Evaluating Technology Acceptance in Teaching of Advanced Level Geography in Zimbabwean Secondary Schools

Thomas Firomumwe[1]
Daniel Gamira[2]

Abstract

The main purpose of this qualitative study was to evaluate technology acceptance in teaching of Advanced level Geography in Zimbabwean Secondary Schools. Technology Acceptance Model (TAM) was used to evaluate teacher's perceived usefulness of technology, perceived ease of use and teacher's attitude towards using technology during instruction. The study purposively selected 40 A-level teachers to participate in this study. Data was collected through questionnaires and interviews. The findings of the study reveal that Advanced level Geography teachers' find Information and Communication Technology (ICT) as a useful tool which improve their efficiency and performance. Teachers find it very easy to use and integrate technology in their daily instruction though QGIS and ArcGIS software were difficult to use. Teacher's positive attitude in using technology during instruction stem from perceived usefulness and perceived ease of use in ICT. The present study recommends that teachers must be trained to appreciate ICT use and on how to use QGIS, ARCGIS and other software in order to improve their computer and related software proficiency.

Keywords: Information, communication technology, Technology Acceptance Model, Geography technology, Geography, e-learning.

[1] Geography and Science Department, Embakwe High School, Zimbabwe,
E-mail: firomumwethomas@gmail.com
[2] Department of Teacher Development, Great Zimbabwe University, Zimbabwe,
E-mail: gamirad@gzu.ac.zw or dgamira.lands@gmail.com

Introduction

Information and communication technology (ICT) is one of the modern approaches which influence the way teaching and learning is done. It overtakes one of the traditional approaches in geography which is field work (Firomumwe, 2019). It has changed the teaching and learning process across the general education (Zarafshani, et al., 2020). ICT tools and gadgets such as smart phones, computers, global positioning system, printers and wi-fi are important in geography learning as they provide learners with experiential learning and diverse learning (Nooghabi, Iravani & Fami, 2011). ICT tools promoted e-learning which facilitated distance education in school particularly in the Covid period where e-learning through google classroom, WhatsApp, Facebook, YouTube, and world-wide-web sources are common. Recent studies by Hennessy, Ruthven & Brindley (2005); McGorry (2002); Teeroovengadum, Heeraman & Jugurnath (2017) noted the usefulness of ICT to positive performance in learners. Proper use of ICT in education do have positive effects in learner's achievement.

More related studies documented ICT as an important tool which facilitate effective communication between teachers and learners in the scope of curriculum implementation. The opportunity for effective communication from ICT gadgets and tools was not possible before (Tondeur, et al., 2017). Documented sources have seen teacher as a vital part in ICT implementation in schools. Teachers are the main protagonists in supporting ICT in education sector. Their functional role in supporting ICT ease learning in schools as revealed by several studies from (Comi, Argentin, Gui, Origo, & Pagani, 2017; Englund, Olofsson & Price, 2017; Nikolopoulou & Gialamas, 2016)

The history of ICT in Geography can be traced back to 1950s in a research by (Maguire, 1989). He provided the useful account of computers revolution in the discipline of Geography. Computers are enabling technology as they improve Geographer's efficacy and efficiency in several ways (Maguire, 1989). His study pinpoints that computers and technology collect and store large quantities of data and that data can be quickly manipulated to suit the needs of the teacher. In a study by (Morgan & Tidmarsh, 2004) computers are important in developing teacher's skills and help them to plan more effectively. Compared to traditional methods of teaching, computers and ICT tools develop teacher's proficiency in content development and curriculum implementation. The teaching of Geography require ICT tools and introduction of ICT changes the face of geography methodological stances (Gamira, 2019). In Zimbabwe, geography curriculum overhaul in

early part of the year 2017 brought a challenging effect in the way geography methodological approaches are done. Introduction of Geographic Information System (GIS) and Remote Sensing (RS) call for a great deal in the application of technology in spatial learning in Geography at all levels. GIS and RS demand for integration of computers in teaching. The use of computer-based applications like Quantum Geographic Information System (QGIS), GPS waypoints, DIVAGIS, ArcGIS etc. are purely computer-based programs which require ICT knowledge and integration in teaching and learning of the topics. Thus, instructional methodologies in topics GIS and RS require the use of ICT tools and computers as a mandatory resource. Despite the importance of computers in teaching GIS and RS topics, technology is vital in all topics across the whole geography curriculum. ICT tools particularly internet produce ideal and conducive environment which is learner centred through the use of internet geographic knowledge base games and quiz applications. Therefore, computers and ICT in Geography instructions created an encouraging learner-centred environment in which it constructs learner's knowledge and creates experimental and experiential learning environment. Thus, use of computers instil generic skills such as research skills, analytical skills, data collection skills (Firomumwe, 2019) in geography learners. In short, introduction of ICT in geography learning at advanced level brings a notable paradigm shift from traditional geography to modern geo technology. Once more, the shift is from teacher centred to learner centred instructional approach. Learners are now able to express themselves freely during holidays and after hours in WhatsApp and Facebook application during educational discussions with friends. Concrete and abstract concepts in geography are now being simplified by applications such as YouTube and Nat-Geo which brings the world into a smartphone and computers. This notably reduce the traditional requirements of expensive and inaccessible fieldwork. The use of Remote sensing and satellite imagery in classroom is very cheap but very effective learning approach.

In Zimbabwe, the use of ICT tools in teaching and learning is pulled back by poor economic environment. Poor economic development and growth dragged the digital revolution greatly in Zimbabwe (BWPI, 2009). Most schools are unable to purchase ICT tools for learning because of costs associated. Some schools in rural parts of Zimbabwe are not electrified and this act as a prohibitive agent for ICT integration in schools (Mandonga, Matswetu & Mhishi, 2013). Despite economic challenges affecting the use of ICT in schools, some schools have a notable progress in utilising ICT tools in teaching and learning especially

urban schools and elite schools in Zimbabwe. ICT gained momentum recently in higher and tertiary institutions in Zimbabwe, however, in the Ministry of Primary and Secondary Education it is slowly implemented. In 2014, the Ministry of Information and Communication Technology planned to have one computer per class in secondary education as a way of integrating ICT in secondary schools. This means a ratio of one computer for an average of 40 learners (Ministry of Information Communication Technology (MICT), 2010) was the target. Computers in Secondary schools are being donated by parents, School Development Committee (SDC) and Government since 2010 (Mandonga, Matswetu & Mhishi, 2013) up to 2020 but the ratio is still high in most schools.

Reviewof Literature

There are several studies conducted on technology acceptance in different disciplines. A study was conducted through a systematic review of exploring factors influencing acceptance of technology for aging individuals (Peek, etal., 2014). A related study evaluated technology acceptance in social media (Wirtz & Goettel, 2016). Recent studies on TAM in education has appeared as a leading scientific paradigm for researching on technology acceptance in teaching and learning arena. Recent studies by Scherer, Siddiq & Tondeur (2019), Davis (2011), Abdullah & Ward (2016) focused on adoption of technology acceptance in education in the context of e-learning. The studies showed popularity of TAM in the discipline of technology, however, there is a knowledge gap in the context of education. The research on technology acceptance model in education is not in its beginning at all. The field of TAM still lacks a detailed application that underscores the need for a study of TAM on educational context (Granic & Marangunic, 2019) particularly in geography. Available literature on education reviews that technology should be designed and implemented on two principles which are; learning is facilitated by technology and technology must be used in different modes of learning methodologies. Again, perceived ease of use and perceived usefulness largely influence teacher's intentions to adopt or reject technology in teaching and learning. Teacher's technology self-proficiency and technology concern affect teachers' intended behaviour on the use of technology. Teacher's perceived ease of use like simple user interface of technology, accessibility and functionality and perceived usefulness such as quality of content and output were mentioned as factors considered by most educators in the use of technology in teaching and learning process (Zhonggen, & Xiaozhi, 2019). A recent study of ICT adoption in Mauritian secondary schools

showed that teacher's use of technology is largely influenced by external factors rather than perceived ease of use and perceived usefulness only (Teeroovengadum, Heeraman & Jugurnath, 2017). Studies in ICT and education has shown that attitude of teachers has an influencing role in teacher' acceptance of technology (Gamira, 2019; Zarafshani, et al., 2020). A study by Gamira (2019) found a positive correlation between use of ICT tools in teaching of Geography and high passrates. Therefore, the adoption of ICT in learning is important in improving teacher's performance and learner's educational outcomes.

Theoretical Framework

Technology Acceptance Model (TAM*)*. This research study was influenced by Technology Acceptance Model proposed by Davis (1986), in his Technology Acceptance Model for Empirically Testing New End User Information Systems: Theory and Results. It was further developed by Davis, Bagozzi & Warshaw (1989). This model was widely used in technology adoption questions (Zarafshani, et al., 2020) because of its simplicity and applicability in technology usage. Because of the practical aspect of technology in Geography, the research underpropped technology acceptance model in evaluating technology acceptance by geography teachers in secondary schools.
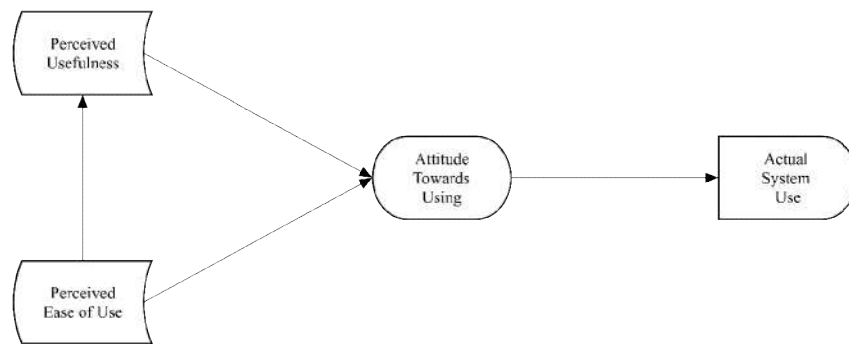

Figure 01.Technology Acceptance Model (TAM), (Davis, 1986)

The model explained why technology is accepted or rejected in teaching of geography. The theory of Technology Acceptance Model is based on three main tenets which are *perceived ease of use*, *perceived usefulness* and *attitude towards using technology*. Perceived usefulness is defined as the extent to which a person believes that using particular technology enhances his/her work-related performance (output) and

perceived ease of use refers to the extent to which a person believes that using a particular technology is free of effort (Davis, 1986). These three main constructs influence geography teacher's intended behaviour in the use of technology during instructions. So, the use of technology by geography teachers is mainly influenced by teachers' attitude towards technology, perceived ease of use and perceived usefulness of technology to teachers' pass rates in geography. Two main elements of Technology Acceptance Model (TAM); perceived ease of use and perceived usefulness are affected by extrinsic factors such as self-efficacy on computers (Zhonggen & Xiaozhi, 2019; Vankatesh, 2001). In short, TAM assumes that three main factors attitude, perceived ease of use and perceived usefulness affect behavioural intention of a teacher to accept the use of technology in teachings of geography. Majority of the teachers who developed negative attitude towards technology in schools rejected and shunned to use technology during teaching (Bayhan, Olgun & Yelland, 2002).

Objectives of the Study

The study aimed at gathering data about technology acceptance of advanced level geography teachers during instructions. Therefore, the following objectives guided this study:

- To explore Geography teacher's perceived usefulness on technology during instruction
- To identify geography teacher's perceived ease of use in using technology during instruction
- To explore geography teacher's attitude towards the use of technology integration in geography instructions.

Methodology

This qualitative study sought teachers' views of TAM because of its ability to explain in-depth information concerning teacher's technology acceptance at advanced level geography instructions. Due to the knowledge gap concerning technology acceptance during geography instruction, the researchers felt it appropriate to use qualitative approach which provide detailed information which concerns teacher's technology acceptance. Data was collected from the field work using questionnaire and interviews. Questionnaires were administered using e-mail and Facebook to geography teachers only. Facebook questionnaires were administered and structured using an online application called *Survey Poll*. Focused group interviews were administered using phone calls and face-to-face interviews in local

schools. The population of the study was made up of advanced level geography teachers and the sample was 40 teachers from the population. The sample was drawn from advanced level teachers where computers and ICT gadgets and infrastructure were found. This necessitated purposive sampling as a sampling technique to gather information concerning geography teachers' technology acceptance.

Results and Discussion

Objective 1: Geography teacher's perceived usefulness of technology during instruction: The first objective of this study was based on exploring geography teacher's perceived usefulness on technology during instruction and the belief that use of technology improve performance (Davis, 2011). This objective was based on the assumption that geography teacher's use of technology enhanced output/teacher's performance or learner's performance. The results of the study revealed that Geography teachers strongly agreed with the notion that the use of technology enhance their work-related performance. Majority of the teachers highlighted that the use of technology during geography instruction invoke all five senses to learners. It improved and helped teachers to explain abstract concepts to the recommended level of learners in a simple way. The present study notes that teachers explain that the use of computer technology in geography benefit teacher's record keeping and progress check on learners. During holiday and exit weekends, teachers continually interact with learners which improve their teaching and learning interaction. The study notes that in cases where fieldwork is very expensive and inaccessible, the use of technology brings the world in the corner of a classroom. This was supported by the following except; *the use of technology, internet and computer in particular substitute fieldwork and remote sensing comes into play*. The use of remote sensing, QGIS, internet and google maps reduce the cost associated with field trips whilst the quality of learning and ease of comparing geographic phenomena in the classroom is enhanced by technology. The study finds that majority of teachers concur with the notion that the use of technology during instruction expose teachers to various sources of information rather than relying only on traditional textbooks as sources of information. This was seconded in a study by Zhonggen & Xiaozhi (2019) that the use of technology reduces the burden of carrying textbook from one room to another. This simply concludes that geography teachers were in accord with the notion that technology is useful in improving teacher's efficiency in the classroom.

This concur with the study by Gamira (2019) that learner's exposure to ICT improved learner's passrate from 65% to 95.5% from the year 2011 to 2015 respectively. His study noted that the use of ICT motivates learners' as it provides rich sources of information to learners. This was seconded in a study by Maguire (1989) who reasoned that the use of ICT in schools help learners and teacher to manipulate data in a different way which improve efficiency and understanding of geographic concepts. Hassell (2002) insist that ICT provides a non-threatening environment for learning and helping learners to meet their unique needs and abilities during learning. A research by Cachia & Ferrari (2010) revealed that teachers perceive technology as an important tool for them to analyse results and learners progress. Their studies claim that computers and other educational technologies are important in combining information and resources for teaching and learning rather than relying on textbooks only. In a study by Morgan and Tidmarsh (2004), it was noted that teachers embrace ICT because it improves information delivery during instruction, motivate learners, make learning more active and offers new ways of working in the teaching fraternity. Technology can be used to control the knowledge, skills and values which teachers and students develop in schools and to domesticate them to existing social realities (Morgan & Tidmarsh, 2004). A research study by Shaha & Barkasb (2018)revealed that the use of technology in e-learning was correlated to good performance in engineering programs in university education in the United Kingdom. Studies identified concur with the findings of this study that the use of technology is perceived as usefulness to geography teaching as it improves performance of both teachers and learners. The whole essence of ICT integration in geography education is because of its fundamental benefits enjoyed in improving teacher's performance and results of learners.

Objective 2: Identifying geography's perceived ease of use of technology during instruction. In Davis (2011); Davis (1986); Davis, Bagozzi & Warshaw (1989) individual intent to integrate/use technology when they think it is easy to use. In this objective, the study reveals that majority of teachers find it easy to use technology during geography instruction. They revealed that computers, projectors, smart boards and internet are part of gadgets they use during geography teaching. Software like Google Classroom, QGIS, ArcGIS, Thubani, word processor, excel, power point are the most common software used during instruction. Teachers reveal that the use of these gadgets and software are very easy in the classroom since they have conducted several workshops on how to

integrate ICT in teaching of Geography. However, minority of teachers indicated that the use of specialised software like QGIS, ArcGIS and Thubanis not easy since it is a new aspect and is difficult to integrate. Teachers indicated that the use of these software needs extra training to make it simpler to integrate. The study reasoned that teachers associate the use of social media like WhatsApp, Facebook and Twitter to learning. These social media technologies are simple to operate, due to this, they use social media in geography lessons daily particularly after hours. The results of this study point that perceived ease of use make technology an aspect of daily integration in teaching as indicated by respondents that most teachers are now addicted to use of technology during instruction in all subjects at this school. Therefore, perceived ease of use largely contributed to technology integration and acceptance in teaching of geography daily in schools. This was in tandem with the study by Teeroovengadum, Heeraman & Jugurnath (2017) that perceived ease of use is an explanatory variable of ICT adoption in education. Thus, perceived ease of use is a central role in technology acceptance (Davis, Bagozzi & Warshaw, 1989; Davis, 1986; Abdullah & Ward, 2016) during advanced level geography instruction. This was echoed in a study by Zarafshani, et al. (2020) who emphasised that perceived ease of use permit user's behavioural intentions to use technology. A complementary study by Liao, et al. (2018) revealed that teacher's self-efficacy and proficiency is a significant variable which influence teachers to integrate technology in the classroom. The teacher's proficiency in computer and technology literacy improve teacher's willingness to integrate technology in daily instructions.

Objective 3: Exploring teacher's attitudes towards using technology in geography instruction. Attitude is a specific behaviour of teachers towards technology integration during instruction. Several studies on Technology Acceptance Model noted that integration of technology is highly correlated to attitude of users towards technology (Zhonggen & Xiaozhi, 2019; Vankatesh, 2001). The present study reveals that majority of teachers agree for positive impact of integrating technology on geography instruction. They agreed that technology is a positive tool for teacher's innovation in geography lessons. Teachers reveal that they intent to use technology daily in their instruction and it is wiser to use ICT in modern geography instruction because of its ability to tackle abstract concepts at advanced level. The study concluded that majority of teachers understudy reveal a positive attitude towards technology integration in schools. According to TAM, the attitude of teacher toward using technology is developed by two

main factors which are perceived ease of use and perceived usefulness. As noted with this study, advanced level Geography teachers find technology very useful and ease to use. Therefore, their attitude towards technology integration is positive. Advanced level Geography teachers intended to use technology as it yields positive results and is easy to integrate as there is no mental labour to integrate technology. This study was complemented in a study by Gamira (2019) who insists that Geography teacher's attitude towards ICT at Jameson High school in Kadoma was positive. Their positive attitude towards ICT influenced them to integrate technology in their daily instructions. This was supported by Osodo, Indoshi & Ongati (2010) that 82% of teachers' attitude was favourable towards integration of ICT integration in Geography. In short, teacher's favourable attitude towards technology develop a positive intention to use technology during instructions.

Conclusion

The study concludes that Advanced level Geography teachers adopted the use of technology in their daily instruction. The adoption was associated with perceived usefulness in which teacher's perceived that the use of technology during instruction enhances their performance and output. Teachers view the use of technology in classrooms as beneficial for reducing costs associated with field trips, however, technology was seen as an effective tool in enhancing teacher's output in Geography education at advanced level. Teachers revealed that the use of technology is very easy for them, that is the reason why they integrate it during instruction. However, minority of teachers noted that technical software like QGIS, ArcGIS and Thuban are difficult to use as they need more training to integrate them in Geography teaching. Perceived ease of use and perceived usefulness was indicated by teachers' behavioural intention to use technology which remained high. Therefore, teachers' favourable attitude towards technology integration in schools was supported by ease of use and usefulness of technology in geography instruction. This study recommend that training should be emphasised to enhance perceived ease of use on software such as QGIS and ArcGIS as they are crucial software for teaching advanced level topics like Geographic Information System and Remote Sensing.

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