Effects of Modern Instructional Technology (MIT) on Critical Thinking Skills of Students in Agriculture Vocational Courses in Nigeria

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DEDICATION

I dedicate this thesis to my children; Abdullahi, Abdurrahman, Ibrahim Khalil, Mohammad Habeeb and Imran for their unequal patient, encouragement and prayers, despite the hard time they went through, which gave me the strength to withstand the obstacles throughout my academic struggles. I dedicate this thesis to my lovely husband Dr. Bala Ishiyaku for his understanding, encouragement and prayers to my success. I dedicate it to my brothers and sisters that contributed immensely to the success of this study. I love you all.
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ABSTRACT

The recent development in modern instruction technology (MIT) methods and equipment warranted for studies to examine their effects on students, teachers, and the education system in general. This study examines the effects of MIT on students’ critical thinking skills in Agriculture vocational courses in Nigeria. The methods and equipment used were identified, and the effect of teachers’ usage behaviour was assessed. A survey approach was adopted, using questionnaires for data collection. The descriptive, correlations and multiple regressions were carried out using SPSS. The result of this study indicates that the most commonly used equipment is electronic whiteboard, while the least are electronic tablets and laptops. Cooperative learning is the most commonly used methods while games and online instruction are the least. There is a moderate positive correlation between MIT methods and the students’ critical thinking skill, but a very weak positive correlation between MIT equipment and students’ critical thinking skill. There is statistically significant contribution of methods to student’s critical thinking, but insignificant method usage behaviour. Therefore, it is concluded that government should incorporate the provision and effective utilisation of MIT equipment and methods in the national education policy. School managements should emphasise the use of MIT methods and review curriculum to improve teachers’ skills in MIT usage. Teachers should utilise the available MIT equipment and method along with their skills for an effective delivery of lessons. Similarly, the students should be encouraged to appreciate the available methods and the equipment, and use them effectively.
ABSTRAK

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<td>AECT</td>
<td>Association for Educational Communications and Technology</td>
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<td>ATBU</td>
<td>Abubakar Tafawa Balewa University</td>
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<td>AVE</td>
<td>Available Equipment</td>
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<td>AVM</td>
<td>Available Methods</td>
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<td>BCED</td>
<td>British Columbia Education Department</td>
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<td>CGPA</td>
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<td>CK</td>
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<td>NMC</td>
<td>New Media Consortium</td>
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<td>PCs</td>
<td>Personal Computer</td>
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<td>PK</td>
<td>Pedagogical knowledge</td>
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<td>TAM</td>
<td>Technology Acceptance Model</td>
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TPACK  Technological Pedagogical and Content Knowledge
TPB    Technological Pedagogical Knowledge
USB    Usage Behaviour
VTE    Vocational and Technical Education
CHAPTER 1

INTRODUCTION

1.1 Introduction

Modern instruction technology (MIT) refers to the theory and practice of applying educational rules and techniques and recent information and technology, through sketches, outline, improvement, usage, assessment and administration of the teaching methods and teaching materials, to accomplish the ideal transfer of knowledge (Long et al., 2008). MIT methods are advanced teaching methods concerned with improving the efficiency and effectiveness of learning (Cranford, 2011; Shapiro & Varian, 2013). This terminology is used widely in different fields of education, specifically in emerging technologies that are used in instruction and learning processes (Earle, 2002). It is sometimes referred to both the medium of communicating knowledge and other media used, such as audiovisual equipment and computers, or a systematic process (method) such as instructional design and assessment (Seels & Richey, 1994; Hodell, 2015).

Modern instructional technology (MIT) is very important in teaching process as it helps in improving the efficiency and effectiveness of instruction and motivates student’s interest in learning. MIT also allows students to learn by themselves (student centred), helps them to produce their innate ability by boosting their critical thinking ability, resulting in the creation of new learning experience and high quality learning outcomes.
Despite the roles of MIT in improving the teaching and learning process, it was observed that much emphasis is given to information and communication technology (ICT) instead of MIT in education studies (Nwezeh, 2010; Onyia & Onyia, 2011; Oviawe & Oshio, 2011; Turruam & Abur, 2013; Brown & Green, 2015). ICT referred to combination of informatics innovation and relevant innovations, especially communication technology (Hennessy, 2010; Hodell, 2015). ICT consists of the communication mediums such as wireless networks, Internet, cell phones and so on. In contrast, MIT comprises new teaching methods such as simulation, games, problem based instruction, case studies, cooperative learning, competition, brainstorming, individualized instruction, on-line instruction, programmed and automated instruction and the respective communication equipment needed such as computers, handset, iPhone, iPad and projector to impact knowledge (College of Southern Nevada, 2011). Despite the fact that MIT and ICT have the same mediums of communication, their primary aims differ significantly. Communicating an idea (ICT), and understanding and applying the idea into action (MIT) are two different aspect of learning. Therefore, it is expected that after using MIT there must be a result, which should be manifested, exhibited or demonstrated, in a form of reflex, cognitive and psychomotor which are the expected outputs.

This means that the results are observed in the students’ action, critical thinking ability and new learning experience. Therefore the use of MIT cannot be over emphasized as it plays a vital role in improving student’s performance, developing critical thinking skill and allowing students to make decision by themselves and experience the outcome of their decision. This can even lead to innovation as it supports factual knowledge acquisition.

1.2 Background of the study

Integrating MIT into learning and classroom instruction has been a relevant issue in all fields of studies. Despite the important role of MIT on instruction and learning, high cost
of MIT equipment, lack of technical expertise by instructors and lack of awareness towards the use of MIT limit its utilization in the classroom (Lai & Kritsonis, 2006). Despite the increasing progress in introduction and application of MIT for teaching, generally (Hunt, 2005) there are issues with integration of MIT in higher education institutions in developing countries, due to inadequate financing (Lai & Kritsonis, 2006). This causes the failure of both students and teachers to work at improving the level of use toward MIT (Aburime, 2010).

It is evidenced now that the importance of MIT is vividly clear and has become a globally discussed issue as efforts are geared toward making policies for its effective incorporation and utilisation in teaching and learning activities (Nwezeh, 2010). MIT encompasses planning, development, utilisation, administration and assessment of procedures and resources for instruction (McDonald, Yanchar & Osguthorpe, 2005). It expects to advance the utilization of approved, practical systems in the design and conveyance of lecture.

MIT requires that today’s teacher should be able to utilize modern technology in instruction to achieve educational objectives on a modern, faster, reliable and repeatable basis (Adegbija, 2013). This means that teachers should know and utilise MIT in order to achieve educational objectives in the 21st century digital instructional tools and methods for timely delivery of lesson and use it on a daily basis when delivering a lesson. This include the use of audio/video production, digital imaging, and standards of visual configuration; working with cloud based, community oriented applications; planning and developing instructional media for learning; designing and producing internet learning; coordinating present day innovation into every branch of knowledge; developing an individualised learning network and making their own digital footprint and making a digital portfolio that exhibits their development, capacities and comprehension (Adegbija, 2013).

MIT methods encourage students to solve problems by gathering data, organizing data, and attempting an explanation (College of Southern Nevada, 2011). For example, MIT can help create competition among students under the surveillance of the instructor, and encourage students to display their critical thinking ability. Students can discuss contents of a given task with their instructor via telephone conferencing, video
conferencing and other communication technology. Students interact with colleagues and share ideas, which provide room for creativity and critical thinking disposition. Through this, each member will be encouraged to contribute and bring out their innate ability, and display critical thinking skill to perceive successful completion of a given task.

Kung, Chang and Feng (2010) also pointed that as the MIT equipment such as computers are user friendly, as long as teachers in high institutions can comprehensively integrate the instructional methods with MIT equipment, then students can use MIT equipment as tools for self-learning, and acquire more learning opportunities. There is a consensus in literature narratives, that MIT knowledge is very important in developing students’ critical thinking skills (Jonassen, Carr, & Yueh, 1998; Halpern, 1999; Hopson, Simms & Knezek, 2001). Authors like Carr & Kemmis (2003) stated that understanding the knowledge and implication of MIT methods and equipment by the instructors are vital to the students’ achievements of critical thinking skills and innovation. This is important in making the graduates marketable. Summers and Vlosky (2001) indicated that both Agriculture students and lecturers accepted that courses relevant to MIT application are significant to students’ forthcoming struggle for employment. As the study involved Agriculture vocational course that need acquisition of skills, the skills can best be achieved by using modern instruction technology. In the 21st century digital world, most skills require the use of modern technology to achieve a certain level. Students that acquire critical thinking skills can manipulate ideas to achieve sound decision, which is highly required in today’s competitive labour market environment.

Some of the skills required include identifying direction of technology in agricultural practices such as irrigation, pesticide use, cultivation, harvest and storage technology and ability to uterlise it. Time management and organizational skill is also important for agricultural practices such as supply of raw material and management of laborers. It is equally important that students should have skills in ability to adapt to a changing environment. This is because what is learn from school may be different from the practical, such as difference in soil topography which can influence success in agriculture. An innovation skill is also important, which is to be able to use modern technology in local environment.
It is therefore expected that Agriculture student that acquire critical thinking skills can be engaged in self-active learning, hence can have more learning and employment opportunities. It can give such students the ability to make sound criticism and judgment, and the ability to work independently. However, to what extent are students and teachers in Agriculture education utilise the advantages of such MIT methods is the bone of contention (Birkenholz & Stewart, 1989). The study by Klimoviene et al. (2006) pointed that the need for critical thinking skills is not only the concern of employers; as their staff did not exhibit the necessary skills to work independently and efficiently. Similarly, parents and the general public show concern that students are not skilful, in terms of independent reasoning and the ability to utilise the enormous opportunities of the present developments. The study and modelling critical thinking is essential to give students an insight on how their teachers perceive critical thinking (Brookfield, 2012).

Higher education institutions provide opportunities for students in their learning and skill acquisition process to improve their abilities in the competitive environment (King, 2000). The higher education institutions design skills acquisition for students consists of an effective understanding of technical and vocational skills, and the ways to use those skills in their respective areas of study. In this manner, MIT has additionally turned into an essential part of the higher learning institutions’ vocational education content delivery technique (Kung, Chang & Feng, 2010). Technical and vocational education are career courses which are available in secondary schools, colleges, polytechnics and universities all over the world to provide skills training that solve the need of high-development industries (ACTE, 2010). Technical and vocational education makes a very great impact to students, as it emphasizes practicality rather than just the acquisition of knowledge. It also makes a student more interested in the specialized field of study and, serves as encouragement to develop the sentential skills and critical thinking (Horne, 2010).

Among the major problems of higher education institutions is the issue of poor condition of equipment and facilities. Equipment acquisition in higher education institution is partly carried out by the school management at central level and by respective departments concern. In Nigeria for instance beside the central procurement
of equipment by high education institution the departments have direct teaching and learning committee (DTLC). This committee have an allocation every year for direct purchase of consumable equipment. Despite all this, the problem of vocational and technical education still includes inadequate equipment (Umunadi, 2011). The ability of an Agriculture education department or institution to adapt MIT will be influenced by factors such as a) availability of high quality facilities, equipment, technical support, and training in MIT used in teaching Agriculture vocational courses, b) knowledge, skills, attitude and abilities of its staff to apply MIT methods in teaching Agriculture vocational courses, and c) strategic framework for improving teaching of Agriculture vocational courses using MIT (Adedbjia, 2013). Therefore, continuous research to identify and improve MIT in Agriculture education is important to accommodate students’ dynamic learning needs and styles through a variety of MIT methods.

Regardless of the advantages and importance of MIT equipment and methods on students’ critical thinking skills explained, the above discussion indicated its limited application in Agriculture departments in Nigeria. This created the need for investigation into the MIT equipment and methods used and their effects on students’ critical thinking skills in Agriculture departments in Nigerian high education institutions; Abubakar Tafawa Balewa University, Bauchi (ATBU Bauchi) and Federal College of Education Technical Gombe (FCET Gombe).

1.3 Statement of problem

Despite the continuous improvement in development and application of MIT equipment for teaching and learning (Hunt, 2005), inability of teachers and students to operate at improving levels toward MIT methods was observed in Nigeria (Aburime & Uhumoibhi, 2010). There is a problem of integration of MIT methods and provision of appropriate MIT equipment and facilities in higher education institutions in developing countries due to inadequate financing (Lai & Kritsonis, 2006). Hence, Agriculture teacher in higher institution thinks that it is hard to understand their actual potentials as
far as knowledge engineering, advancing and widening cooperation in the utilization of MIT (Aburime & Uhomoibhi, 2010).

Eventhough authors agreed on the need to apply the MIT method and equipment knowledge in instruction delivery, little attention is given to the implementation and outcomes of such interventions. Selwyn (2007) observed that in spite of large struggle to put MIT as a major target of higher education, most students and faculties do not make reasonable use of it for formal academic work. In the same view, it has been observed that teachers in vocational and technical schools use MIT most frequently for managerial purposes and least in teaching and learning processes (Kuskaya-Mumcu & Koçak-Usluel, 2013).

In addition, there is also inadequate knowledge on to what extend does the insufficient usage affect students’ critical thinking skills. Hence, little is known on relationship between the provision of MIT equipment, the application of MIT methods, and the influence of teachers’ usage behaviour of MIT methods on students’ critical thinking. Implication of this is graduation of students without sound critical thinking skills which may assist them in the present competitive labour market. A study by Snyder and Snyder (2008) observed that nowadays, the labour market is very competitive and requires people with the ability to work independently and efficiently.

A study by Aburime and Uhomoibhi (2010) who investigated in Nigeria on level of MIT knowledge revealed that there are many effort involved in improving students proficiency in technology to develop students critical thinking. The above research also indicated that majority of the students are in the habit of memorising the content rather than optimising their critical thinking skill in their learning process. They experience issues in choosing between critical options despite the fact that they do attempt to relate the lectures to real life situations. Many students attend classes without opportunity of comprehending the lessons and have problems remembering facts and treating information comprehensively. The students’ memorisation of lecture notes does not help students in development of critical thinking; it even discourages it (Facione, 2015). Such issues adversely affect the progress and later advancement of students’ critical thinking. This is against the objective of critical thinking which encourages in-depth learning for improved comprehension of the lesson (Marzano & Brown, 2009). In Nigeria, little
attention is given to the use of MIT in terms of provision, adequate utilisation and how the use of MIT can improve Agriculture education students’ critical thinking (Adegbija, 2013). It is important to revisit instruction methods applied in Nigerian course delivery. The objective of the study was to identify the modern instruction technology (MIT) equipment, methods, and identify the teachers’ usage behaviour in relation to students’ critical thinking skills. Therefore, the purpose of this study is to investigate the effects of modern instruction technology on students’ critical thinking in Agriculture vocational course in Nigeria.

1.4 Aim and objectives of study

The aim of this study is to assess the effect of MIT in the teaching of Agriculture vocational courses in Nigerian higher institution, with a view to identify the influence of MIT methods and equipment on students’ critical thinking and recommend possible areas of improvement.

To achieve the above mentioned aim, the following objectives are formulated:

   i. To identify types of MIT equipment used for teaching Agriculture vocational courses in Nigerian high education institutions.

   ii. To identify the MIT methods used in teaching Agriculture vocational courses in the study areas.

   iii. To explore the effect of MIT methods and equipment on students’ critical thinking skill in Agriculture courses in the study areas.

   iv. To assess the effect of teachers’ usage behaviour of MIT methods on the relationship between MIT methods and students’ critical thinking skill in Agriculture courses in the study areas.
1.5 Research questions

i. What is the MIT equipment used for teaching Agriculture vocational courses in Nigerian high education institutions?

ii. What are the MIT methods used in teaching Agriculture vocational courses in Nigerian high education institutions?

iii. What is the relationship between MIT method and equipment on student critical thinking in the study area?

iv. How well does the combination of MIT method and usage behaviour of MIT methods predict student critical thinking skill in the study area?

1.6 Scope of study

There are different types of instruction methods and equipment in teaching Agriculture vocational courses in schools. The method of instruction can be traditional method such as face-to-face method of teaching (teacher and student) and modern method, which involved the utilisation of technology equipment in learning (student centred). Therefore, this study was limited to the second group, which includes Case Studies, Problem Based instruction, Cooperative Learning, Competition, Simulation, Brainstorming, Games, Individualized Instruction, On-Line Instruction, Programmed and Automated Instruction. The MIT equipment used for instructional purpose is the audio visuals machines such as computers, M-devices, projectors, iPad, Notepad, Bluetooth, etc. This study examines the effects of the MIT equipment and methods on the students’ critical thinking skill in Agriculture education courses in the study area. Meanwhile, two Nigerian high education institutions; Abubakar Tafawa Balewa University, Bauchi (ATBU Bauchi) and Federal College of Education Technical Gombe (FCET Gombe) were used to be the areas of studies because they are technical and
vocational schools offering Agriculture vocational courses unlike other institutions, which are technology institutions, that do now offer Agriculture vocational courses or non-technology schools but offer Agriculture vocational courses. The expected respondent to the instruments of data collection for the study are Agriculture education students in the study areas. The study was limited to students that are studying Agriculture education and not students that take Agriculture courses from other fields of study.

1.7 Significance of the study

The study provides ideas on how to motivate both teachers and students to improve their performance in Agriculture vocational courses. As Agricultural education is career course, this study highlights the need to provide skill training that can motivate both teachers and students to addresses the need of industrial growth. This study stressed that using MIT in practical situation provides motivation for skill acquisition and allow learner to demonstrate their true potential or innate ability as MIT encourages independent practice. This makes student much more interested in the professional field and serve as motivation to foster competence in the core skills. It shows how the use of MIT influences teaching and learning in the study area. The study indicates how to encourage young individuals to embark on vocational skills. It demonstrates that use of MIT leads to critical thinking that leads to innovations. The teachers can also understand their students’ opinion on the use of MIT methods in Agriculture education courses. The students can equally benefit from the study in learning why their teachers use MIT methods in their own way. In general, the study provides measures for improving the use of MIT methods and equipment in Agriculture education in the study areas.
1.8 Structural concept of the study

Research structure is an overview of how the study was planned; the literature review, data collection techniques, statistical tools for analysis and reporting of data. The structure covers the contents discussed in various chapters of the research reports. The study stems from the literature reviewed which pointed to the insufficient studies on use of MIT methods in Agriculture education courses. The MIT equipment (such as projectors, electronic whiteboards, audio visual equipment, computers, etc.) which may influence teaching and learning ability of students in Agricultural vocational courses depending on subject area, intention to use and usage behaviour of both the teachers and students in the class.

The conceptual framework model of this study is based on RED Model of Critical Thinking by Watson (1980) and TPACK framework in Heick (2013). The RED model is based on 3-factors: Recognise Assumptions, Evaluate Arguments and Draw Conclusions. Recognising assumptions is the ability to differentiate between fact and opinion. Recognising an organised and not well organised assumptions, and choosing whether an argument in light of a particular piece of information is truly taking into account the necessary elements of the information is an indication of critical thinking skills (Şendağ & Odabaşı, 2009). Hence, this was substituted by the students’ ability to identify the MIT equipment and methods. The evaluation of arguments here refers to student’s identifying the usage behaviour of teachers in respect to the MIT equipment and methods, to identify the strong and weak aspects of teachers’ usage behaviour of MIT. Drawing an appropriate conclusion, which is the students’ critical thinking skill, depends on the available evidence of MIT equipment, methods and teachers’ usage behaviour.

The TPACK framework in Heick (2013) viewed that to design an instruction that can develop students’ critical thinking skills; there is need for the knowledge of MIT methods, MIT equipment and subject content knowledge. These were termed pedagogical knowledge, technological knowledge and content knowledge in the
framework. Content knowledge (CK) refers to subject knowledge which teacher acquire from his study area. The Pedagogical knowledge (PK) is teachers’ knowledge of MIT methods which he can use to deliver instruction. The Technology knowledge (TK) is teachers’ knowledge about equipment applicable in instruction, based on his area of expertise. The students’ critical thinking abilities to use modern technology activities depend on the method of teaching employed and the instruction equipment available (Gardner et al, 1993; Watson, 1993). Teachers’ usage behaviour was incorporated in the conceptual model of the study based on Hunter (1982) that stressed the relevance of the teachers’ usage behaviour in the process of teaching. The model was therefore drawn to indicate the relevance of MIT equipment and methods on students’ critical thinking skills, while taking into consideration the teachers’ usage behaviour.

As demonstrated in Figure 1.1, this study argued that if MIT methods are effectively utilized using available MIT equipment at appropriate subject area and with good intention to use, critical thinking skill can be achieved. This showed the usefulness of MIT in teaching, hence enhancing students’ problem solving skills in study area and critical thinking skill in general. In this way, making utilisation of MIT in instructional practices helps teachers to teach students with significant modern thinking skills (Şendağ & Odabaşı, 2009).

![Figure 1.1: Conceptual framework for effects of modern instructional technology on students’ critical thinking skills in Agriculture vocational courses in Nigeria (adapted and modified from Watson, 1980 and Heick, 2013).](image-url)
The framework suggested that the MIT method might influence students’ critical thinking skill in the teaching of Agriculture vocational course if there is available equipment, with teachers’ good behaviours towards the use of the equipment. This influence can be in the forms of easy understanding, ability to comprehend faster and ability to recall the subject matter. Therefore, if there is available MIT equipment with good teachers’ usage behaviour, the appropriate MIT methods can be used and students’ critical thinking skill will be achieved. However, if there is no MIT equipment and appropriate MIT methods, students’ critical thinking skill cannot be achieved. Meanwhile, the framework intends to postulate that usage behaviour can influence the causal relation between MIT equipment and method with critical thinking skill in the teaching of Agriculture vocational courses. Hence, even if there is available MIT equipment with appropriate MIT methods used in teaching Agriculture vocational courses, the teachers’ usage behaviour can enhance student critical thinking skills in the Agriculture vocational course.

1.9 Definition of Terms

**Modern Instruction Technology (MIT):** It is defined by Long et al. (2008) as the theory and practice of utilizing instruction theory, and advanced information technology, through design, improvement, use, assessment and administration of the teaching process and instruction resources, to accomplish the ideal educating effect. Earle (2002) defined it as emerging technologies used in instruction and learning processes. In this study, MIT is the use of modern technology equipment and methods in teaching Agriculture education students.

**MIT Method:** These are advanced teaching methods concerned with improving the efficiency and effectiveness of learning (Cranford, 2011). In this study, MIT methods are modern interactive teaching methods, which encourage teachers to use MIT.
MIT Equipment: These refer to the technology careers such as laptops, PCs, iPad, iPhone, projector, Smartphone that can be used as the instructional materials in Agriculture education class.

Critical Thinking: Sternberg (1997) defined thinking style as a inclination in the utilisation of the capacity that a person has rather than favoured sort of something or capacity. For this study, critical thinking refers to the ability of student in Problem solving, Sound decision making, Sound Judgment, Self-development, Independent reasoning, creativity.

Usage behaviour: It is defined by Abedalaziz, Jamaluddin and Leng (2013) as an individual's general assessment or feeling towards innovation and particular computer and Internet relevant exercises. Teo (2008) refers to usage behaviour as behavioural intentions and actions with respect to computers. In this study, usage behaviour refers to the teachers’ application of modern technology in instructions.

Higher Education Institution: Higher education institutions are learning places designed to provide opportunities for learning and skill development for students to improve their ability to compete in a real workplace (King, 2000). It refers to the formal learning environments where Agriculture education certificates are awarded.

Technical and Vocational Education: Technical and vocational education are career courses carried out in secondary schools, universities, colleges and other schools all over the world which provide skills training that addresses the need of commercial enterprises (ACTE, 2010). For this study, Technical and Vocational Education are professional education courses that develop students’ critical thinking skills.

1.10 Summary

Chapter 1 discusses the preliminary overview of the major background ideas that leads to the purpose of carrying out the research. Therefore, this chapter portrayed the need for
direct involvement of teachers and student in facilitating the acceptance and utilisation of MIT methods for teaching and learning process particularly in Agriculture vocational courses to ensure effective results. As this chapter revealed that information regarding the use of the MIT equipment and other technology are limited, it justified the need for the study. Therefore, this chapter discussed the objectives expected to be achieved by the research and the questions to be answered. This chapter also explained the expected scope to be covered by the research and enlightened the area that may not be covered by the research. This chapter also explained the potential beneficiaries of the research as well as the area of the benefits. The research structure was explained as a guide for better understanding of the study. Therefore, this chapter serves as the foundation of the research.
CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The chapter discusses the relevant literature on the research concepts. It begins by explaining the meaning of Instruction and modern instruction. MIT is discussed together with methods and equipment’s for modern instruction. The difference between MIT and ICT are highlighted, and the relationship between MIT and critical thinking are elaborated and its implication to vocational education. The challenges of MIT to Agriculture education in particular and institutions of higher learning in general are explained. The chapter concludes with a conclusion on the relevance of the literature reviewed on the subject of the study.

2.2 Meaning of Instruction

Instruction was defined in Schofield (2013) as the act of building into the mind, knowledge of facts, relations or principle of one kind or another. In a broader perspective, instruction is much more than teaching or training because it is systematic, specific and objective. Bruner (1996) defines instruction as the process of leading the learner through sequence of statement of a problem or body of knowledge that can
increase the learners’ ability to understand, transformed and transfer of what he is learning.

Arteaga, Cortijo and Javed (2014) advocated the necessity to move from a traditional instructor centred way to learning, where instructor teaches students, to a learner-centred approach, where the student, instead of absorbing material transmitted by the instructor, learns how to learn. Educational Technology is defined by Association for Educational Communications and Technology (AECT) as investigation and moral exercise of creating, and encouraging study to improve performance through execution, utilizing, and application of suitable technological procedures and materials.

The MIT usage in class can be carried out based on ADDIE model. The model suggested sequential use of Analysis, Design, Develop, Implement and Evaluate to achieve success (Molenda, 2003). In this study, they refer to analysing the students characteristics, critical thinking skills intended to achieve and constraints exist. It also involves identifying the appropriate instructional method to use, such as game, online instruction or cooperative method. Designing the instruction method involve the incorporation of the identified elements above in the particular method to use. However, developing the instructional content based on the instructional method involve the step by step fixing of the course content to the designed instruction plan. Implementing the instruction as planned is delivery of the instruction method in accordance with the plan. Evaluation of the students to know if they have acquired the targeted critical thing skills is the last item, to ensure that the aim of the instruction was achieved.

2.3 Instruction technology

Instructing is the essential foundation of students learning, because it prepares students to be qualified on whatever career is important to give them a training that bestows, enhances and build up the imperative abilities required for such position. The transitional stages of technological development in respect to instructional application in schools can be divided into three (3) as in Mishra & Koehler (2006), which are
traditional, semi traditional and modern technology. The traditional instruction equipment consists of materials such as books, chalks and blackboards (Mishra & Koehler, 2006; Cox, 2013). At this stage, the traditional instruction methods are face-to-face method of teaching such as lecturer method. The methods are teacher centred, where the teacher imparts knowledge to students (Arteaga, Cortijo & Javed, 2014). The next stage is the semi traditional stage, whereby equipment such as video camera, photo camera, telephone lines, radio tape recorder are used for instruction (Mishra & Koehler, 2006; Cox, 2013). The semi traditional methods used are cooperative learning, games, competition, brainstorming, case studies, and individualised instruction. Modern technology stage witnessed the introduction of instruction equipment such as mini computers, learning software, smart-touch equipment, projectors, ipad, wireless networks, cloud computing and others (Johnson, Adams-Becker, Estrada & Freeman, 2014; Mishra & Koehler, 2006; Johnson, et al., 2013). The modern technology methods were developed to suit the modern instruction equipment available. The student centred approach, where the student, instead of absorbing material transmitted by the instructor, learns how to learn. The methods include on-line instruction, programmed and automated instruction, cooperative learning, games and online competition.

2.4 Modern Technology

Modern technology refers to the innovations in equipment and methods that provide enabling environment for the efficient acquisition and creation of knowledge and skills (Nogalski, & Wojcik-Augustyniak, 2012). For instance, with the development in communication, it can now be possible to communicate through mail, telephone, fax and numerous others and enhance transport via air, train and cars. The best of all is the utilization of computers. Another definition is derived as anything invented or created in the most recent years. For instance, Windows 8, Microsoft's new operating system, is modern technology. As there is no particular person that invented modern technology, it
evolved piece-by-piece, improvement-by-improvement from all other technology that preceded it.

The developments in innovation, particularly computer technology, encourage improvements and simplified many things in all aspects of human life. Some parts of the innovation are exceptionally important and are general issues in contemporary education policy (Nwezeh, 2010). Messina and Tabone (2012) viewed that Technology Knowledge refers to knowledge about innovation, extending from traditional (book, writing board, and so forth.) and semi-traditional ones (camcorder, photographic camera, and so on.) to new digital technologies (computers, softwares, and so on).

2.4.1 History of modern technology

Cox (2013) discussed the historical development of modern technologies that are relevant to education from 1970 to 2011. This is traced to the creation of the internet-ARPANET in 1968. Between 1970-1977 there were continuous intelligent workstations, operator design real-time stations which are accessible. Web connection to a few schools by means of telephone routes and modern, distance accessibility to computers at distinctive areas. There was also global network of computers via Janet Joints Academic Network and precursors desktop systems such as Hewlett Packard. Subsequently, between 1977-1980 other developments manifested such as reduction computer size and development of mini desktop computers (Cox, 2013).

However, between the period of 1980 and 1984 the initial Apple-Macintosh was introduced at £1500, Fibre optics encouraging quick with substantial communication, extending the scope in gadgets for instruction. These include devices such as robot turtle, graphics tablets, concept keyboard, Quinkey keyboard and touch screens voice inputs and outputs were introduced. Some noticeable developments also reached between 1985-1987 with Microsoft windows launching, highly effective, less expensive individual’s minicomputers, IBM computers with 256K storage capacity and 32 processor memory, Mac II computers with 256k capable storage and the effort by Tim
Bemers-Lee in development of World Wide Web. Meanwhile, external storage gadgets such as memory cards and CD-ROM were introduced between 1987-1990. The period also witnesses the development in laptop computers, significant improvement in storage abilities of memory gadgets and reduces production costs. There was also increase in wireless computer innovations; remote computer systems and video-teleconferencing were introduced (Cox, 2013). The period between 1996 and 1999 witnessed the development of the collaborative whiteboard and all-inclusive development of the application of websites. The extension of mobile handset innovations such as mp3 players, Mobile Phones and further improvement in computing innovation, improvement of storage in computers and increased processing capacity were observed between 2000-2004 (Cox, 2013).

The most noticeable developments in MIT equipment was between 2005-2007, comprising the introduction of thin customer technologies in schools and universities, improvements of smart-touch gadgets for instruction, improvement of miniature computing innovation. Increased improvement to processors and saving capacities, and miniaturisation, general availability of wireless services, interactive whiteboards and Web 2 innovation, social software areas, such as Wikipedia and Second Life were all introduced. The graphic portable gadgets, such as iPad, iPhone, Mp3 Players-Books, Satnav and social softwares, such as Blogs, Facebook, One World TV, Twitter with the incorporation of mobile innovations in social software were developed between 2007 and 2011(Cox, 2013). Meanwhile, the period from 2011 indicated new era in terms of MIT equipment development. The New Media Consortium (NMC) with a board of over 750 professionals from different high institutions of learning outlined ten (10) most emerging MIT in instruction, learning, and critical analysis inquiry in international level within this period and to next five (5) years. It consists of mobile learning, cloud computing, open content, learning analytics, wearable technology, 3D printing, games and gamification, virtual and remote laboratories and tablet computing (Johnson, Adams-Becker, Estrada & Freeman, 2014; Johnson, et al., 2013).
2.4.2 Benefits of modern technology

The development of laptops computers, personal digital devices, and other miniature gadgets in 1990s empowered students to study at homes, against the usual classroom learning, and study on their own. Improvement to handheld gadgets recently, such as Smart phones and MP4 devices had given numerous chances to learners to have the capacity to move around with their gadgets, and utilise them to search for data and interact with others, associates, and instructors (Cox, 2013). Minocha (2009) in Table 2.1, citing each level of change and resultant development, illustrated the technological change in this area.

Table 2.1 Experiences of Using Educational Social Software (Minocha, 2009)

<table>
<thead>
<tr>
<th>Media</th>
<th>Basic</th>
<th>Intermediate</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>One-way</td>
<td>One-way</td>
<td>One-way</td>
</tr>
<tr>
<td></td>
<td>Print</td>
<td>Web Pages</td>
<td>Blogs</td>
</tr>
<tr>
<td></td>
<td>Interactive</td>
<td>Interactive Computer Conferencing</td>
<td>Interactive Wikis, Blogs</td>
</tr>
<tr>
<td></td>
<td>Email</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio</td>
<td>One-way</td>
<td>One-way</td>
<td>One-way</td>
</tr>
<tr>
<td></td>
<td>Audio Clips</td>
<td>Podcasts</td>
<td>iPod Downloads</td>
</tr>
<tr>
<td></td>
<td>Interactive</td>
<td>Interactive Telephone Support</td>
<td>Interactive Audio graphics</td>
</tr>
<tr>
<td></td>
<td>Interactive</td>
<td>Telephone Conferencing</td>
<td></td>
</tr>
<tr>
<td>Images</td>
<td>One-way</td>
<td>One-way</td>
<td>One-way</td>
</tr>
<tr>
<td></td>
<td>Photographs</td>
<td>CD/DVD</td>
<td>Animations</td>
</tr>
<tr>
<td></td>
<td>Interactive</td>
<td>Interactive Share and Edit, e.g. Flick</td>
<td>Interactive Simulations/Games</td>
</tr>
<tr>
<td></td>
<td>Image Banks, e.g. Creative</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Commons</td>
<td></td>
<td></td>
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<tr>
<td>Video</td>
<td>One-way</td>
<td>One-way</td>
<td>One-way</td>
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<tr>
<td></td>
<td>Video Clips</td>
<td>Animations</td>
<td>Vods</td>
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<tr>
<td></td>
<td>Interactive</td>
<td>Interactive Skype</td>
<td>Interactive Video conferencing</td>
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<tr>
<td></td>
<td>Webcasts/TV</td>
<td></td>
<td></td>
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</tbody>
</table>

The main reason to South Korea extra-ordinary economic progress is that they placed their primary focus on educational sector and particularly on modern technology education (Hicks & Graber, 2010). The importance of the modern technology media for education has been demonstrated by several studies. Ventura and Quero (2013) cited number of studies that demonstrate the important of social media (Halici, Lee, Paulus &

Hackbarth (1996) viewed that this revolution brought forth satellite signal of learning TV and radio in rural schools. Video tapings of live sessions, joining of video streams and computer innovations that empowers students to possess a whole library readily available, and to "walk" or "fly" in simulated virtual library situations, combining computer systems worldwide by means of web, and the attention on electronic wizardry connected by data super high approaches allow users to get information within reach. Chelliah and Clarke (2011) pointed that these technologies are tools. Therefore, teachers generate innovation in education by integrating technology into curriculum.

Lee, Waxman, Wu, Michko and Lin (2013) discussed the relevance of technology and outline of computer utilisation. They observed that technology performs many important functions in instructional development. Modern technology equipment better importance in encouraging student self studies, provide scaffolding to students that have deficiencies, encourage individualised studies, and stresses the ability of instructional innovations to provide new learning practice for students. Arteaga, Cortijo and Javed (2014) cited that modern technology had advanced a system of data sharing which contributes in the improvement of agriculture education. While the Web 1.0 vastly expanded access to information, the Web 2.0 provides new kind of online resources (social network sites, blogs, wikis, folksonomies, virtual communities) that allow students with common interests to meet, share ideas, and collaborate (Brown & Adler, 2008; Maloney, 2007). Therefore, Minocha (2009) summarised that the benefits of utilisation of social networks and tools in education to students and educators cannot be over emphasized. The use of Web 1.0 permitted information to be dispersed live and received broadly. Collaborative feature of online networking permits scholars to take part in group assignments, whereby to achieve quality learning results, members in the group take advantage from both group efforts and individual ability, both excellent arrangement for more modern collective collaboration. The social software techniques
and tools connect effectively with learners both independently and in groups whilst still giving chances to separation since the individual commitments may be identified and followed.

2.5 Modern Instruction Technology (MIT)

MIT is the instruction method and equipment used in teaching and learning process in most recent times (Long et al., 2008). The MIT equipment includes computers and mobile devices like handset, iPad, iPhone, and projectors. While Long et al., (2008) described the MIT methods as problem based and inquiry learning, cooperative learning, simulation games and competition, brainstorming, individualized instruction, mixed-mode instruction, collaborative learning, case studies, colloquia, controversial issues, on-line instruction and learning and programmed or automated instruction. Coordinating technology into classroom teaching and learning has been a critical issue in the recent decades. A few meta-analyses were conducted to analyse particular methods of teaching or instructional practices that enhanced students’ learning and teaching with technology. Lou, Abrami, and d’Apollonia (2001), for instance, analysed the impact between small groups versus individual instruction with innovation, and found that small group learning had more beneficial outcomes than individual learning. Other studies analysed the adequacy of collaborative distant training (Cavanaugh, 2001), the impact of Computer-Assisted Instruction (CAI) in science education by Blok, Oostdam, Otter & Overmaat, (2002) and Bayraktar, (2001). Similarly, Moran, Ferdig, Pearson, Wardrop, and Blomeyer (2008) and Lee, Waxman, Wu, Michko & Lin, (2013) studied the impact of technology on reading performance in grades 6-8. Lwoga (2012) pointed that MIT can assist higher institutions to cope with the increasing demands for higher education, and minimise the impact of continuous decrease in the size of qualified teachers. Technology has significantly influence educational program, the philosophy of instructing, and learning procedures (Rhema & Miliszewska, 2010).
Zhou, Hu and Gao (2010) observed that an individual belief in performing a task can influence the successful completion of the task. Therefore, for successful incorporation of MIT in education, user acceptance is very vital. Hence, Zhou, Hu and Gao (2010) cited some factors influencing individual’s attitudes towards MIT use and computers. Other studies on factors that determine the effectiveness of MIT in influencing student’s critical thinking are presented in Table 2.2. The factors include, the attitude toward the use of MIT, level of knowledge about MIT, self confidence in using MIT, gender, age, and years of experience, feeling nervousness in using MIT, the level of acceptance of MIT, level of individual’s experience on the use of MIT, the method used in imparting MIT knowledge and accessibility of MIT. Meanwhile, only relevant factors were presented in the table. Other factors such as anxiety, culture and belief were not presented.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Factors</th>
<th>Related Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MIT attitudes, knowledge and use</td>
<td>Teo, Chai, Hug and Lee, 2008a; Chen,2008; Psillos et.al., 2003; Shapka and Ferrari, 2003</td>
</tr>
<tr>
<td>2</td>
<td>Demographic characteristics; gender, age, years of experience</td>
<td>Durndell, and Thomson, 1997; Hartley and Bendixen, 2001</td>
</tr>
<tr>
<td>3</td>
<td>Experience in MIT use and training</td>
<td>Paraskeva et. al., 2008; Rosen and Weil, 1995; Galanouli et. al., 2004</td>
</tr>
<tr>
<td>4</td>
<td>Learning and teaching approach</td>
<td>Niederhauser and Storoddart, 2007; Teo, Chai, Hug and Lee, 2008</td>
</tr>
<tr>
<td>5</td>
<td>Access to technology and attitudes</td>
<td>Muelle et. al., 2008; Drent and Meelissen, 2008</td>
</tr>
</tbody>
</table>

A research by Vrana (2010) shows that MIT usage creates major changes in roles of teachers and students. Sharifi and Imani (2013) cited that according to previous researches, knowing and applying MIT to students affects their educational achievements, which will enhance student’s skills in problem solving, critical thinking and sound decision. Apart from complexity of technology, lack of proficiency, knowledge and positive view toward MIT, makes it impossible to be applied (Baylor & Ritchie, 2002). The multimedia instruction methods additionally recognise the importance of learners viewing cases in an interconnected way (Pridmore, Bradley &
REFERENCES


literature. *Centre for Commonwealth Education & Aga Khan University Institute for Educational Development–Eastern Africa Research Report, (1).*


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