmann, 1983)

For each word, the participant first touched the big ball at the beginning of the arrow that runs under the word to be read. The tutor would tell the learner to "sound it out". Then he/she would move to each ball on the arrow and stop for at least one second. (One second is not one instant. It is a fairly long time. This means, the participant was to say "mmmeeeee", not "mmm" – pause-"eee". This will help the participant to remember and learn how too pronounce words with similar characters.

For further studies,other lessons have some words end in sounds that cannot be held for a long period of time. In his instructions for using the approach, Engelmann explains that other lessons have some words end in sounds that cannot be held for a long period of time. The tutor should thus present these words almost the same way as they would present words with sounds that can be held (Engelmann, 1983). The only difference is that you do not stop at the last full sound for a full second (Engelmann, 1983). The screenshot of an example of a different lesson is shown below.

1) Start with your finger here

s a t

2) Move quickly 3) Move quickly 4) Move quickly

Sample Lesson from DISTAR Reading program (Engelmann, 1983)

Hold for at least one

Hold for at least one

Hold for an instant
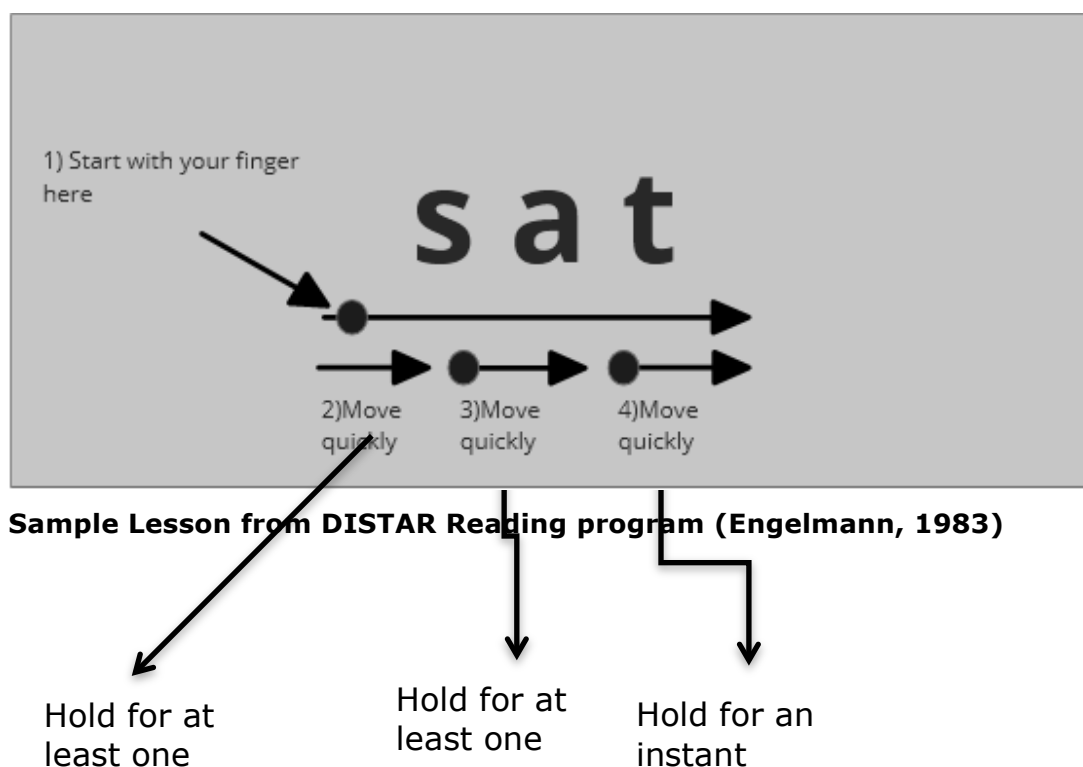
The program script for each task provides the response the learner is supposed to produce. For example, the word above is "ssssaat". The response shows that the reader holds the first sounds but does not hold the last sound. I selected four lessons from the textbook, "Teach your child how to read in 100 Easy Lesson" to do my testing.

3.8.2 Using the individual self guided review sessions

Participants that used he self-guided tutoring system did not use any of the learning materials but would revise what they are learning in class.

Three students did not use a tablet or the DISTAR reading program. They were allowed to have their own extra private study. The participants had the opportunity to interact with the tutors and ask any questions about what they learnt during class sessions.

3.8.3 Using the Adesua Ye Learning Tool

I developed a tablet-based tool that adopted the DISTAR Reading program. Unlike the DISTAR program that was talked about initially, this learning method exempts the tutor from the learning process. The goal of this tablet-based tool is to complement the class sessions in order to help students also learn on their own with technology. This tablet-based tool is called the Adesua Ye Learning Tool. The Adesua Ye learning tool is an Android tablet-based tool of the DISTAR reading program. This tool had lessons from the DISTAR reading program. I selected some lessons, which were not in line in what they were doing in class. Three students were given the tablets with the application to use for the testing period. Students were not allowed to take the tablets home. Students learned to read each word in the three lessons that were provided on the application. In cases where the student needed help pronouncing a word or verifying if the word had been correctly pronounced, the help button was clicked to handle the verification.

3.8.3.1 Overview

Adesua Ye Learning Tool was intended to run on Android devices such as phones, tablets and other more. I chose an Android device

because the android devices were resources available from the Computer Science Department of Ashesi University College.

3.8.3.2 Product Functions

This product will perform the functions below:

- The beginning exercises are simple and do not resemble later exercises.

- The product provided help for an Adult Learner who is expected to use it in performing even the simplest reading exercises.

- The exercises change form slowly, and the changes are relatively small, so that the exercises are always relatively easy for the Adult Learner.

- At every step, the program provides very clear and unambiguous communications with the Adult Learner.

3.8.3.3 User Classes and Characteristics

The User (Adult Learner) must have basic knowledge on how to use computer applications. Students without any knowledge about the use of technology will be trained on how to use the application.

3.8.2.4 Assumptions and Dependencies

Before I left the participants to use the application on their own I did the following four things.

- Make up a teaching schedule

- Practice one lesson with them.

- Teach them how to use the application for a few minutes.

3.9 Study Setup and Procedure and Tasks

After the participant signed consents to take part in the study, the study was carried. A summary of the testing procedure is as follows:

Step 1: Get records from pretest.

Step 2: Participants used these methods of learning outside the classroom for a period of ten days.

Step 3: Participants took the same test and their scores will be measure again.

Step 4: Results was to be analyzed to measure differences.

3.10 Data Analysis

The results of the test both before and after the use of the three learning methods were gathered for ten days and later analyzed to measure the impact of all the three learning methods. Data collected from the test was to determine whether the students who used the technology improved their reading abilities.

3.11 Ethical Considerations

The major ethical consideration was to ensure respondent's anonymity throughout the analysis process. This ethical consideration was addressed in a consent form that was signed by the Human Subject Review of Ashesi University College.

3.12 Limitations

Some of these limitations included resources, availability of participants and time.

- Resources – The test was conducted on only 9 students because of the number of tablets that was available for the research. I have 3 tablets available for the test and thus it meant I had to test using three students on each learning program.

- Small sample size – The beginner's class had a total number of 10 students in the program and that also affected the number of people to do the test.

- Time constraints – Time was a factor during my testing since I had to develop the application before doing my test. This limited the amount of time I could do my test before doing my analysis.

Chapter 4: Findings

4.1 Introduction

This chapter discusses the findings of the study based on the data obtained from the pre-test and post-test (which were explained in the Methodology). It also comprises analysis and interpretations of the data collected in relation to the study. The findings from the test are presented in tables and bar graphs to make the data obtained understandable. The test was conducted on nine (9) students from the Adesua Ye Literacy Program. The methodology required that three learning methods were applied in addition to the current two hour daily sessions administered by an Adesua Ye tutor. Out of the nine students, there were three students that took part in each of the three learning methods. The three methods of learning are shown in the table below:

Methods	Number of Students
DISTAR Reading Program	3
Adesua Ye Learning Tool	3
Self Guided Review Sessions	3

The analysis also includes feedback obtained from the tutors about the overall performance of the students during the data collection period. Ultimately, the data obtained played a key role in addressing the research questions and objectives of this study.

4.2 Details of Test Result Findings

This section summarizes the performance of each research participant. The total number of participants for the research was nine

(9) students from the beginner's class. The research participants were between the ages of 18 and 50. The students were not ardent users of data mobile technology and for some of the participants it was their first time of using a tablet.

To begin the test, a quiz was conducted to find out the initial performance of the students before the learning methods were applied. This was the pre-test, which was measured with the following four variables: the number of words read correctly, the total number of tries on pronouncing each word, and time taken to pronounce a word correctly and lastly the overall performance which was indicated by the tutor of the program. The maximum possible scores was for the number of words read correctly was fifty-seven, which meant that, one point was scored for every word pronounced correctly. The scores from the test were put in a table (See Appendix B). Table 4.1 shows the total scores from this pre-test. The test was carried out over a period of two weeks, where students assigned to a particular learning method spent thirty minutes each day for ten days using that learning method. After ten days, the same quiz administered during the pre-test stage was conducted again and the results are shown in Table 4.2.

4.2.2 Interpretation of Results from Pre-test and Post-test

Figure 1.1: Graph Showing The Total Number Of Words Read Correctly By All The Students Under Study

	Adesua Ye P1	Adesua Ye P2	Adesua Ye P3	Distar P4	Distar P5	Distar P6	None P7	None P8	None P9
Pre-Posttest Gain	6	10	5	8	-3.5	25	5.5	-5	2
No of words	50	47	44	37	3.5	0	48	55	17
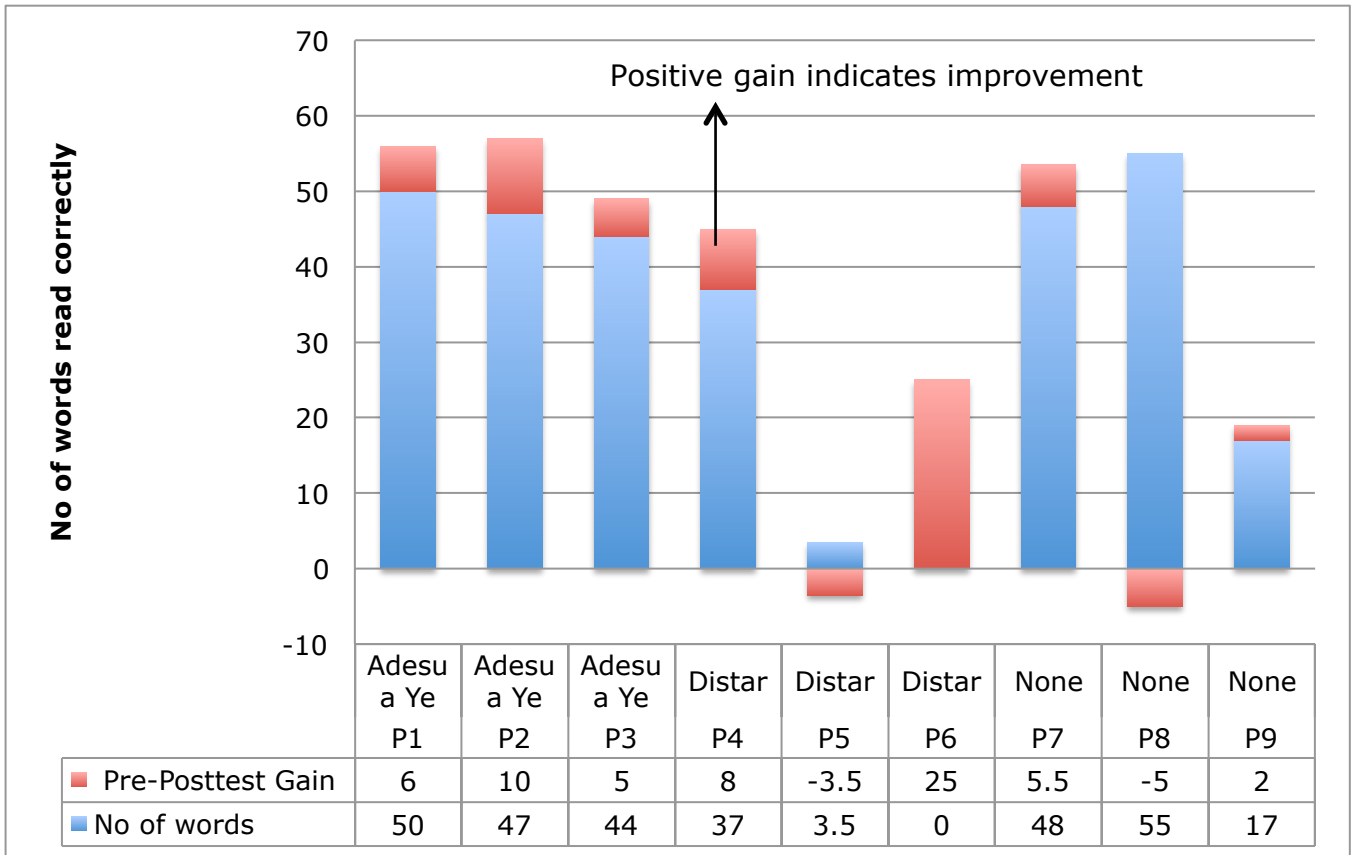
Figure 1.1 shows the total number of words read correctly by each student before and after the learning methods were applied. The part of graph shaded blue represents the total number of words read correctly before the testing, whereas the part shaded red represents the difference between the number of words read correctly in the Pre-test and Post-test. In some cases there was an increase in the number of words read correctly after the Post-test. For instance, the total number of words read correctly by P1 and P2 increased. This indicates an improvement over the course of the study. However, P5 and P8 reduced. From the graph, it is clear that all the students who used the Adesua Ye Learning Tool improved the number of words they read correctly. The difference in the

31

graphs indicates that the students who used the Adesua Ye Learning Tool (P1, P2 and P3) during the testing period improved their reading skills. Students who used the DISTAR Reading (P4 and P6) also increased the number of words they can read. Lastly the students who did not use any of the reading programs had two of the students increasing the number of words read correctly.

Figure 1.2: Graph Showing The Total Number Of Tries To Read All The Sentences

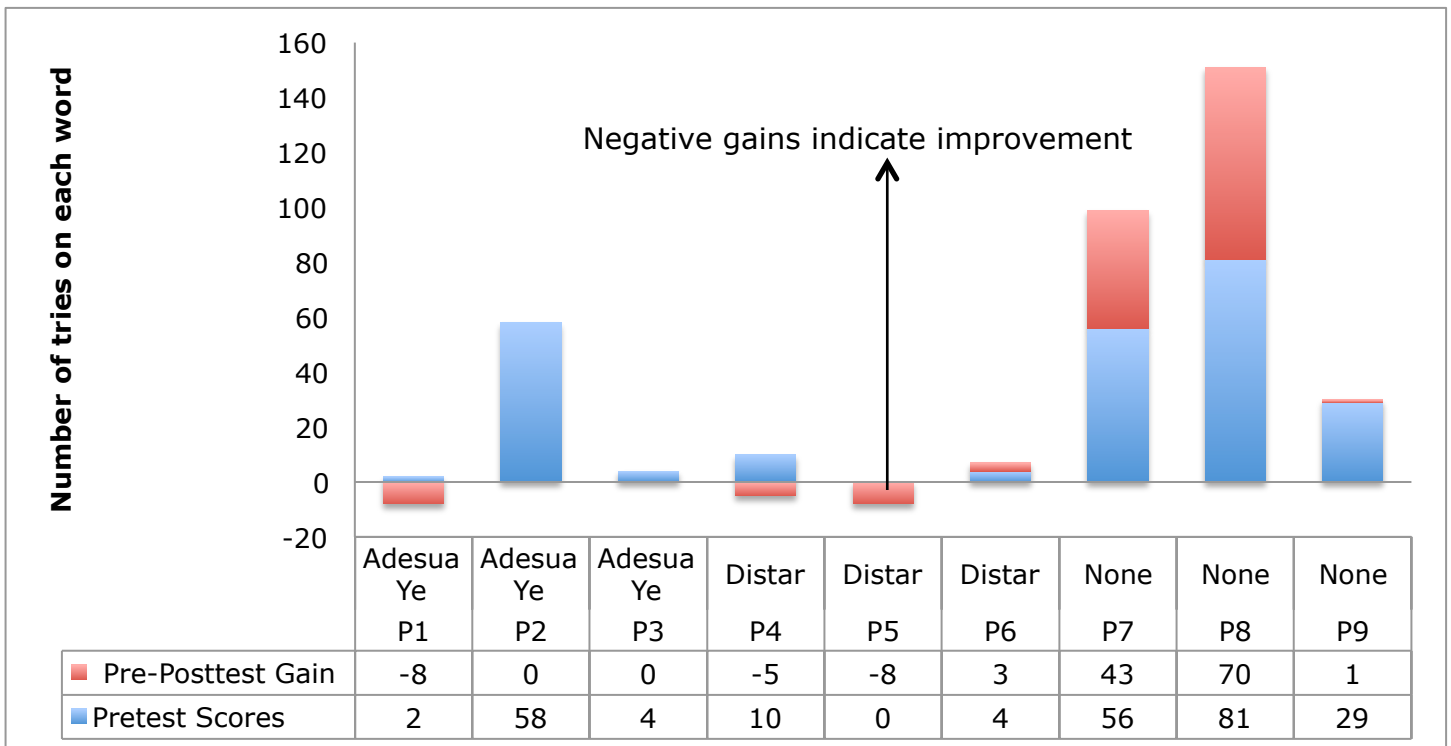|	Adesua Ye P1	Adesua Ye P2	Adesua Ye P3	Distar P4	Distar P5	Distar P6	None P7	None P8	None P9
Pre-Posttest Gain	-8	0	0	-5	-8	3	43	70	1
Pretest Scores	2	58	4	10	0	4	56	81	29

Figure 1.2 shows a graph of the total number of tries taken to read all the words correctly by each student. From the graph, its shows that students who used the Adesua Ye Learning Tool had less number of tries in reading the words and the sentences. P1, P2 and P3 who used the Adesua Ye Learning Tool had less number of tries on each word. In

addition, P4 who used the DISTAR Reading program also used less number of tries in reading the sentences. P5, P6, P7, P8 and P9 used more number of tries reading all the sentences. This suggests that the students who used the Adesua Ye Learning Tool improved their reading skills during the testing period.

Figure 1.3: Graph Showing The Total Amount of Time

	Adesua Ye P1	Adesua Ye P2	Adesua Ye P3	Distar P4	Distar P5	Distar P6	None P7	None P8	None P9
■ Pre-Posttest Gain	-1.9	-0.2	-1.5	-2.1	2	2	0	3.73	0.2
■ Pretest Scores	3.5	1.8	3.5	4	4	5	2	5	5.2

Negative gains indicate improvement

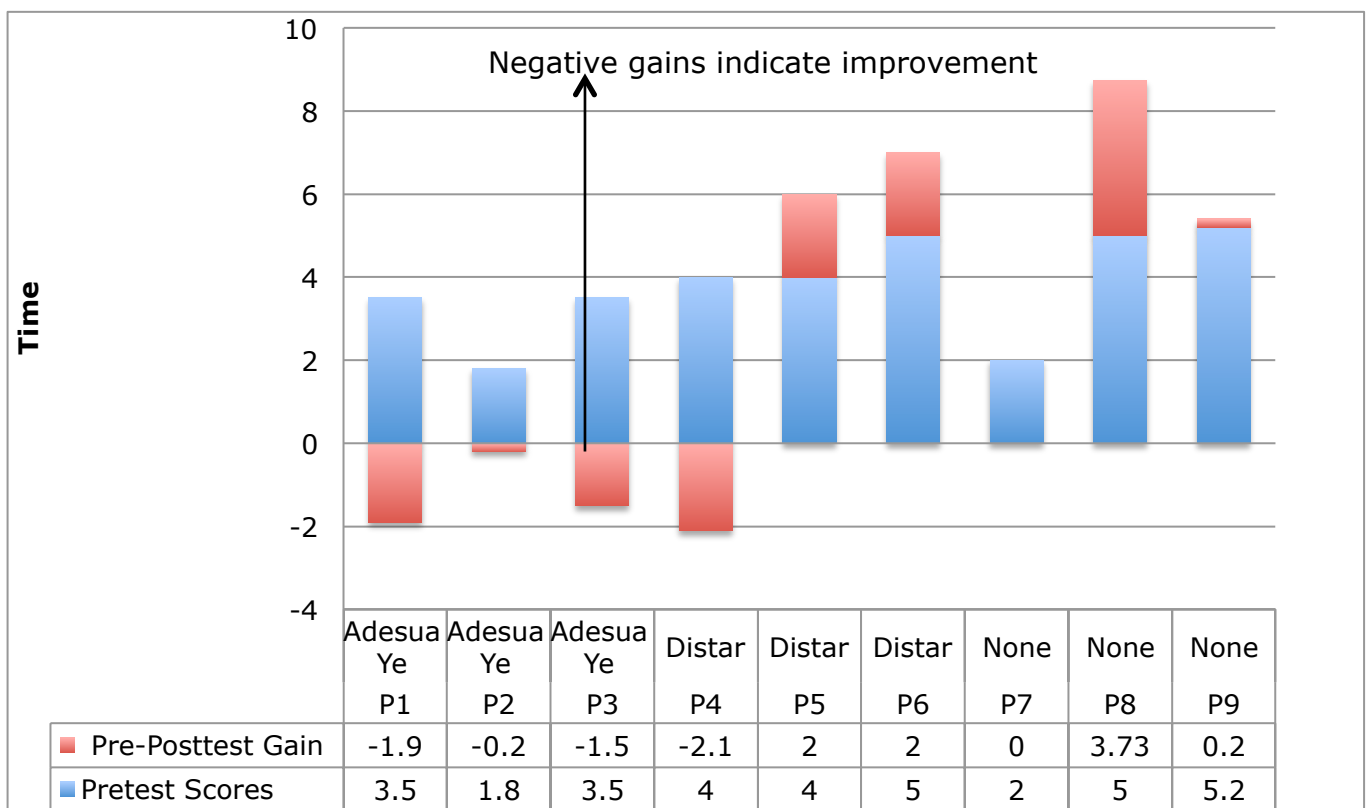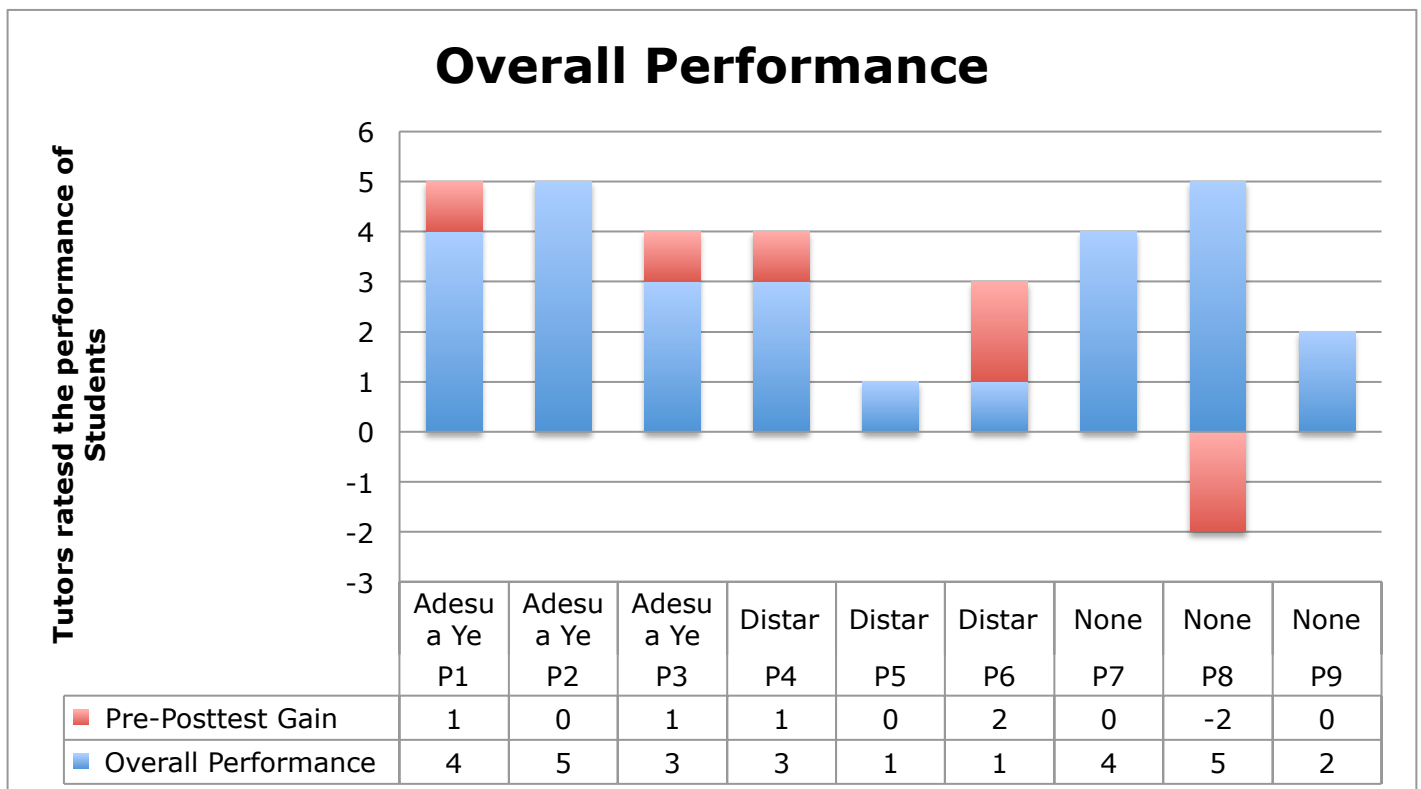Figure 1.3 shows the total amount of time it took each person to read all the sentences on the test. From the graph we can clearly see that students who used the Adesua Ye Learning Tool used less time to read the sentences during the post-test period. P1, P2 and P3 are participants who used the Adesua Ye Learning Tool and used less time to read all the sentences. P4 who used the DISTAR reading program also used less time

33

to read all the sentences. The graph shows that negative gains indicate improvement. P5, P6, P7, P8 and P9 from the graph took a longer time to read which indicate low performance.

Figure 1.4: Graph Showing The Overall Performance

Figure 1.4

Overall Performance

	Adesua Ye P1	Adesua Ye P2	Adesua Ye P3	Distar P4	Distar P5	Distar P6	None P7	None P8	None P9
Pre-Posttest Gain	1	0	1	1	0	2	0	-2	0
Overall Performance	4	5	3	3	1	1	4	5	2

Y-axis label: Tutors ratesd the performance of Students

The graph above shows the review that was done by the tutors indicated that the students who used the Adesua Ye Learning Tool had the highest performance. `The graphs show a representation of the qualitative representation on my testing. Tutors from the program were allowed to rate each student according to their level of performance from 1 to 5. 1 represents the student who can read words but not full sentences and 5 represents students who can read sentences. These results might not stastically prove the importance of technology but it gives fair ideas of

what was the perspective of the tutors in the program. This is relevant because the same tutors that did the pre-test were the same tutor that did the post-test.

4.3 Findings during the testing

Figure 1.1, 1.2 and 1.3 suggests that the DISTAR reading program that was used both in the lessons and the application has helped students to improve their reading. The analysis also indicates that the students who used the Adesua Ye Learning tool that adopts its concept from the DISTAR Reading program improved their reading skills compared to the other two methods. These results are promising although they are not statically significant due to the length of testing and sample size. It shows that there is motivation for further research with the Adesua Ye Learning Tool on larger sample size. In addition the technology can also be an alternative platform to enforce this reading programs in other adult literacy programs.

In addition the Figure 1.1, 1.2 and 1.3 shows that the participants who used the Adesua Ye Learning tool were consistent in improving their reading skills using the three variables. Although the graphs shows that some of the participants who used the DISTAR also performed in some areas participants who used the Adesua Ye Tool were consistent in their performance. This analysis also emphasizes the importance of using technology as a tool to help improve adult literacy.

4.4 Feedback from Research

The feedback received from the research participants about the Adesua Ye Learning Tool was generally positive. Students showed a lot of interest in the application and were recommending it to their friends who were not in the program. P1 and P2 gained so much interest that they found devices that they could install the applications on for use at home. Their feedback about the application is as follows.

4.4.1 Feedback from Research Participants

Students were asked to give feedback on each of the learning methods that they used during the testing period. Students who used the Adesua Ye Learning tool were asked to share their views on using the application and the DISTAR reading program.

- Adesua Ye Learning Tool
  1. The use of the tablet will be a good platform for most adults in Berekuso because they can't attend the classes. This will help them learn at home.
  2. You can learn at work when you are less busy.
  3. The help button allows you to listen to the right answers and repeat them. It is a good way to learn because there is no one monitoring or assisting you.
  4. Some students share the opinion that the application helps you learn at your own pace. Classes have a lot of people and it is difficult to follow.

- DISTAR Reading Program

    1. This reading program helps you learn how to pronounce the words correctly.

    2. The tutor helps them to learn how to pronounce each word correctly because the tutor can hear what the student says and correct it.

4.3.4 Participants Feedback on Additional Features & Improvements

- Voice Recognition - P1 and P2 want the application to have voice recognition that allows the user to check if what he/she has said is right or wrong. The device should have both male and female voices and should include a score counter to allow the user to know how well he/she is doing.

- Usability - P1, P2 and P3 wanted the application to have the instruction given in the local languages to help students who cannot use the application to know how it works. They suggested that it could start with a video tutorial to demonstrate how the application is used.

- Incorporate classes – P1, P2 and P3 suggested that the Adesua Ye Tool should have an adult literacy program on the device so that they won't have to come for the class. They share the difficulty in balancing evening programs with their work.

4.3.5 Feedback from Leaders of Adesua Ye Program

The tutors of the Adesua Ye program showed a huge interest in the application. I asked the leaders from the Adesua Ye program to give feedback about the Adesua Ye Learning Tool. According to one of the leaders of the program, Ms. Kuukua Bartels Kwodwo, this is a great tool to use in teaching phonetics, which is one of the first topics in the beginner's curriculum, which is critical and important in building the foundation of a beginner's reading ability. As such, the tool has a potential to significantly strengthen the student's learning at this stage. She said that the application should be deployed to many towns, especially rural towns where adult literacy programs like this cannot be setup. The application can also be improved to cater for users who cannot speak English at all. The instruction should be in a voice format and should be in multiple local dialects.

Chapter 5: Conclusion and Future Work

5.1 Introduction

The dissertation was intended to develop an application that will improve and facilitate adult literacy programs in Ghana. The initial pilot testing of this application was at the Adesua Ye Literacy Program in Berekuso. The application was designed to run on an Android platform. First, the researcher investigated the types of computer-based learning platforms for adult literacy that already exist. It was found that the learning platforms used include: Talking Book, which uses audio to teach farmers how to read and write; and Project ABC, an SMS learning platform that uses text messaging to teach a literacy and numeracy program to people in rural areas. Then, the researcher investigated reading programs that have worked in developing countries and can be applied to facilitate adult literacy programs in Ghana. The Adesua Ye Learning tool acquired its concept from a well-known reading program called DISTAR, an acronym for Direct Instruction System for Teaching Arithmetic and Reading[3]. DISTAR reading program was selected because research showed that students from the Adesua Ye adult literacy program could not pronounce and identify words correctly. DISTAR is a very scripted direct instruction program for teaching phonetics, which has been proven successful in several comparative studies. This research

---

[3] Engelmann, S., Haddox, P., & Bruner, E. (2011, December). *Teach Your Child to Read in 100 Easy Lessons*.

investigated whether by using a similar tutoring approach on a tablet computer; illiterate adults who have limited or no access to a literate tutor can still acquire basic literacy skills. The main outcomes of this research study show that there is potential in using a computerized or interactive tutor to help facilitate and improve adult literacy in Berekuso. In addition, I hold the position that technology can also be used to address the low literacy programs in Ghana. Although, funding might be an issue, it is still possible of making it affordable.

5.2 Recommendations

This project was motivated by the researcher's passion for education and technology and their role in economic development. The development of an application that will help improve adult literacy is an alternative way to complement literacy among adults who want to learn how to read and write but cannot attend these literacy programs for different reasons. All areas of improvement, which were suggested by the tutors and participants, should be included in the future version of the application. The recommendations below suggest how a tablet-based application can be used to improve adult literacy in Ghana for years to come and beyond;

1. Comprehensive study based on a larger sample size.
2. The application should be developed in a way that allows the user to start with a local dialect and then move on to English.

3. The application should also make use of voice recognition for the words in order to help students check the accuracy of their words.

4. The application should have a female voice because P1 and P2 said it was easier to listen and follow.

5. The application should have a quiz for the students to test themselves after every lesson.

6. The application should be incorporated into the curriculum to encourage students to get better grades as they use the application.

7. Students are not familiar with basic technology features and therefore future development should embrace good use of Human Computer Interaction.

8. The application can have a platform that allows the tutor to view the performance of the students and also give learning materials or help on the application. Tutors suggested that assignments could be given on the application.

5.3 Future Work

The study has extended previous research by providing information and data on how technology can be used to improve adult literacy. I believe that these suggestions will be noted for future development in order to facilitate the learning process. Participants that used the application performed better in all variables used for measurement in the application. Although the preliminary results are not statistically significant due to the small sample size, the graphs suggest that the

41

students who used the Adesua Ye Learning Tool and the DISTAR Reading Program improved their reading skills. These preliminary results provide motivation for further work on this application. However people who do not know how to read and write without having to attend any adult literacy program can also use a tablet-based tutor helping the students in the program. Some steps to consider for future developments are listed below;

- Find philanthropists and researchers who are interested in funding literacy programs.

- Involve technology companies to support the expansion of the Adesua Ye Learning tool on a larger scale; this will help people to easily understand and use applications and software developed by them.

Bibliography

1. Atengdem, P.B. (2012) *Moving beyond the Rhetoric: Observations from a Shepherd-boy on Institutional and Policy Support for Literacy in Ghana.* A paper presented at 2012 Harmattan School, Tamale (slide 6).

2. Askov, E.N., & Bixler, B. (1998). Transforming adult literacy instruction through computer-assisted instruction. In D. Reinking, M.C. McKenna, L.D. Labbo, & R.D. Kieffer (Eds.), *Handbook of literacy and technology: Transformations in a post-typographic world* (pp.167-184). Mahwah, NJ: Lawrence Erlbaum Associates.

3. Centre for Literacy. (2013). Adult Basic Education . Retrieved April 16, 2014, from http://www.centerforliteracy.org/adult_basic_education_abe_.aspx

4. Aker, J. (2010). Home. Project ABC. Retrieved December 28, 2013, from http://sites.tufts.edu/projectabc/

5. Berdie, S. (2012, February 6). 8th Centre for Continuing Education and Interdisciplinary Research, University for Development Studies, Harmattan School conference. Addressing the national literacy challenge: a road map.Retrieved November 25, 2013, from http://www.uds.edu.gh/cceir/Berdie,%20Addressing%20the%20national%20literacy%20challenge.pdf

6. Berger, J.I. (2001). Effectiveness of computers in ALBE classrooms: An analytical review of the literature. *Adult Basic Education*, *11*(3), 162-183.

7. Duke, N.K., & Pearson, D.P. (2002). Effective practices for developing reading comprehension. In A.E. Farstrup & S.J. Samuels (Eds.), *What research has to say about reading instruction* (3rd ed., pp. 205– 242). Newark, DE: International Reading Association.

8. Engelmann, S., Haddox, P., & Bruner, E. (2011, December).*Teach Your Child to Read in 100 Easy Lessons*. N.p.: Touchstone.

9. Fisher, C., Dwyer, D.C., & Yocam, K. (Eds.) (1996). *Education and technology: Reflections on computing in classrooms*. San Francisco, CA: Jossey-Bass

10. Fox, K. (2011, July 24). Africa's mobile economic revolution. *The Observer*. Retrieved April 15, 2014, from http://www.theguardian.com/technology/2011/jul/24/mobile-phones-africa-microfinance-farming

11. GILLBT. (n.d.). Literacy. Ghana Institute of Linguistics, Literacy and Bible Translation. Retrieved October 27, 2013, from http://www.gillbt.org/literacy/.

12. Ghana Statistical Service (GSS) (2000) 2000 Population and Housing Census. Accra: GSS Ghana Statistical Service (GSS) (1987) Ghana Living standards Survey 1987. Accra: GSS

13. Ghana Statistical Service (GSS) (2008) Ghana Living standards Survey, Report of the 5th Round. Accra: GSS

14. Hopey, C.E., Harvey-Morgan, J., & Rethemeyer, K.R. (1996). Technology and adult Literacy: Findings from a survey on technology use in adult literacy programs. (Technical Report No.TR96-12). Philadelphia: University of Pennsylvania, National Center on Adult Literacy.

15. How is the adult literacy population. (n.d.). In *Literacy Statistics*. National Institute for Literacy Retrieved April 14, 2014, from http://www.literacymidsouth.org/resources/literacy-statistics/

16. In Adult Literacy & Technology Network. Retrieved December 28, 2013, from http://www.altn.org/about.html

17. Kwarteng, F. (n.d.). National Literacy Policy-A Neglected Issue in Ghana. GhanaWeb. Retrieved October 21, 2013, from http://www.ghanaweb.com/GhanaHomePage/blogs/blog.article.php?blog=4542&ID=1000011422

18. Langille, L. M. (2004). Adult Literacy Educators' perceptions of technology integration (Master's thesis).

19. Lteracy Rate- Adult total(% of people ages 15 and above) in Ghana (2009). In *Trading Economics*. Retrieved April 15, 2014, from http://www.tradingeconomics.com/ghana/literacy-rate-adult-total-percent-of-people-ages-15-and-above-wb-data.html

20. Miller, B., McCardle, P., & Hernandez, R. (2010, March). Advances and Remaining Challenges in Adult Literacy Research. *Journal of Learning Disabilities*, *43*(2), 101-107. Retrieved from http://ldx.sagepub.com/content/43/2/101.full.pdf+html

21. Munteanu, C., Molyneaux, H., Matiland, J., McDonald, D., Leung, R., Fournier, H., & Lumsden, J. (2013, November). Hidden in plain sight: low-literacy adults in a developed country overcoming social and educational challenges through mobile learning support tools. *Spinger Link*. Retrieved December 28, 2013, from http://link.springer.com/article/10.1007/s00779-013-0748-x#page-1

22. Northrop, L., & Killeen, E. (2013). A framework for using iPads to build early literacy skills. The Reading Teacher.

23. NFED (2007) Tracer Study (Terminal Phase) Report (Vol.1). Accra: AB INTEL LTD NFED (1988). MASSLIP: A Policy Document for Non-Formal Education Division. Accra: NFED

24. Osei, M.A. (2001). Can you do what I do? A case study of computer-assisted instruction for adults participating in an adult education program. Adult Basic Education, 11(3), 150-161.

25. Publishers. Fisher, D., Lapp, D., & Flood, J. (1999). Technology & literacy: Is there a positive relationship? The California Reader, 32(4), 35-38.

26. Ragsdale, R.G. (1997). Surprised by technology: Unanticipated outcomes of technology 137 implementation. Paper presented at the Annual Meeting of the American Educational Research Association, March 24-28, Chicago, IL.

27. Suarez-Orozco, M.M. (Ed.). (2007). *Learning in the global era: International perspectives on globalization and education*. Los Angeles: University of California Press.

28. Tools of a Lifetime. (1993). Adult Literacy and New Technologies: Tools for a Lifetime. Washington DC: US Government Printing Office.

29. Talking Book. (2003). In Literacy Bridge. Retrieved December 25, 2013, from http://www.literacybridge.org/talking-book/

30. Pascal Atengdem (n.d.). In Dilton Consult Ghana. Retrieved December 25, 2013, from http://www.diltonconsultghana.com/pascal_atengdem.html (2013, November).

31. UNESCO. (2013). What is Adult Education? In S. Sebastian & . (Eds.). N.p.UNESCO Centre. Retrieved December 28, 2013, from http://uil.unesco.org/fileadmin/keydocuments/AdultEducation/Confinea/en/WhatIsAdultEducationUNESCOAnswers.pdf

32. What is Literacy? (n.d.). The Centre for Literacy. Retrieved October 18, 2013

33.What is the rate of adult literacy in the United States. (n.d.). In *Literacy Statistics*. Retrieved April 14, 2014, from http://www.literacymidsouth.org/resources/literacy-statistics/

Appendix A: Snap shots of Students for Adesua Ye using the application
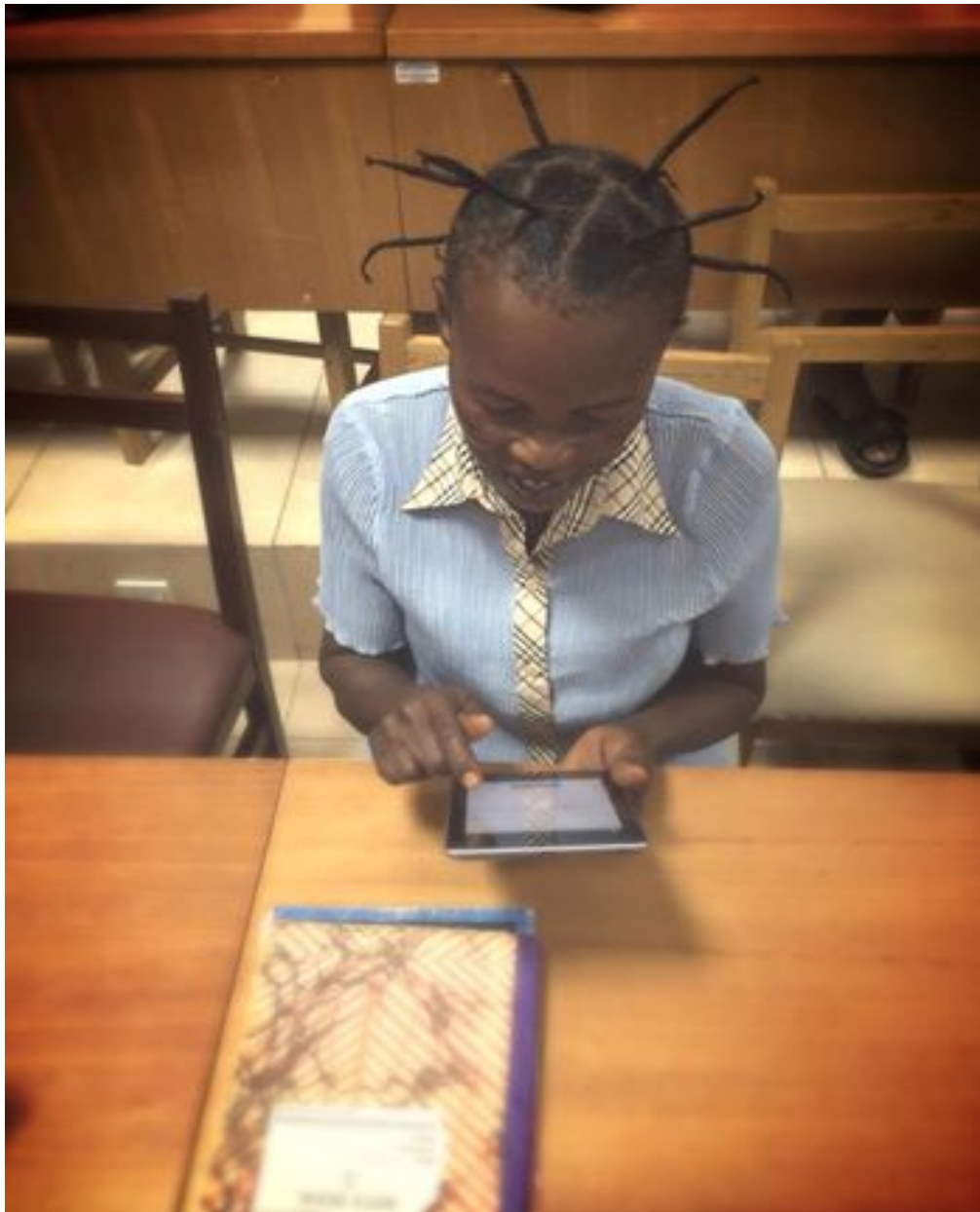
Comfort, a student of the Adesua Ye adult literacy program in Berekuso, Ghana, uses the Android application.

Appendix B: Tables from the data collection
Table 4.1 Pre-Test Quiz Results

Student Name	Method	No of words	No of tries	Time (minutes)
P1	Adesua Ye	50	10	5.4
P2	Adesua Ye	47	58	2
P3	Adesua Ye	44	4	5
P4	Distar	37	15	6.1
P5	Distar	3.5	8	2
P6	Distar	0	1	3
P7	Self	48	13	2
P8	Self	55	11	1.27
P9	Self	17	28	5

Table 4.2 Post-Test Quiz Results

Student Name	Method	No of words	No of tries	Time (minutes)
P1	Adesua Ye	56	2	3.5
P2	Adesua Ye	57	58	1.8
P3	Adesua Ye	49	4	3.5
P4	Distar	45	10	4
P5	Distar	0	0	4
P6	Distar	25	4	5
P7	Self	53.5	56	2
P8	Self	50	81	5
P9	Self	19	29	5.2

Appendix B: Evaluation Form for testing learning methods

Hello, my name is Leonard and I am doing a test on how to improve the adult literacy program with technology. Please read these sentences. Make an effort to read each word but if you can skip to the next word.

Pre- Test for the Thesis Project (Adesua Ye Literacy Foundation)
Student Name:_____
Student Level:_____
Test 1
Student should read the following sentences

1. This is a man.
2. I should go to school.
3. He said I am late to class.
4. She is sick. She needs medicine
5. The cow eats grass.

Test 2
Student should read the following sentences

1. Is she a boy or a girl?
2. I want a cake.
3. Kuukua said we should do the work.
4. Kweku said we should be quiet.
5. The cow and the fish are animals.

No of words read correctly: ☐

No of tries on all the ☐ words:

Time: ☐

Overall Rating (Please circle)   1   2   3   4
5
Comments