UNIVERSITY OF EDUCATION, WINNEBA

THE IMPACT OF ELECTRONIC-LAB ON TEACHING AND LEARNING OF

COMPUTING AT THE SENIOR HIGH SCHOOL: THE MODERATING

ROLE OF PERCEIVED EASE OF USE.

MARY NANA APPAH
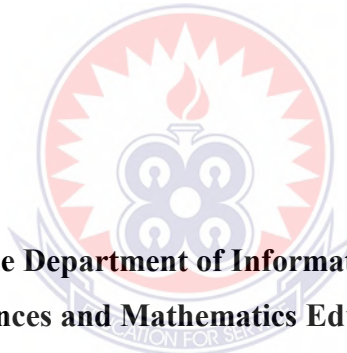
MASTER OF SCIENCE DISSERTATION

2021

UNIVERSITY OF EDUCATION, WINNEBA

THE IMPACT OF ELECTRONIC-LAB ON TEACHING AND LEARNING OF COMPUTING AT THE SENIOR HIGH SCHOOL: THE MODERATING ROLE OF PERCEIVED EASE OF USE.

MARY NANA APPAH

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

MAY, 2021

DECLARATION

STUDENT'S DECLARATION

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

SIGNATURE: …………………………………………

DATE: ……………………………………………………

SUPERVISOR'S DECLARATION

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

DR. KWAME ANSONG-GYIMAH
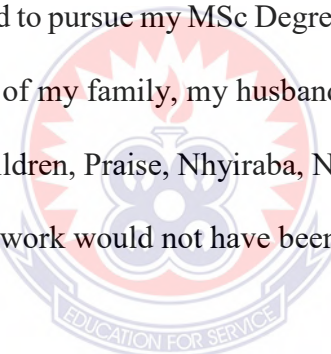

SIGNATURE: …………………………………………

DATE: ……………………………………………………

DEDICATION

This work is dedicated to my husband, Mr. Samuel Ewur Quansah, for all the endless support and devotion towards me when I had to pursue this course; helping to take care of the children when I had to travel every weekend, without complaining.

ACKNOWLEDGEMENT

TABLE OF CONTENTS

CONTENT **PAGE**

LIST OF TABLES

LIST OF FIGURES

FIGURE   **PAGE**

ABSTRACT

One of the essential duties of an educational institution is to teach students so they can adapt to contemporary difficulties; thusly, instructive establishments ought not to put superfluous restrictions on learning and learning situations. Students from fundamental school levels to tertiary degrees of today grow up with a variety of innovation, both at home and at school. There is in this way requirement for a student to know, and properly utilize electronic-laboratory to enhance their knowledge. Thus, the aim of this research was to investigate the impact of electronic-laboratory on teaching and learning of computing: the moderating effect of perceived ease of use at Potsin TI Ahmadiyya senior high school. The researcher in the research study adopted a descriptive study. The population for the study was two thousand, four hundred and thirty-five (2435) Senior High School students at Potsin TI Ahmadiyya Senior High School, Potsin. The sample for the study consists of four hundred and eighty-eight (488) senior high school students at Potsin TI Ahmadiyya Senior High School, Potsin. Systematic sampling was used for selecting the sample size from the population. The researcher used a questionnaire to gather the data for studying the issue under investigation. SPSS, AMOS and Microsoft Excel were used by the researcher for the analysis. The study revealed that electronic laboratory of students displayed a positive relationship with students learning and teaching and learning of computing. The study concluded that perceived ease of use had insignificant influence in the relationship between electronic laboratory and teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The quick improvement of Information Technology and the ceaseless extension of knowledge contents have been of extraordinary worry to educating and learning (Ho et al., 2019; Oliveira et al., 2019). One of the essential duties of an educational institution is to teach students so they can adapt to contemporary difficulties; thusly, instructive establishments ought not to put superfluous restrictions on learning and learning situations (Sezer & Abay, 2019). In the push to maintain a strategic distance from such confinements, it is imperative to consolidate new advancements with traditional teaching system (Ahmad, 2010; Means, Toyama, Murphy, & Baki, 2013; Sezer & Abay, 2019). The use of Information Communication Technology (ICT) and its related instruments have affected pretty much every feature of our day by day activities be it family, wellbeing, instruction, sports among others. Students from fundamental school levels to tertiary degrees of today grow up with a variety of innovation, both at home and at school. There is in this way requirement for a student to know, and properly utilize electronic-laboratory to enhance their knowledge (Biljon & Sanders, 2019).

Practically the entirety of computer laboratory in various educational institutions currently are experiencing a change through digitalization. It is very hard for us currently to see the computers at the laboratory not connected to the internet (Lanlan, Ahmi, Muse, & Popoola, 2019). E-laboratory alludes the use of Information and Communication Technologies (ICTs) to advance increasingly efficient and effective teaching and learning of computing (Sarrayrih & Sriram, 2015). In fact, e-lab is considered as an incredible tool in enhancing teaching and learning of computing

1

(Elbahnasawy, 2014; Abd et al., 2016). Past literature on the use of e-lab at each stage of the academic ladder at the educational institutions has concentrated on pre-adoption stage (Belanche, Casaló, & Flavián, 2012; Fakhoury & Aubert, 2015; Lee, Bharosa, Yang, Janssen, & Rao, 2011; Rana & Dwivedi, 2015; Shareef, Kumar, Kumar, & Dwivedi, 2011; Weerakkody, El-Haddadeh, Al-Sobhi, Shareef, & Dwivedi, 2013). In this sense, teachers in Ghana and progressive governments have likewise given attention to electronic-laboratories in the learning condition where experimental teaching method is used most in designing instructions. Majority of classes done electronically in the laboratories permit students complete practical lessons and experiments independent from anyone else or in groups and electronic instructors have to screen students' learning results.

Potsin TI Ahmadiyya Senior High School, Gomoa Potsin in the central region of Ghana has benefited from the use of electronic laboratory. Be that as it may, because of hardware deficiency, it is additionally viewed as a significant undermining variable of educating and learning in laboratories (Adebi Caesar, 2012). Furthermore, the Millennium Development Goals (MDGs) and the Education for All (EFA) states that to accomplish all inclusive essential teaching and learning electronic laboratory should be provided to schools. Numerous nations, Ghana included are a long way from arriving at these objectives for the most part because of the deficiency of educators, infrastructure, and resources. One way which governments use to improve or expand instructional objectives and increase quality training availability is by the use of ICT in teaching and learning (Wang1 & Quan2, 2019), requirements, qualities and shortcomings to drive the learning procedure with the educator encouraging instead of directing (Kizilkaya & Askar, 2008). Findings in nations, uncovered that ICT has the

ability to drastically change American tutoring, increasing performance expectations while possibly at the same time reducing expenses. The report showed that ICT empowered the development of another sort of instructional method that was centered on addressing the requirements of individual students (mass customization) (Lee, Brescia, & Kissinger, 2009).

1.2 Statement of the Problem

Potsin TI Ahmadiyya Senior High School, Gomoa Potsin has been using electronic laboratory in the school for three years now. Since the use of an electronic laboratory in computing education in an early stage was to accomplish a better degree of learning and to be able to have the option to build up the necessary abilities and adroitness for placing information energetically, the lab experience can't be left aside (García & Flores, 2019). In spite of the expansion in electronic laboratory in Ghanaian Senior High schools, it appears majority of the schools appear to educate ICT proficiency rather than complete development of essential functional ICT skills for students. This has led to a decline in the awareness, usage and performance of students in ICT in second cycle schools like Potsin TI Ahmadiyya Senior High School, Gomoa Potsin.

1.3 Purpose of the Study

The aim of this research is to investigate the impact of electronic-laboratory on teaching and learning of computing: the moderating effect of perceived ease of use at Potsin TI Ahmadiyya senior high school.

3

1.4 Objectives of the Study

The study will seek to

1. To investigate the impact of electronic laboratory on teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin.

2. To identify the impact of electronic laboratory on students learning at Potsin TI Ahmadiyya Senior High School, Potsin.

3. To determine the moderating effect of perceived ease of use on the relationship between electronic laboratory and teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin.

1.5 Research Questions

This study sought to answer the accompanying specific research questions:

1. What is the impact of electronic laboratory on teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin?

2. What is the impact of electronic laboratory on students learning at Potsin TI Ahmadiyya Senior High School, Potsin?

3. What is the moderating effect of perceived ease of use on the relationship between electronic laboratory and teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin?

1.6 Significance of the Study

The study would be relevant as it would provide information on electronic-laboratory awareness, usage and impact on teaching and learning SHS courses at Potsin TI Ahmadiyya Senior High School, Potsin (Anksorus, Bradley, Porter, Vanlangen, & Donohoe, 2019). This will inform necessary changes in the teaching and learning of

ICT and other courses that needs the aid of electronic laboratory at Potsin TI Ahmadiyya Senior High School, Potsin and other senior high schools. The results of this study will provide useful information for the Ministry of Education in Ghana and also teachers in developing knowledge and skills acquired by students in learning ICT and other courses that needs the aid of electronic laboratory. It will pave way for stakeholders, including teachers, students and the Ministry of Education to make a policy that will enhance quality and accessibility of education. Findings from the study would serve as a resource and basis for further research to be conducted in this field.

1.7 Delimitation

This study would be delimited to computing students at Potsin TI Ahmadiyya Senior High School, Potsin and to electronic laboratory awareness, usage and performance.

1.8 Organization of the Study

The study is organized into five chapters. Chapter one is the introduction and it covers the background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, limitations of the study, delimitation of the study, definition of terms and the organization of the study. Chapter two deals with related literature of the study. The review involves empirical studies and conceptual framework of the problem under study. Chapter three presents an overview of the research methodology. It covers introduction, research design, population, sampling, instrumentation, validity and reliability, data collection procedure, the procedure for the analysis of the data and ethical consideration. Chapter four deals with presentation and analysis of data and the discussion of the research findings. Chapter five summarizes the research findings and provides recommendations from the findings including suggestions for future studies and conclusions.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The aim of this research is to investigate the impact of electronic-laboratory on teaching and learning of computing: the moderating effect of perceived ease of use at Potsin TI Ahmadiyya senior high school. This section focuses on review of related literatures on causes of low grades of pupils in mathematics at the basic level. The chapter constitute the theoretical basis of the study, conceptual framework, and empirical basis of the study.

2.2 Theoretical Basis of the Study

2.2.1 Constructivism Theory

The constructivist theory of knowledge expresses that knowledge can't be moved starting with one individual then onto the next; it must be effectively developed by the student through co-operations with nature. Such an announcement suggests, that the idea of the earth is as significant as the attributes of the student with regards to teaching the individual, and modifying nature may prompt diverse learning results (Domin, 1999). Constructivism has required management theorists to reevaluate the idea of authority and make another way of thinking, constructivist initiative. As it identified with the showing calling, constructivist authority comprises of both proportional procedures and otherworldly ideas. Consequently, it prompts a common reason in learning through empowering related members to build implications and grasp correspondence, value, which means, learning, obligation, and network. It depends on constructivist learning standards (Lambert, 2002a; Yildirim, 2019), such as active participation, encouragement, facilitation, and shared responsibility (Brooks and

6

Brooks, 1999; Lambert *et al.*, 2002; Fosnot, 2005). Accordingly, constructivist initiative likewise requires proportional procedures that include dynamic interest, shared purposes and qualities, sharing duty, consolation and facilitation (Yildirim, 2019). Constructivism is a philosophical position that grasps a way to deal with discovering that includes effectively assembling information and comprehension. Inside the field of computing instruction, this dynamic methodology can take numerous structures that outcome in students building abilities and confidence. One fundamental inhabitant of constructivism is that students make new information through a subjective procedure of connecting earlier information and encounters. The researchers in this venture speculate students can use their related involvements as a system which all through the semester they expand upon by means of activities and profound request with the use of electronic laboratory (Reilly & Swanson, 2019).

2.2.2 Technology Acceptance Model

TAM expressed that conduct intension to use is controlled by two convictions: first, perceived usefulness as characterized as the degree to which a person accept that the use of the electronic laboratory will improve its performance. Second, perceived ease is characterized as the degree to which a person accept that the use of electronic laboratory is simple. TAM likewise expresses that the effect of such outside factors (qualities of electronic laboratory, process advancement and preparing) to the intension to use is interceded by apparent of value and perceived ease of use. TAM idea likewise expresses that apparent handiness is impacted by apparent simplicity of use. Venkatesh and Davis (2000) states that TAM is an idea that is viewed as the greatest in clarifying the conduct of the client of the new electronic laboratory system. TAM is a model that is considered the most exact in clarifying how the client gets a system (Lampouw &

Fajar, 2019). Phuangthong and Malisawan (2005) included the factor of apparent intriguing quality based on TAM model to contemplate the client conduct expectation of versatile learning in 3G portable Internet innovation. In light of TAM model, Malisawan includes two factors: perceived versatile worth and perceived stimulation. It examines the key factors that impact versatile clients' acknowledgment of portable learning, and studies affirm the impact of apparent versatile worth and perceived amusement on their eagerness to use. Chong, J., Chong, A., Ooi, K. & Lin, B. (2011) thought about social foundation and different factors, and joined TAM and TPB models, inferred that components, for example, perceived convenience, perceived ease of use, service quality and social foundation significantly affected the acknowledgment of portable learning in Malaysia (Peng, 2019).

2.2.3 Perception Theory

People perceive information, yet we are not as certain about how we perceive (Maloney, 2016). We realize that representations present information that is then perceived, yet how are these perceptions seen? How would we realize that our visual portrayals are not deciphered diversely by various viewers? How might we be certain that the information we present is understood? We study perception to all the more likely control the introduction of information, and in the end to saddle human observation (Zigman, 2018). Most characterize perception as the way toward perceiving (monitoring), sorting out (gathering and putting away), and interpreting (official to information) sensory data. Perception manages the human senses that create signals from the environment through sight, hearing, contact, smell and taste. Perception is the process by which we interpret our general surroundings, shaping a psychological representation of nature (Loschky, Larson, Smith, & Magliano, 2019). This portrayal

8

isn't isomorphic to the world, however it's dependent upon numerous correspondence contrasts and mistakes. The mind makes as suppositions about the world to defeat the natural equivocalness in every tangible datum, and in light of the job needing to be done (Perception & Processing, 2012).

2.3 Learning to Perceive or Perceiving to Learn

In a 70 years of research life, a theory of perceptual learning was developed by Eleanor Jack Gibson. The first paper that was published on perceptual learning was published by Eleanor Jack Gibson in 1932 (Gibson et al., 1932; Adolph & Kretch, 2015) and her last paper in 2002 (Gibson, 2002; Adolph & Kretch, 2015). There is an unmistakable string from start to finish, yet she was not unyielding in her thoughts; her theories were constantly educated by information, and data collection was regularly motivated by reality and good fortune. Her theory is reliable with yet not indistinguishable from James Gibson's (1979) ecological way to deal with perception. In spite of the fact that the Gibson were hitched and shared numerous contentions and thoughts regarding perceptual learning and improvement, they composed just five articles together (Adolph & Kretch, 2015). In this manner, in this study, 'Gibson' alludes to Eleanor Gibson except if in any case noted. Principles of Perceptual Learning and Development is a book that was written by Gibson in 1969, the book depicted her theory in detail and kicked off another field of request (Adolph & Kretch, 2015).

Be that as it may, as new strategies and discoveries opened up, prominently better approaches for examining perception in the young people, Gibson addressed things that she had once underestimated and expanded her area of request. In later compositions, Gibson investigated her 1969 record for neglecting to catch how babies figure out how to distinguish the perceptual data for directing activity adaptively as their perceptual-

9

motor systems are growing. Truth be told, she believed earliest stages to be the ideal spot to consider perceptual learning (Gibson, 1992) and she was very key in building the field of infant perception (Pick, 1992). On Gibson's (1969) account, perceptual learning involves an expanded capacity to separate pertinent data from a boost exhibit as the outcome of experience. The customary perspective on perceptual getting the hang of, returning to Bishop Berkeley during the 1700s, is that creatures must figure out how to perceive; the data at sensory receptors is devastated and futile and along these lines a total percept requires learning. In the view of Gibson, the data at receptors is adequate to help total percepts from the beginning, and along these lines creatures need not figure out how to perceive; rather, they perceive to learn (Gibson, July 1989; Adolph & Kretch, 2015).

The way to information and where everything starts is called perceptual learning. Gibson (1992) kept up that a theory of perceptual learning must answer essential inquiries: What is found out and at what capacity? What actuates realizing and what ends the procedure? With respect to the topic of system, Gibson held that significant clarifications of mental procedures must be at the degree of conduct. She constantly kept up that the activity of a recognition analyst is to depict and clarify perception at the degree of individual conduct, not regarding the basic neurophysiology (Gibson and Pick, 2000). Perceptual processes ought to be steady with our opinion of neural components and physiology, yet these realities ought not to drive studies into perceptual processes. Or maybe, the suitable research program should start with a thought of what there is to be perceived in a biological setting – what creatures need to perceive in order to act adaptively in the indigenous habitats in which they advanced and in the changing conditions where they develop.

2.4 Conceptual Framework

The following concept will be reviewed: Electronic Laboratory, Computing, Learning to Perceive or Perceiving to Learn.
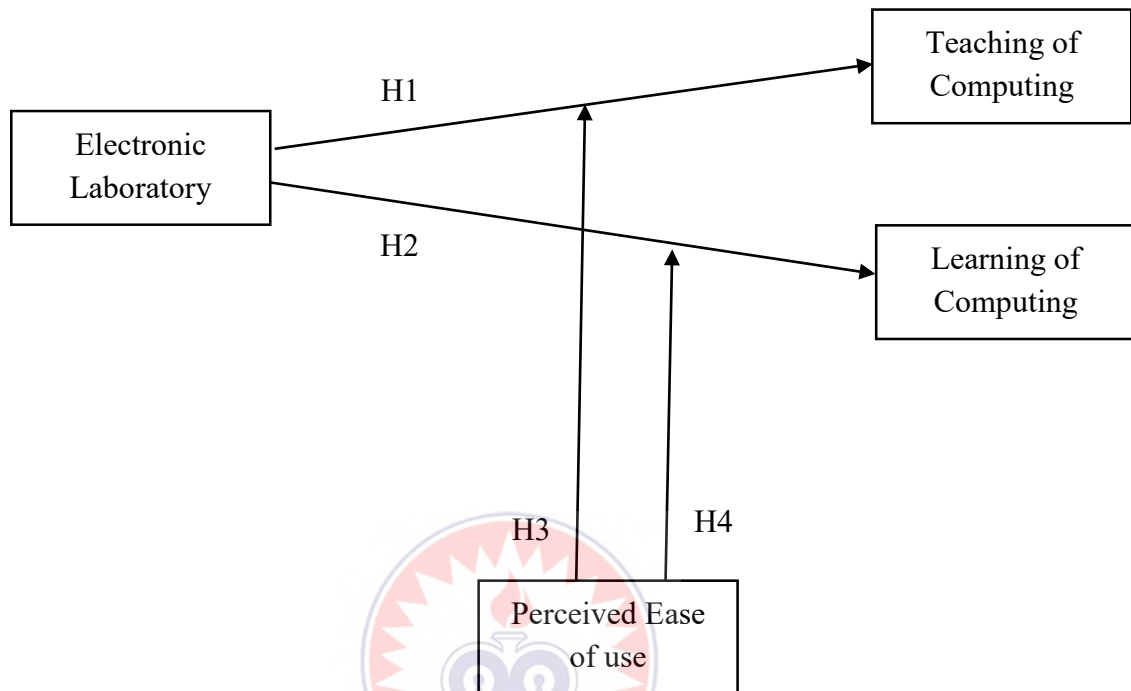
Figure 1: Conceptual Framework

2.4.1 Electronic Laboratory

The Electronics Lab (eLab) is a cutting-edge hardware lab, which is utilized for educating and research purposes in all computing certificate programs. In the nearby electronic workshop, long term tasks can be arranged and electronic models produced in an assembly line. In an electronic laboratory, clients are connected to one server, there is also a master server used to monitor what every computer at the electronic laboratory is used for. With the help of master device, if students go contrary to the purpose of which they are to do at the laboratory, the administrator can speak to them through headset. In an electronic laboratory, the instructor can let the students put headset on and teach the students. At the electronic laboratory, learning materials are

11

on each computer with guided instruction. Teachers and students can also use the laboratory for research on the internet. Experimental teaching is a significant practical step in teaching computing at the educational sector. As of late, numerous research have been directed on virtual instructing and virtual experiment systems, electronic computing instructors additionally find electronic labs alluring as a result of simple to use and control, advantageous connection, wellbeing activity and viable cost (Yang, Yuan, Chinthammit, & Kang, 2019).

2.4.2 Computing

Computing is a practice that utilizes computers to manage, process, and impart information. It incorporates advancement of both hardware and programming. Computing is a basic, fundamental segment of present day modern technology (Okafor, 2017). Significant computing disciplines incorporate computer engineering, programming, software engineering, information systems, and information technology.
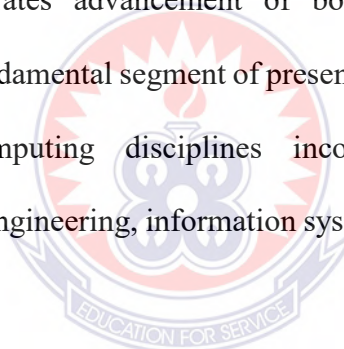
2.4.3 Perceived Ease of Use

Perceived Ease of Use as "how much an individual accepts that utilizing a technology will be liberated from effort" (Davis 1989; Abd, Zaidi, Razak, Abu, & Salihin, 2016). With regards to this study, Perceived Ease of Use alludes to the degree to which users accept that their proceeded with utilization of e-laboratory is liberated from effort. In the event that a system is moderately simple to utilize, people will be all the more ready to find out about its highlights lastly expect to keep using it. Studies show that Perceived Ease of Use is emphatically connected with duration intention with regards to Web-based learning (Chiu & Wang, 2008; Abd et al., 2016). Perceived ease of use (PEOU) reflecting the degree to which students of Potsin TI Ahmadiyya Senior High School,

12

Gomoa Potsin trusts it is anything but happy to use an electronic laboratory (Davis, 1989; Lanlan et al., 2019). There are numerous earlier sorts of study accepting that perceived ease of use importantly affects IT users and usage behavior (Venkatesh, 2000; Lanlan et al., 2019).

Ozturk, Bilgihan, Nusair, and Okumus (2016) indicate the perceived ease of use as a self-deciding component to inspect the effect on the use of electronic laboratory by senior high school students at Potsin TI Ahmadiyya Senior High School, Gomoa Potsin. Perceived ease of use significantly impacts the use of electronic laboratory by senior high school students at Potsin TI Ahmadiyya Senior High School, Gomoa Potsin. According to Wang and Ha-Brookshire (2018), perceived ease of use identifies with the degree to which the user accepts that utilizing specific technology would be easy and hassle free. Studies from previous studies found that within the Chinese textile and apparel company owners, perceived ease of use was stressed more on the ease of technology use with smooth connections between the organization's benefits, representative capacities, and technology framework. Mustapha and Sheik Obid (2015) assessed the intervening effect of perceived ease of use on the association between the nature of tax administrations and online tax so as to understand the efficient utilization of the online tax structure without anyone else taxpayers in Nigeria. Other studies found that there is a positive connection between perceived ease of use and the use of CAS by bookkeepers in MSEs in Xi'an, Shaan Xi of China (Lanlan et al., 2019).

2.5 Empirical Basis of the Study

Abd, Zaidi, Razak, Abu, & Salihin (2016) studied the effects of perceived usefulness and perceived ease of use on continuance intention to use E-Government and found that E-government can offer improved nature of data supply and less authoritative weights. In spite of huge advantages in e-government systems, the degree to which residents have had the option to acclimatize these systems is as yet muddled. This study broke down the connections between indicator's variable (saw convenience and saw usability) and measure variable which is duration expectation to utilize e-government. A sum of 543 government worker who instructed in Malaysian state funded schools finished the questionnaire and turned into the participants of this study. To respond to the research questions, multiple regression analysis was applied. The outcomes show that perceived usefulness ($\beta = 0.65$, $p < 0.01$) and perceived ease of use ($\beta = 0.14$, $p < 0.05$) were emphatically identified with continuation aim to utilize e-government and ready to clarify an aggregate of 56% variance.

The discoveries of this study, showing that perceived usefulness and perceived ease of use does predicts the continuation goal of utilizing the e-taxpayer services in Malaysia. In any case, relationship between perceived usefulness and continuation goal was higher than the relationship between perceived ease of use and duration expectation. These discoveries are steady with earlier studies (Abbas & Hamdy, 2015; Barnes, 2011; Kang, Hong, & Lee, 2009; Kim, 2010; Sørebø, Halvari, Gulli, & Kristiansen, 2009). This infers, if clients consider e- government service will be helpful and improve their cooperation with government office, at that point they will be bound to keep utilizing the administration. Along these lines, the designer must consider the requirements of users in structuring the e-government system. Regarding perceived ease of use and

duration goals, the outcome is as yet critical yet was not as solid as the users' perceived usefulness.

Accordingly, if plan of the e-government system is compelling and simple to use, this would be required to reinforce the users' perceived ease of use of e-government system. Along these lines, for a fruitful deployment of e-government application, the designer ought to guarantee that specific e-government system is without a doubt simple to use. Similarly, as with all studies, the current research has its constraints. To start with, because of the way that Malaysia has a few kinds' e-government applications, the capacity to sum up to a wide range of e-government system is muddled. Further studies is important to check the generalizability of our discoveries. Second, our example comprises of just government worker users. Users who are not government worker may have various feelings, which could have prompted testing inclination. Further studies is likewise expected to confirm whether this inclination will impacts the outcomes. Finally, as the proposed model did exclude the other TAM develop (attitude), it is conceivable to add attitude to the model as an indicator for e-government continuance intention.

Lanlan, Ahmi, Muse, & Popoola (2019) studied a study on perceived ease of use, perceived usefulness and the usage of computerized accounting systems: a performance of micro and small enterprises (MSEs) in China and found that Computerized Accounting Systems (CAS) has been used as a device to support the bookkeepers and the entrepreneur to record day by day business exchanges and produce bookkeeping reports instantly. The selection of CAS among the clients, in any case, fluctuates particularly in term of the elements that impact the use and the degree of the reception.

This paper points, among different components, to research the connection between the model of technology acceptance (TAM) and the use of CAS. The principle object is to inspect the association between the two factors of TAM, perceived ease of use and perceived usefulness, and utilization of CAS among bookkeepers in micro and small enterprises (MSEs).

The extent of this study is organizations in Xi'an, Shaan Xi of China. An online review has been used to get criticism from 400 respondents. In any case, just 201 reactions have been returned and accessible for further studies. In view of 201 feedback from the respondents in China's MSEsin Xi'an Shaan Xi, this research finds that perceived ease of use and perceived usefulness affects the utilization of CAS. Through the multiple regression analysis, this research finds that there is a positive relationship between perceived ease of use and perceived usefulness with the aim of utilizing CAS. The essential objective of this study was consequently practiced and the research questions featured in the main section were replied. About the present utilization territory of CAS in Xi'an, Shaan Xi of China, there were about the 73.6 % of business previously actualized CAS while 26.4% of the business despite everything didn't execute CAS in Xi'an, Shaan Xi of China (Lanlan & Ahmi, 2018).

The discoveries likewise demonstrate that the perceived ease of use affected the utilization of CAS by 42.7 percent. Perceived usefulness affirms 55.4 percent sway on CAS use. The blend of perceived ease of use and perceived usefulness influences the utilization of CAS by 49.05 percent. This research may support bookkeepers and entrepreneurs comprehend the relationship between technology acceptance and the utilization of CAS, particularly in the MSEs, which could most likely assist them to

prevail in their business. There are a few imperatives in this study. The principal limitation concerns the sample size. The absolute number of solicitations sent to take an interest in this overview was 400. Nonetheless, 221 questionnaires were returned, and just 201 were used for additional analysis. The respondent rate speaks to 55.25%.

In spite of the fact that the quantity of questionnaires returned is sufficient to do the analysis, notwithstanding, contrast with the quantity of populaces in Xi'an, it is moderately little. Furthermore, the collection of data was recovered from the sample of MSEs just and not from the bigger organizations. Future research could extend the investigation into medium and large businesses. Thirdly, this study utilizes an online review. This methodology can obtain a circumstance or an occasion at a given time. Future studies can use other research approaches, for example, perceptions, tests or contextual investigation. These techniques likely can give us an increasingly itemized clarification of the reception of CAS. This study finds an advantageous association between perceived ease of use, perceived usefulness and CAS use. This study could guide the bookkeepers and entrepreneurs just as the research networks to comprehend the relationship of technology acceptance and the utilization of CAS.

Wang & Wang (2019) studied design of laboratories for teaching electrical/ mechatronics engineering in the context of manufacturing upgrades and found that with regards to upgrading of the overall assembling industry, propelled programmed creation systems are received in assembling endeavors moving towards insightful assembling, which requires thorough specialized capacities for mechatronic/electrical building experts. This paper exhibits the research centers intended for instructing mechatronics/electrical building in professional designing training, where students can

create industry-applicable abilities, which adjust to the prerequisites of assembling industry upgrading. Following the investigation of the expert fitness, the down to earth modules of the prospectus are sketched out, and the comparing labs are planned and executed. Assessment results demonstrate that the training in the labs is useful in improving the necessary specialized capacities for the students.

It adds to building training by introducing a research facility condition in which students can create industry-important aptitudes which adjust to the prerequisites of assembling industry updating. The recreating generation system empowers students to be prepared in a situation that reenacts the genuine creation condition in assembling endeavors, so they can get acquainted with genuine mechanical gear and figure out how to tackle genuine issues in the entire creation framework. Modernized mechanical segments, gadgets and secluded frameworks offer students the chance to gain proficiency with the new innovations and gadgets. Assessment results demonstrate that the training in the labs is useful in improving the necessary specialized capacities of the students.

Yang et al. (2019) studied distributed case- and project-based learning to design 3d lab on electronic engineering education. As of late, laboratories that are virtual have springing up in web-based learning for undergrads to self-take a crack at the trials. Like in-class showing philosophy, laboratories that are virtual need to meet the necessities like real world laboratories and bolster productive learning and communication services. The objective of this study is to build up a 3D virtual experiment system to acknowledge copy electronic lab and give students an important hands-on way to deal with learning. To accomplish this objective, we structure the test creation dependent on CPBL incorporated with staged electronic direction, equipment data and down to earth

18

3D displaying, at that point use picture and content acknowledgment to acknowledge intuitive evaluation productively. Besides, this system additionally bolsters intelligent communication among students and virtual instructor, our system can give services to students' moment manage during learning.

At long last, the proposed system is to begin with explored for a situation study, which estimated both quantitative data (i.e., finishing time and learning impact) and abstract feeling. In view of the gathered information, the fundamental information from the experiment demonstratively underpins our supposition that our proposed 3D lab might be more financially savvy in term of lesson learning time than the customary electronic building physical lab. In this research, we detail the advancement of our dispersed 3D lab system dependent on case-and task-based learning technique, which bolster self-loader explore creation, appraisal and information-based moment discussion. We showed the capability of our system with a contextual analysis in a subject of electronic building. The primer outcomes showed that our system exhibited the capability of giving adaptable appraisal, sparing time, improving trial aptitudes and making understudies increasingly certain.

Gan & Zhong (2019) studied experimental teaching research based on virtual simulation electronic laboratory and found that with the consistent improvement of China's advanced education and the nonstop headway of the showing change of conventional electronic courses, a few imperfections and inadequacies of customary test instruments in electronic analysis instructing are progressively evident. The encouraging strategies for electronic experiment using virtual simulation electronic laboratories have pulled in increasingly more consideration. In this paper, the relative

19

research and investigation of customary test instructing and virtual reenactment electronic trial instructing demonstrate that the encouraging technique dependent on virtual recreation electronic lab can be all around joined with conventional exploratory strategies on trial educating.

As a rule, the utilization of virtual simulation electronics laboratory for electronic experiment educating can spare expenses, yet in addition improve the quality and proficiency of instructing. The educating of electronic experiments should place the thorough capacity and complete nature of students in the essential position, which is the major motivation behind experimental teaching. Common electronic experiment instruments and their related training techniques are generally old and in reverse, and can never again adjust to the present showing condition, which has significantly confined the advancement of students; these days, schools utilize virtual instruments for electronic experiment teaching, not just It can compensate for these inadequacies, and it can likewise make the electronic experiment teaching process progressively great, consequently improving the quality and proficiency of teaching.

Cooper (2005) studied remote laboratories in teaching and learning – issues impinging on widespread adoption in science and engineering education and talks about the significant issues that encroach on the far-reaching selection of remote-controlled research facilities in science and building instruction. This exchange to a great extent rises up out of crafted by the PEARL venture and is shown with models and assessment information from the task. Right off the bat the basis for needing to offer students remote experiments is laid out. Remote controlled analyses for instructive purposes have existed for more than 10 years and there has been a fast increment in

improvements in this field since 2000. Anyway, the vast majority of these improvements have been secluded instances of what can be accomplished.

Some have been incorporated into courses however to the extent the creator knows no courses as of now exist with a thorough scope of remote experiments over their presentation. This paper has sketched out key issues that should be tended to if remote controlled experiments are to turn out to be generally received in science and building instruction. The paper purposely stays away from discourse of specialized execution issues of remote tests however rather centers around issues that encroach on the determination and structure of such offices. This incorporates academic, ease of use and availability issues. It looks at remote investigations to programming reproductions. It likewise considers remote analyses in the more extensive setting for instructive establishments and layouts gives that will influence their choices with respect to whether to embrace this methodology.

In end it contends that there are huge difficulties to be met if remote research facilities are to accomplish a boundless nearness in training however communicates the expectation that this outline of the issues is a commitment towards meeting these difficulties. Some of the concepts used by researchers are perspective, Project-based learning, Case-based learning, Exciting virtual lab, Remote Triggered Labs, Measurement-Based Labs, Simulation/Modeling-Based Labs, User management module, Experiment creation module, Experiment assessment module, intelligent conversation module, Electronic user management, Electronic experiment creation, Electronic experiment assessment, intelligent conversation, and Knowledge-based conversation. Theories used are Theory of Planned Behavior and Technology Acceptance Model.

Yau, Choy, Sibley, & Kannangara (2019) studied Teaching Laboratory Data Management (TLDM) System and found that in the teaching laboratory, students produce a lot of information and regularly battle with the consequent computations for results. Reviewing the generous measures of results and estimations from a large class is burdening for educators, who are left with less time to associate with students. The TLDM system intends to determine the essential test related with laboratory exploratory estimations: while the numerical tasks for a given research are required to be the equivalent, the right numerical outcomes differ dependent on the interesting crude information gathered by each student. The system gives adaptable instructional platform to manage students through their own counts.

The system additionally attempts to create custom marking keys exceptional to every student's crude information to help instructors in reviewing the numerical part of reports, leaving them with more opportunity to give criticism in different territories. The TLDM framework assists students with managing the enormous measure of information created in teaching laboratories by joining successive feedback and adaptable platform to assist them master complex numerical estimations. Educators can use the TLDM system to improve the exactness and effectiveness of evaluating, in this way permitting extra time to be spent giving input to students. The traceability and exactness of all laboratory information is improved, which builds the clearness and straightforwardness of reviewing.

Additionally, the gathered informational collections can be used to make new teaching opportunities, track student and equipment performance, and help with course advancement and program accreditation. While the effective usage of the TLDM system has been exhibited in Chemical Engineering laboratory courses, it has solid

22

potential for application to lab courses in different disciplines also. For whatever length of time that numerical information is created in a teaching laboratory environment, the essential highlights of the TLDM system offered through its 5 center documents can be applied to different teaches and course settings. Likewise, while the usage of the TLDM system has been exhibited dependent on Microsoft Excel™ as a computations stage, it is conceivably conceivable to actualize the majority of its highlights on other spreadsheet applications.

The idea of giving students test raw data and answers can likewise be applied to count apparatuses other than spreadsheets, for example, statistical or modeling software, however it is relied upon to be increasingly hard to execute the programmed grading section of the TLDM system in these applications. The TLDM system permits you to add new thoroughness to your lab courses with decreased grading effort. The time savings permit the instructor to re-center student/educator discussions to the significant underlying scientific principles behind each laboratory experiment.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The aim of this research was to investigate the impact of electronic-laboratory on teaching and learning of computing: the moderating effect of perceived ease of use at Potsin TI Ahmadiyya senior high school. This chapter looked at the methods used to gather information for the study. This chapter covers introduction, research design, population, sample and sampling technique, instrumentation, validity and reliability, data collection procedure, the procedure for the analysis of the data and ethical consideration.

3.2 Research Design

The type of research design that used was a survey research design, the researcher intended to describe trends for a population of students. The researcher in the research study adopted a descriptive study. Creswell (2003) prompted that exploratory research is useful when much has not been expounded on the point or the research group being contemplated. Descriptive research otherwise called survey is significantly identified with mindfulness, conclusions, practices, techniques socioeconomics and inclinations (Airasian and Gay, 2000). The results of the quantitative analysis was supported by comprehensive interviews.

3.3 Profile of Research Site

Potsin TI Ahmadiyya Senior High School is in a city of Gomoa Potsin in the Central Region of Ghana with a postal address of Gomoa Potsin, 29 (Education, 2019). Potsin TI Ahmadiyya Senior High School was built up by the Ahmadiyya Muslim Mission of

24

Ghana with help from the Gomoa Potsin people group at first as a private instructive establishment in 1972. Potsin TI Ahmadiyya Senior High School is one of the educational institutions built up under the Nusrat Jahan (Service to Humanity) conspire started by the late Khalifatul Masih III, Hadhrat Hafiz Mirza Nasir Ahmad, and the Supreme Head of the Ahmadiyya Muslim Community around the world. The school began with just 13 young men and a young lady and four teachers including the main dean, Mr. Sharif Ahmad, a Pakistani, yet by and by, it has a student populace of 2,435 made up of 1,331 young men and 1,104 young ladies, with a total of 81 teaching staff, while the non-teaching staff is 44. The school offers projects, for example, General Arts, Business, General Science, Home Economics, Visual Arts, and Technical (Keelson, 2012).

3.4 Population

A population is a group of individuals that the researcher generalizes his or her findings to, Kusi (2012). Fraenkel (2004) further explains that the population is the large group which one aspires to apply findings. The population for the study was two thousand, four hundred and thirty-five (2435) Senior High School students at Potsin TI Ahmadiyya Senior High School, Potsin. Out of the population, one thousand three hundred and thirty-four (1334) students were males and one thousand one hundred and six (1106) students were females. The view of the majority helped the researcher to appreciate the real facts on the ground and not circumscribed in any spectrum.

3.5 Sample and Sampling Technique

The sample for the study consists of four hundred and eighty-eight (488) senior high school students at Potsin TI Ahmadiyya Senior High School, Potsin. Systematic sampling (Lavrakas, 2008) was used for selecting the sample size from the population.

The researcher selected a percentage of 20% of the population and that is where the researcher got the sample size. The researcher used an interval of five (488/2,440, or 1 out of 5) to select students from the target population list. Therefore, this researcher sends every fifth student on the list a survey. This helped the researcher to collect data at ease.

3.6 Data Collection Instruments

The researcher used a questionnaire to gather the data for studying the issue under investigation. The questionnaire for respondents at the Potsin TI Ahmadiyya Senior High School in the Central Region was closed-ended. Simple sentences were used for the wording such that respondents could understand the instructions. Although the sample size for the study is four hundred and eighty- eight (488), the researcher shared five hundred and fifty (550) questionnaires to avoid any inconveniences. A questionnaire was used for the study which helped the researcher to gather authentic information about students' awareness and usage of electronic laboratory hence, a five Likert type questionnaire was created to gather information for the research questions expressed. The questionnaire was made up of 30 close-ended items. Close-ended question according to Cohen, et al, (2003) are quick to compile and straight forward to code and do not discriminate unduly on the basis of how articulate the respondents are. The five Likert-type scale range from "Strongly agree (SA), "Agree" (A), "Uncertain" (U), "Disagree" (D) to "Strongly Disagree" (SD). As indicated by Ary et al (2002), the Likert scale is one of the most broadly utilized systems to measure variables intended for the study. Four of the content of the questionnaire was adopted from previous studies (Ma, Gam, & Banning, 2017) and the rest of the contents was self-developed.

26

3.7 Validity and Reliability

To guarantee validity of the questionnaire; pilot testing was carried out at Potsin TI Ahmadiyya Senior High School where twenty questionnaires was sent to the participants. This assisted with surveying the language clearness, gathering information from respondents, adequacy as far as length and moral thought for respondents. The questionnaire was sent to the supervisor of the researcher to rate the instruments in order to discover their validity. To establish content validity, response from the supervisor was taken into consideration and took effect of any corrections. The edited questionnaire was sent to twenty respondents to answer. Their responses were coded into SPSS to check the reliability of the questionnaire. The reliability test was above the Cronbach's Alpha of .700.

3.8 Data Analysis

The type of analysis for the study was a descriptive analyses (Abd et al., 2016). The responses to closed-ended items in the questionnaire was fully coded for easy identification. The analyses of the responses of the questionnaire was in frequency. Independent t-test was used to test the hypothesis and descriptive statistics was used to interpret the response of respondents. SPSS v.21.0. Statistical Package for Service Solution (SPSS), AMOS and Microsoft Excel were used by the researcher for the analysis.

3.9 Ethical Consideration

In conducting the study, therefore, the researcher provided an introductory letter from the University of Education, Winneba to the headmaster of Potsin TI Ahmadiyya Senior High School for his approval before the study was conducted. Participation in the study was voluntary; and respondents were advised of their rights to decline participation at

any time. Explanation about the aims of the study was made to the respondents, to acquire their educated assent. Anonymity of the respondents was guaranteed and the information that they gave was dealt with most extreme privately. Accordingly, the respondents' names were maintained a strategic distance from responses.

CHAPTER FOUR

RESULTS AND INTERPRETATION

4.1 Introduction

The aim of this research is to investigate the impact of electronic-laboratory on teaching and learning of computing: the moderating effect of perceived ease of use at Potsin TI Ahmadiyya senior high school. This section includes demographic characteristics of respondents, answers to the research questions, and discussion of findings.

4.2 Respondents' Demographic Characteristics

For the purpose of this study, the demographics of the respondents are age and gender.

4.2.1 Age

Figure 2 shows that fifty-seven of respondents representing 11.7% are 11 years or 14 years or between, three hundred and fifty-seven of the respondents representing 73.1% are 15 years or 19 years or between, and seventy-four of the respondents representing 15.2% are 20 years and above.
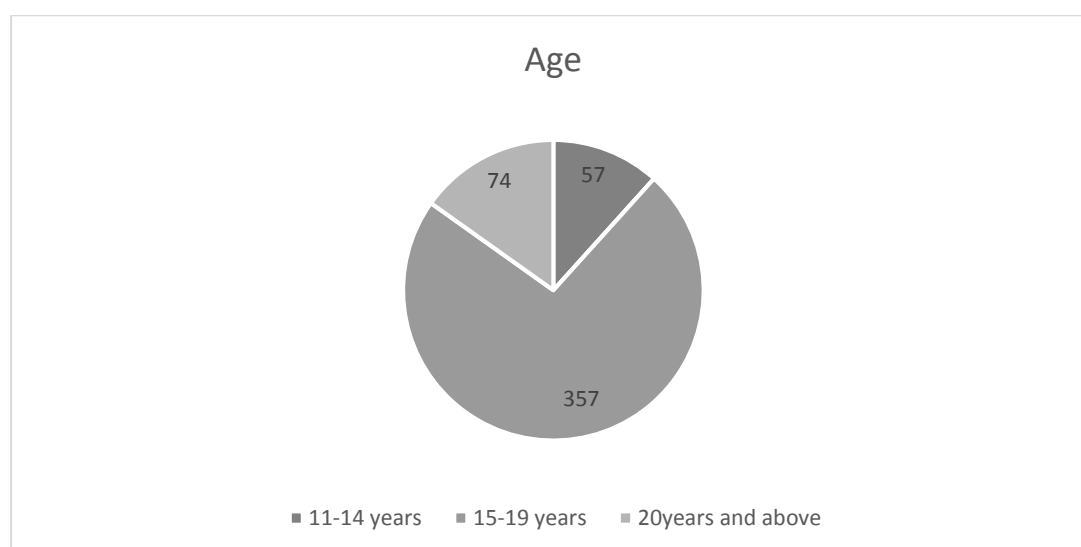
Figure 2: Age of respondents

Source: Researchers' field survey, 2021

4.2.2 Gender

Figure 3 shows that one hundred and thirty-seven of the respondents representing 28.1% are males and three hundred and fifty-one of the respondents representing 71.9% are females.
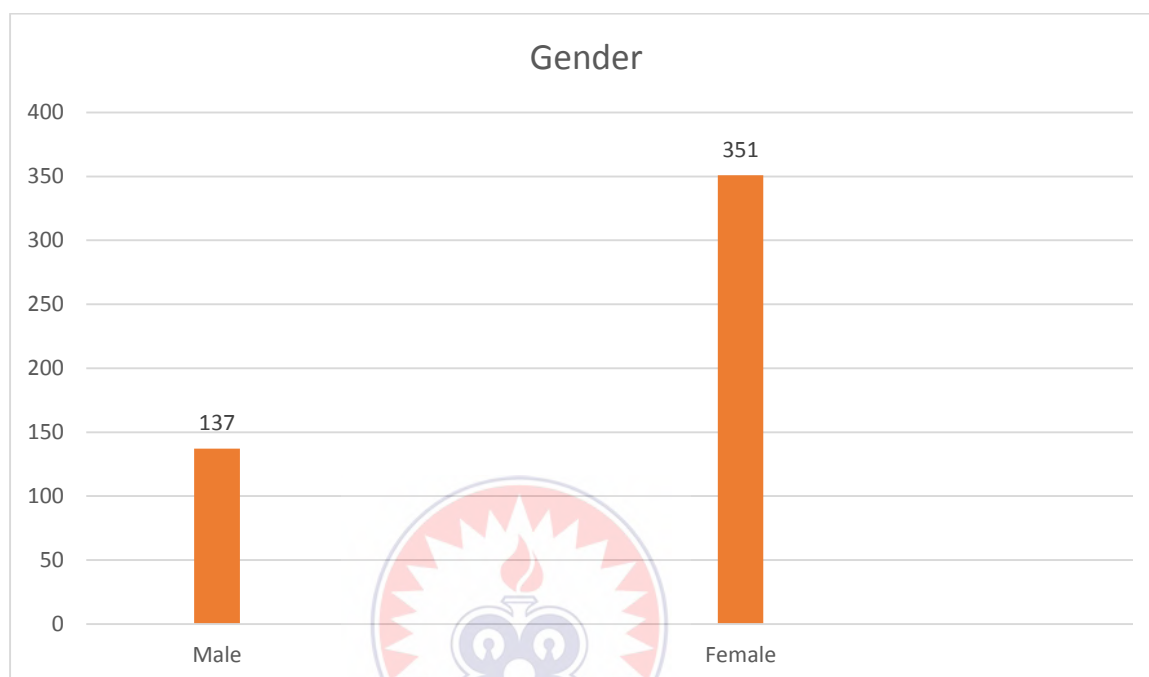
Figure 3: Gender of respondents

Source: Researchers' field survey, 2021

4.3 Research Objective One

The impact of electronic laboratory on teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin

In Table 1, the standardized coefficient (β) values were shown with the total value for Sig. F statistics, Adjusted R Square, and R Square. Electronic laboratory was entered as independent variable to predict teaching and learning of computing. In total, the model testified significant effect with Adjusted R Square = .063; R Square = .067; and $p = .000^b$ $(p < .01)$. Electronic laboratory entered had a significant influence with a variance of 6.3% in teaching and learning of computing. Electronic laboratory of

30

students displayed a positive relationship with teaching and learning of computing (B = .259, t = 4.118).

Table 1: Hierarchical multiple regression analysis results predicting teaching and learning of computing from electronic laboratory – standardized coefficients

	Beta	t
Electronic laboratory	.259	4.118
R Square	.067	
Adjusted R Square	.063	
Df1	2	
Df2	484	
ANOVA		
F	16.958	
Sig.	.000b	

Note. N = 488. Standardised coefficients are reported $p < .05$; $p < .01$. a. Dependent variable: teaching and learning of computing
Source: Researcher's field survey, 2021

Table 2 below shows that it helps teachers to monitor the way students use computers in the laboratory (5) had the highest mean of 5.28. This shows that the highest impact of electronic laboratory on teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin is that it helps teachers to monitor the way students use computers in the laboratory. The next highest factor is, it helps students to practice what they learn (4) with a second highest mean of 4.63. The next factor is, it helps teachers draw attention of students to computing (3) with third highest mean of 3.91. The next factor is, it helps teachers search for most of the items they mention when teaching for demonstration (2) with a fourth highest mean of 3.86. The next factor is, the use of electronic laboratory make teaching of computing easy (1) with the last mean of 3.81.

31

Table 2: Descriptive Statistics for the impact of electronic laboratory on teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin

	N	Minimum	Maximum	Mean	Std. Deviation
1	488	1	7	3.81	1.908
2	488	1	7	3.86	1.779
3	488	1	7	3.91	2.060
4	488	1	7	4.63	1.997
5	488	1	7	5.28	1.618
5	488	1	7	5.28	1.618

Source: Researchers' field survey, 2021

4.4 Research Objective Two

The impact of electronic laboratory on students learning at Potsin TI Ahmadiyya Senior High School, Potsin

In Table 3, the standardized coefficient (β) values were shown with the total value for Sig. F statistics, Adjusted R Square, and R Square. Electronic laboratory was entered as independent variable to predict students learning. In total, the model testified significant effect with Adjusted R Square = .014; R Square = .018; and $p = .038^b$ ($p <$ .05). Electronic laboratory entered had a significant influence with a variance of 1.8% in students learning. Electronic laboratory of students displayed a positive relationship with ($B = .135$, t = -2.082).

32

Table 3: Hierarchical multiple regression analysis results predicting students learning from electronic laboratory – standardized coefficients

	Beta	t
Electronic laboratory	.135	-2.082
R Square	.018	
Adjusted R Square	.014	
Df1	2	
Df2	484	
ANOVA		
F	4.336	
Sig.	.038[b]	

Note. N = 488. Standardised coefficients are reported $p < .05; p < .01$. a. Dependent variable: students learning
Source: Researcher's field survey, 2021

Table 4 below shows that electronic laboratory improves students learning ability (5) had the highest mean of 3.81. This shows that the highest impact of electronic laboratory on students learning at Potsin TI Ahmadiyya Senior High School, Potsin is that electronic laboratory improves students learning ability. The next highest factor is electronic laboratory helps students to get further understanding of what they were taught (4) with a second highest mean of 3.77. The next factor is electronic laboratory helps students to add up to what they were taught (2) with a third highest mean of 3.75. The next factor is electronic laboratory helps students to learn without a manual book (3) with a fourth highest mean of 3.38. The next factor is students are able to practice what they learn (1) with the last mean of 2.87.

Table 4: Descriptive Statistics for the impact of electronic laboratory on students learning at Potsin TI Ahmadiyya Senior High School, Potsin

	N	Minimum	Maximum	Mean	Std. Deviation
1	488	1	7	2.87	1.735
2	488	1	7	3.75	1.833
3	488	1	7	3.38	1.853
4	488	1	7	3.77	1.876
5	488	1	7	3.81	1.908

Source: Researchers' field survey, 2021

4.5 Research Objective Three

The moderating effect of perceived ease of use on the relationship between electronic laboratory and teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin

In Table 5, 6, and 7, the standardized coefficient (β) values were shown with the total value for Sig. F statistics, Adjusted R Square, and R Square. Electronic laboratory was entered as independent variable to predict teaching and learning of computing with the moderating effect of perceived ease of use. Model 1 and the Anova testified significant effect with Adjusted R Square = .014; R Square = .018; and p = .038[b] ($p < .05$). Model 2 testified insignificant effect with Adjusted R Square = .011; R Square = .019; and p = .103[c] ($p < .05$). Which means that perceived ease of use entered had insignificant influence with a variance of 1.9% in the relationship between electronic laboratory and teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin. Perceived ease of use displayed a positive relationship with (B = .033, t = -0.512).

34

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.135[a]	.018	.014	1.66901
2	.139[b]	.019	.011	1.67164

a. Predictors: (Constant), electronic laboratory

b. Predictors: (Constant), electronic laboratory, perceived ease of use

Source: Researcher's field survey, 2021

Table 6: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	12.078	1	12.078	4.336	.038[b]
1	Residual	654.614	235	2.786		
	Total	666.692	236			
	Regression	12.811	2	6.405	2.292	.103[c]
2	Residual	653.881	234	2.794		
	Total	666.692	236			

a. Dependent Variable: teaching and learning of computing

b. Predictors: (Constant), electronic laboratory

c. Predictors: (Constant), electronic laboratory, perceived ease of use

Source: Researcher's field survey, 2021

Table 7: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.291	.225		23.564	.000
	electronic laboratory	-.125	.060	-.135	-2.082	.038
2	(Constant)	5.214	.271		19.229	.000
	electronic laboratory	-.128	.061	-.138	-2.119	.035
	perceived ease of use	.036	.071	.033	.512	.609

a. Dependent Variable: teaching and learning of computing

Source: Researcher's field survey, 2021

35

4.6 Discussion of Findings

The following are the discussion of findings based on the objectives:

4.6.1 The impact of electronic laboratory on teaching and learning of computing at

Potsin TI Ahmadiyya Senior High School, Potsin

Electronic laboratory was entered as independent variable to predict teaching and learning of computing. In total, the model testified significant effect with Adjusted R Square = .063; R Square = .067; and p = .000[b] ($p < .01$). Similar was presented in an article published by Yang, Yuan, Chinthammit, & Kang, (2019). Electronic laboratory entered had a significant influence with a variance of 6.3% in teaching and learning of computing. Similar is seen in a published paper by Okafor, (2017), Chiu & Wang (2008) and Wang and Ha-Brookshire (2018). Electronic laboratory of students displayed a positive relationship with teaching and learning of computing (B = .259, t = 4.118). The study is similar to that of Abbas & Hamdy (2015), Barnes (2011) and Kang, Hong, & Lee (2009).

4.6.2 The impact of electronic laboratory on students learning at Potsin TI

Ahmadiyya Senior High School, Potsin

Electronic laboratory was entered as independent variable to predict students learning. In total, the model testified significant effect with Adjusted R Square = .014; R Square = .018; and p = .038[b] ($p < .05$). Similar was presented in an article published by Davis 1989; Abd, Zaidi, Razak, Abu, & Salihin, (2016), Davis, 1989; and Lanlan et al., (2019). Electronic laboratory entered had a significant influence with a variance of 1.8% in students learning. Similar can be seen in a paper by Wang and Ha-Brookshire (2018). Electronic laboratory of students displayed a positive relationship with (B = .135, t = -2.082). Similar can be seen in a published paper by Venkatesh, (2000); Lanlan et al., (2019).

36

4.6.3 The moderating effect of perceived ease of use on the relationship between electronic laboratory and teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin

Electronic laboratory was entered as independent variable to predict teaching and learning of computing with the moderating effect of perceived ease of use. Model 1 testified significant effect with Adjusted R Square = .014; R Square = .018; and p = .038[b] *(p < .05)*. Similar was presented in an article by Gibson et al., 1932; Adolph & Kretch, (2015). Model 2 testified insignificant effect with Adjusted R Square = .011; R Square = .019; and p = .103[c] *(p < .05)*. Similar can be seen in a published paper by Adolph & Kretch, (2015). Perceived ease of use entered had insignificant influence with a variance of 1.9% in the relationship between electronic laboratory and teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin. Similar is seen in an article published by Lanlan, Ahmi, Muse, & Popoola (2019) and Ozturk, Bilgihan, Nusair, and Okumus (2016). Perceived ease of use displayed a positive relationship with (B = .033, t = -0.512). The results is similar to that of Kim (2010), Sørebø, Halvari, Gulli, & Kristiansen (2009) and Lanlan & Ahmi (2018).

37

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The aim of this research is to investigate the impact of electronic-laboratory on teaching and learning of computing: the moderating effect of perceived ease of use at Potsin TI Ahmadiyya senior high school. This chapter constitutes the summary, conclusion, and recommendations.

5.2 Summary

The use of Information Communication Technology (ICT) and its related instruments have affected pretty much every feature of our day by day activities be it family, wellbeing, instruction, sports among others. Students from fundamental school levels to tertiary degrees of today grow up with a variety of innovation, both at home and at school. There is in this way requirement for a student to know, and properly utilize electronic-laboratory to enhance their knowledge. E-laboratory alludes the use of Information and Communication Technologies (ICTs) to advance increasingly efficient and effective teaching and learning of computing. As a result, the study aims to to investigate the impact of electronic-laboratory on teaching and learning of computing: the moderating effect of perceived ease of use at Potsin TI Ahmadiyya senior high school.

The researcher adopted a descriptive study. The population for the study was two thousand four hundred and thirty seven (2440) Senior High School students at Potsin TI Ahmadiyya Senior High School, Potsin. The sample for the study consisted of four

38

hundred and eighty eight (488) senior high school students at TI Ahmadiyya Senior High School, Potsin. The researcher applied a questionnaire to gather the data for studying the issue under investigation. Electronic laboratory had a significant influence in teaching and learning of computing. Electronic laboratory had a significant influence % in students learning. Perceived ease of use had insignificant influence in the relationship between electronic laboratory and teaching and learning of computing at Potsin TI Ahmadiyya Senior High School, Potsin.

5.3 Conclusion

The study revealed that the use of electronic laboratory at Potsin TI Ahmadiyya Senior High School, Potsin had a significant influence with a variance of 6.3% in teaching and learning of computing. The study found that the use of electronic laboratory at Potsin TI Ahmadiyya Senior High School, Potsin had a significant influence with a variance of 1.8% in students learning. The study conclude that perceived ease of use of electronic laboratory at Potsin TI Ahmadiyya Senior High School, Potsin had no significant influence in the relationship between electronic laboratory and teaching and learning of computing.

5.4 Recommendations

The researcher recommends that electronic laboratory should be considered when deciding on a positive change in teaching and learning of computing. Also, electronic laboratory should be considered when deciding on students learning. But perceived ease of use should not be considered when deciding on the relationship between electronic laboratory and teaching and learning of computing. Since the use of electronic laboratory has 6.3% impact on teaching and learning of computing, future studies

39

should look at other factors that has impact on teaching and learning of computing. Furthermore, the use of electronic laboratory has 1.8% impact on students learning. So, future studies should look at other factors that influence students learning. Lastly, perceived ease of use of electronic laboratory had no significant impact in the relationship between electronic laboratory and teaching and learning of computing. So, the researcher recommends that future studies should look at the perceived ease of use of electronic laboratory to confirm or contrast, if it mediate the relationship between electronic laboratory and teaching and learning of computing.

REFERENCES

Adebi-Caesar, T.E. (2012). *Assessment of I.C.T situation in senior high schools. A case study in Lower Manya Krobo district*. Kumasi: KNUST.

Airasian, P. & Gay, L. R. (2000). E*ducational Research: Competencies for Analysis and Application* (6ᵗʰ ed.). New Jersey: Prentice Hall Inc.

Abd, A., Zaidi, F., Razak, A., Abu, A., & Salihin, W. (2016). The Effects of Perceived Usefulness and Perceived Ease of Use on Continuance Intention to Use E-Government. *Procedia Economics and Finance*, *35*(October 2015), 644–649. https://doi.org/10.1016/S2212-5671(16)00079-4.

Adolph, K. E., & Kretch, K. S. (2015). Author's personal copy Gibson's Theory of Perceptual Learning Author's personal copy. *International Encyclopedia of the Social & Behavioral Sciences*, *10*, 127–134. Retrieved from http://dx.doi.org/10.1016/B978-0-08-097086-8.23096-1.

Anksorus, H. N., Bradley, C. L., Porter, A. L., Vanlangen, K. M., & Donohoe, K. L. (2019). Establishing a successful teaching assistant program in pharmacy skills laboratory courses. *Currents in Pharmacy Teaching and Learning*, *11*(8), 760–766. https://doi.org/10.1016/j.cptl.2019.04.003.

Biljon, J. Van, & Sanders, I. (2019). Open-distance electronic learning environments: Supervisors' views on usability. *2019 Conference on Information Communications Technology and Society (ICTAS)*, 1–7. https://doi.org/10.1109/ICTAS.2019.8703605.

Cooper, M. (2005). Remote laboratories in teaching and learning – issues impinging on widespread adoption in science and engineering education. *International Journal of Online Engineering*, *1*, 1–8. Retrieved from http://www.i-joe.org/ojs/viewarticle.php?id=11&layout=abstract.

Domin, D. S. (1999). A Review of Laboratory Instruction Styles. *Journal of Chemical Education*, *76*(4), 543–547.

Education. (2019). Potsin TI Ahmadiyya Senior High School Agona Swedru 29 - Yellow Pages Ghana. Retrieved from yellowpages.com.gh website: http://yellowpages.com.gh/Company-Details/potsin-ti-ahmadiyya-senior-high-school-214924.aspx

Gan, Y., & Zhong, J. (2019). Experimental Teaching Research based on Virtual Simulation Electronic Laboratory. *Advances in Social Science, Education and Humanities Research*, *300*(Erss 2018), 128–131. Retrieved from http://creativecommons.org/licenses/by-nc/4.0/

García, M. E. M., & Flores, E. G. R. (2019). with Real Time $ ccess. *2019 IEEE Global Engineering Education Conference*, 646–652.

Ho, P. C. W., Fok, W. W. T., Chan, C. K. K., Yeung, H. H. A., Ng, H. W., Wong, S. L., … Chan, K. H. (2019). Flipping the Learning and Teaching of Reading Strategies and Comprehension through a Cloud-based Interactive Big Data Reading Platform. *ICEIT*, 185–191. Retrieved from http://doi.org/10.1145/3318396.3318427

Keelson, N. A. (2012). Gomoa Potsin T.I. AMASS marks 40th anniversary. Retrieved from MG Modern Ghana website: https://www.modernghana.com/news/430010/gomoa-potsin-ti-amass-marks-40th-anniversary.html

Lampouw, Y. F., & Fajar, A. N. (2019). Evaluation of E-Kelurahan Information Systems at Subdistrict of Pancoran Mas Depok. *Journal of Theoretical and Applied Information Technology*, *97*(3), 714–726. https://doi.org/1992-8645.

Lanlan, Z., Ahmi, A., Muse, O., & Popoola, J. (2019). Perceived Ease of Use ,

Perceived Usefulness and the Usage of Computerized Accounting Systems : A

Performance of Micro and Small Enterprises (MSEs) in China. *International

Journal of Recent Technology and Engineering*, *8*(2), 324–331.

https://doi.org/10.35940/ijrte.B1056.0782S219

Loschky, L. C., Larson, A. M., Smith, T. J., & Magliano, P. (2019). *The Scene

Perception & Event Comprehension Theory (SPECT) Applied to Visual

Narratives* (Kansas State University). https://doi.org/10.1111/tops.12455

Ma, Y. J., Gam, H. J., & Banning, J. (2017). Perceived ease of use and usefulness of

sustainability labels on apparel products: application of the technology

acceptance model. *Fashion and Textiles*, *4*(3), 1–20.

https://doi.org/10.1186/s40691-017-0093-1.

Maloney, C. (2016). North American Philosophical Publications: A Theory Of

Perception. *University of Illinois Press*, *18*(1), 63–70. Retrieved from

http://www.jstor.org/stable/2001 3892.

Okafor, C. F. (2017). Essence of Computer Science Education. *Nnadiebube Journal of

Social Sciences*, *1Okafor*, *C*(1), 21–31.

Oliveira, A., Feyzi, R., Lijun, B., Arwa, N., Burgess, K. J., & Guo, L. (2019).

Emerging technologies as pedagogical tools for teaching and learning science :

A literature review. *Willey Online Library Journal*, (February), 149–160.

https://doi.org/10.1002/hbe2.141.

Peng, D. (2019). *Mobile-Based Teacher Professional Training : Influence Factor of

Technology Acceptance* (Springer Singapore). https://doi.org/10.1007/978-981-

13-6908-7.

Perception, H., & Processing, I. (2012). Human Perception and Information Processing. In *Human Perception and Information Processing* (pp. 1–56).

Reilly, C. F., & Swanson, J. A. (2019). A Case Study in Constructivist Pedagogy in a Computer Organization Course. *IEEE Colloquium on Humanities, Science & Engineering Research*, 2–10.

Sezer, B., & Abay, E. (2019). Looking at the Impact of the Flipped Classroom Model in Medical Education. *Scandinavian Journal of Educational Research*, *63*(6), 853–868. https://doi.org/ 10.1080/00313831.2018.1452292.

Wang, L., & Wang, J. (2019). Design of laboratories for teaching mechatronics / electrical engineering in the context of manufacturing upgrades. *International Journal of Electrical Engineering & Education*, *0*(0), 1–15. https://doi.org/10.1177/0020720919837856.

Wang1, W., & Quan2, X. (2019). Design of Electronic Virtual Experiment System Based on LabVIEW Design of Electronic Virtual Experiment System Based on LabVIEW. *IOP Conference Series: Materials Science and Engineering 490*, 2–7. https://doi.org/10.1088/175 7-899X/490/4/042024.

Yang, W., Yuan, N., Chinthammit, W., & Kang, B. (2019). A distributed case- and project-based learning to design 3D lab on electronic engineering education. *Willey Online Library Journal*, *27*(August 2018), 430–451. https://doi.org/10.1002/cae.22087.

Yau, D., Choy, C., Sibley, J., & Kannangara, D. (2019). *The Teaching Laboratory Data Management (TLDM) System* (pp. 1–8). pp. 1–8. Columbia.

Yildirim, M. C. (2019). The Contributions of School Principals as Constructivist Leaders to Their Schools' Organizational Change. *Asian Journal of Education and Training*, *5*(1), 1–7. https://doi.org/10.20448/journal.522.2019.51.1.7.

Zigman, P. (2018). *Theories of Perception and Recent Empirical Work* (The City

University of New York). Retrieved from

https://academicworks.cuny.edu/gc_etds/2772.

APPENDIX

QUESTIONNAIRE ON THE IMPACT OF E-LAB ON TEACHING AND

LEARNING OF COMPUTING AT THE SENIOR HIGH SCHOOLS

Dear Sir/Madam,

This questionnaire is conducted to study the impact of E-lab on teaching and learning of computing at the Senior High School. This institution has been chosen for the study and you are one of the selected sample sizes to help in gaining a better understanding of the effect topic. Your kind cooperation in this research is very much appreciated and I sincerely hope that you will find the study of interest to you.

I assure you that all information that is collected in this study will be treated confidentially. Thank you very much for your time and cooperation.

SECTION A: DEMOGRAPHIC VARIABLES

Please tick once in the appropriate box for your preferred answer.

1. What is your age?

   a) 18-28 years   b) 29-39 years   c) 40years and above

2. What is your gender?

   a) Male   b) Female

46

SECTION B

Please tick in the box appropriately for your preferred. This is a five Likert point scale where 1 = strongly agree, 2 = agree, 3 = slightly agree, 4 = disagree, 5 = strongly disagree

Statement	1	2	3	4	5
The Impact of Electronic Laboratory on Teaching of Computing					
The use of electronic laboratory make teaching of computing easy.					
It helps teachers search for most of the items they mention when teaching for demonstration.					
It helps teachers draw attention of students to computing					
It helps teachers to monitor the way students use computers in the laboratory.					
It helps students to practice what they learn.					
The Impact of Electronic Laboratory on Students Learning					
Students are able to practice what they learn.					
Electronic laboratory helps students to add up to what they were taught.					
Electronic laboratory helps students to learn without a manual book.					
Electronic laboratory helps students to get further understanding of what they were taught.					
Electronic laboratory improves students learning ability.					
The Influence of Electronic Laboratory on Students' Lives					
Students use electronics in doing their assignment.					
Students use electronics in doing their group work.					
Students use electronics in learning.					
Students use electronics to chat.					

Students use electronics to do many things in their lives.					
Students' lives are almost digital lifestyle.					
Perceived Ease of use					
Learning to use electronic laboratory was (would be) easy for me.					
I would find it easy to use electronic laboratory to learn.					
It would be easy for me to become an expert at utilizing electronic laboratory.					
Overall, I find electronic laboratory easy to use.					
Students use electronics to do many things in their lives.					
Students' lives are almost digital lifestyle.					