

## INVESTIGATING THE BARRIERS TO EFFECTIVE INTEGRATION OF TECHNOLOGY IN THE TEACHING OF PHYSICAL SCIENCE IN OSHIGAMBO CIRCUIT OSHIKOTO REGION

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### ABSTRACT

*The study investigated on the barriers to effective integration of ICT in Oshigambo Circuit in Oshikoto Education Region. A quantitative non experimental research design was used to collect data from 50 Physical Science teachers selected purposefully from five different secondary schools in Oshikoto region. The Technology Acceptance Model and the Theory of Reasoned action were used as the theoretical frameworks of the study. The study sort to answer the following research questions: (1) what are the barriers to effective integration of ICT in the teaching of Physical Science in Oshigambo Circuit in Oshikoto Region? (2) How is the lack of ICT integration*

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*affecting the performances of the learners in Physical Science in Oshigambo Circuit in Oshikoto Education Region? A closed ended questionnaire was used to collect data from the teachers. The participants in the study indicated that lack of ICT equipment lack of interest in ICT integration were the main barriers to integration of ICT in the teaching of Physical Science. The study also found out that lack of ICT integration is leading to poor performance of the learners in physical science and also learners are not motivated to learn Physical Science in Oshigambo Circuit. The study recommended that the Ministry need to provide ICT equipment and train teachers in the use of these equipment. It also unveiled that there is need to change the teachers' negative perceptions on the use of ICT through teacher training on the use of ICT.*

**KEYWORDS:** *Integration, Integrated Communication Technology (ICT), Barriers*

## **INTRODUCTION**

In the twentieth century schools meet a number of difficulties including integration of Information and Communication Technologies (ICT) into the teaching and learning, education curriculum and change in methods in pursuit of developing learner lifelong learning skills (Cox & Abbott, 2005). Strategy of Implementation of Information and Communication Technologies in the Ministry of Education (2001:56) emphasises the main causes that lead to the necessity to utilize ICT in teaching and learning: changes in economy, social and education science areas. (1) Economic changes are associated to the integration of information technologies in various areas of national economy. Computerization of various economic spheres is increasing and therefore there is demand of ICT skilled workers and scholars. (2)

Social changes are related to the profusion of information, development of communication network, which opens new opportunities to obtain and spread information. (3) Pedagogical changes are related to the prospect to use information technologies better and acquire understanding of various subjects and higher order skills sooner. (4) Education has to respond to economic and social changes so it educates young generation equipped with up-to-date knowledge and expertise (including ICT) ready to face challenges of the continuously changing world.

Since Namibia got its independence in 1990, the education system has undergone extraordinary transformation from servicing a privileged few to one involving all learners in integrated classrooms. Namibia's school education system begins with primary education that lasts for seven years, divided into lower primary (four years) and upper primary (three years). Junior secondary education lasts for three years and leads to the Namibian Junior Secondary Certificate (Information Communication and Technology Policy (ICT), 2005). Admission to senior secondary education is based on the six best subjects in the Junior Secondary Certificate (Ministry of Education and Culture (MEC), 1993). Senior secondary education lasts for two years and leads to the Namibia Senior Secondary Certificate (NSSC) of Secondary Education which gives access to higher education (Ministry of Education, 1990). Vocational Training Centers (VTCs) offer technical subjects at the junior secondary level with options in bricklaying and plastering, electricity, motor mechanics, metalwork, welding, and woodwork (ICT Policy for Education, 2005).

The thrust of the Ministry of Education Sports and Culture over the past ten years is to make sure that all the teaching and learning that takes place in the Namibian schools integrates Technology which takes various forms (Archar, Childs, Covadu, & De Young, 2012). These Integrated Computer and Technology (ICT) could be computers, mobile

phones, or any ICT gadget that can be used in the classroom to bring forth effective teaching and learning in the classroom. The use of ICT in the classroom is known to be effective in enhancing successful teaching and learning in the schools. In order for the Ministry of Education Sports and Culture the Government of the Republic of Namibia has made it a must for each Ministry to have a department of ICT that deals with handling ICT tools in every Ministry (Bingimlas, 2009). These different departments for ICT collaborate with the Ministry of ICT so that they support all the other Ministries with the ICT equipment.

It is envisaged that the learners receive quality education through the use of ICT tools in the Namibian classroom. This is done with the purpose of making sure that learners are not out in technology related issues and that they keep in pace with the information age (Berber, 2012). Teaching and learning that takes place in Namibian schools.

The Ministry of Education Sports and Culture has been working so hard recently to equip schools with computers and all the necessary gadgets that can be used to make learning more meaningful to the learners. Oshikoto Region is one of the regions that has also been provided with some of these ICT equipment (Ngololo, 2015). It was hoped that the provision of these ICT tools would lead to improved teaching and learning and eventually lead to an improvement of the learners results at all grade levels. An announcement was made by the Ministry of Education to call all teachers in Namibia to do the Computer Drivers Licence (ICDL) for free, and the Ministry would provide laptops to all teachers who complete the ICDL course as a way of motivation the teachers to take up the opportunity. Astonishingly, the pass rates at in Oshigambo Circuit in Oshikoto Education remain very low. Some schools have all the necessary ICT equipment to teach Physical Science but they don't seem to be utilising these tools to enhance effective teaching and learning. Therefore, the purpose of the study was to examine on the barriers that hinder successful implementation of ICT in the teaching of Physical Science in Oshigambo Circuit Schools in

Oshikoto Education Region. The move for the government to provide computers in most schools in Namibia was thought to be the end of low pass rates in schools. Many millions of dollars have spent by the government to buy computer equipment for the schools, and building computer laboratories for the schools for the schools to use ICT in their teaching various subjects like Mathematics, Biology, Physical science which can be meaningless if they are taught through the traditional means. Physical Science can be taught using ICT through animation especially when teachers are teaching such concepts like the generation of electricity where animations can have done on the computers to show learners how the various systems of the electrical generator produce electricity. The teaching of such concepts such as the generation of electricity using direct current motors or alternating current can be more meaningful if ICT is used to teach them through simulation in the classroom. Teachers in Oshigambo Education region in Oshikoto Region don't seem to be using ICT in their teaching of Physical Science as a result of this, learners performances in Physical Science remain very low (15% in 2014; 13% in 2015) (Ministry of Education, 2017). No previous study has been done in Oshikoto Region Oshigambo Circuit to investigate on this matter.

Therefore, the study investigated on the various barriers that constrain the integration of ICT in the teaching and learning of Physical Science with the purpose of utilising the technological innovations and improve on the current pass rates which remain unsatisfactorily low for the entire circuit.

## **LITERATURE REVIEW**

This study adopted Technology Acceptance Model (TAM) as the theoretical framework of the study. Empirical studies related to diffusion of technological innovations have expanded the use of the Technology Acceptance Model (TAM) model to include attitudes as defined by the

Theory of Reasoned Action (Loock, Grobler, & Mestry, 2006). At first, Casalo & Flava (2007) noted that attitude which is a component of perceptions is the driver of consumer utility or attributes Daniel (2008) described attitude as an individual's positive or negative behaviour towards innovation adaptation to a system Daniel further stated that attitude portrayed the perceptions of usefulness of Information Technology (IT), adaptation features, issues of availability, challenges to use them and personal preferences. Hood (2012) suggested that teacher's attitude is composed of one's attribute beliefs about the object and perceived importance (weight) of that attribute in making the decision to adopt. In the teaching of Physical Science, teachers' attitude is assorted in terms of perceptions regarding product information, difficulties in its utilisation, delivery terms, personalization, visual appeal, navigation, entertainment, and enjoyment (Chong, Ooi, Lin and Tan, 2010). This study employed a three level analysis it first investigated what the barriers to effective integration of physical science are, secondly how these barriers inhibit successful teaching of physical science, then the last part looked at what mitigation strategies need to be put in place to increase the teachers integration of technology in their teaching physical science in Oshigambo Circuit in Oshikoto Region. Rodden (2010:9) argue, "...the use of ICT in the classroom is important because it provides prospects for learners to learn how to operate in the information age". Ngololo (2010) further states that the integration of ICT into the teaching and learning process is disreputably difficult thus will most likely meet a number of difficulties. He defines these barriers as "anything that prevents advancement or accomplishment of an objective..." (p.13). Ngololo (2010) identifies a number of obstructions in the integration of ICT as: lack of time, lack of support, lack of confidence, lack of teacher competence, negative attitudes, lack of effective training, lack of accessibility to ICT based resources, lack of technical support, resistance to change and lack of ICT equipment.

These barriers are divided into different categories, teacher level and school level (Archar, Childs, Covadu, & De Young, 2012). The literature

review will be divided into sub-topics; teacher level barriers, school level and how these problems can be solved and ICT integration be enhanced.

Becta (2004) state that the issue of lack of confidence was the area that attracted most responses from the subjects in his survey of practitioners. Becta (2004) considers this as a major barrier to the integration of ICT by the teachers in the teaching of physical science. This is seen as a barrier because, if teachers do not have confidence to integrate ICT in their lessons then the idea of integrating ICT will be an unachievable dream. Beggs (2000) contend that teachers "fear of failure" caused the lack of confidence (p.238) makes them fail to integrate ICT in their teaching. Fear is a result of lack of confidence to do things because one is afraid that others might notice the mistakes and laugh at him/her. Teachers who have fear of using technological innovations will not even make an attempt to utilise technology in their teaching because they do not want to be laughed at if they fail to use such technological invention (Kenny & Qiang, 2003).

These are the barriers related to the school environment that prevents teachers from integrating ICT in their teaching. In most cases, these barriers are beyond the teachers' control. Bingimals (2009) noted that many teachers who have competences and confidence in using computers in the classroom, made little use of technology because they did not have ample time (p. 239). Time allocation for each lesson is less, that it prevents teachers to use ICT equipment, as they consume more time in fixing and organizing the equipment (Rodden, 2010). If the teachers do not have effective training on how to make use of the ICT equipment, then this also serves as a great obstacle to the integration of ICT in the teaching. Teachers need effective training to keep up with new technology demands. Most of the teachers in the Namibian schools do not have the necessary knowledge needed to use the ICT equipment due to lack of appropriate training (Ngololo, 2010). There are also no ICT technicians in schools with computers, in case the

teachers will need technical ICT support. Though the government has put in considerable efforts to improve teachers ICT skills, it is still not known whether physical science teachers at in Oshigambo Circuit in Oshikoto educational region also took part in this noble government initiative.

The highest barrier to integration of information and communication technologies into the teaching/learning process is the change as such. Hampson, Andrews, Barckley, & Severson (2009:123) discern five stages of integration and overcoming difficulties:

- a. *Entry*: learners are trained how to use information and communication technologies;
- b. *Adoption*: teachers use technologies as supplementary aids in the context of traditional teaching/learning methods;
- c. *Adaptation*: technologies are used for expansion/enrichment of the curriculum;
- d. *Appropriation*: technologies are integrated and used due to their outstanding and unique qualities
- e. *Invention* - new areas are invented where the use of technologies is appropriate.

Schools should make available ICT resources including hardware and soft wares which the teachers have to use in the integration processes. Teachers should take advantage of resources offered at their school and in their communities (Merrill, Read, & Barnett, 2013). They should also have access to ICT resources at home. Bingimals (2009) clarifies that lack of access is not always about the absence of ICT equipment, it also stretches into the areas of poor organization of resources, poor quality hardware, inappropriate software, lack of personal access for teachers. School principals and fellow staff members must ensure that they have quality software's installed, they have the right educational software's that are suitable for their subject matters and provide them with the relevant up to date information that they will need (Rodden,

2010). Thus successful integration of ICT requires the availability of the ICT equipment in place so that the teachers do not struggle to get them.

Technical support refers to an overabundance of services by which enterprises provide assistance to users of technology products such as mobile phones, televisions, computers, software products or other informatics, electronic or mechanical goods (Archar, Childs, Covadu, & De Young, 2012). In general, technical support services address specific problems with a product or service rather than the provision of training, customization, or other support services. Most schools offer technical support teachers, either freely available or for a fee. Technical support may be delivered over by e-mail, live support software on a website, availing free training in ICT integration for the teachers in the school environment, or a tool where users can log a call or incident. Larger schools regularly have internal technical support available to their staff for computer-related problems.

The Internet can also be a good source for freely available tech support, where experienced users help users find solutions to their problems. In addition, some fee-based service companies charge for premium technical support services. Technical support may be delivered by the different technologies depending on the situation. For example, direct questions can be addressed using telephone calls, SMS, Online chat, Support Forums, E-mail or Fax; basic software problems can be addressed over the telephone or, increasingly, by using remote access repair services; while more complicated problems with hardware may need to be dealt with in person in a school environment (Ngololo, 2015). The school should also offer user friendly assistances for individuals having technical problems in the use of ICT. Balanskat et al. (2006) suggest that, schools should provide training courses in dealing with new devices, modern technologies and new pedagogical approaches and teachers should prepare themselves (pre-service) by training. The type of training should be a hands-on training, whereby the teachers are doing it themselves. Training should be an on-going process to

meet up with the demands of technology, as technology is an ever-changing phenomenon.

Bingimals (2009), further suggest that, in order for training to be efficiently effective, it must include both, the training in acquiring basic skills in using technology and exercise in how these technologies should be interactively and successfully be integrated into the teaching process. Sometimes the teachers have the basic knowledge but they do not know how to put the knowledge into practice.

## **METHODOLOGY**

The study adopted a quantitative research approach through the use of a closed ended questionnaire. The study used a closed ended questionnaire to elicit the participants' perspectives of the different barriers that are playing a role in inhibiting the use of ICT in the teaching of Physical science and Mathematics teaching in Oshigambo Circuit in Oshikoto Region. The population for this study comprised of 43 Physical science teachers for the four senior secondary schools in Oshigambo Circuit in Oshikoto education Region. This study used the stratified purposeful sampling strategy coupled with simple random sampling to select forty-three Physical science and mathematics teachers in Oshigambo Circuit in Oshikoto region.

## **RESULTS AND DISCUSSION**

The main purpose for the study was to find out the barriers to effective ICT integration in the teaching of physical science and mathematics in Oshigambo Circuit in Oshikoto Education Region. The study inquired from the participants in the study who were teachers for Physical

Science and mathematics, the figure below shows the results on this aspect.

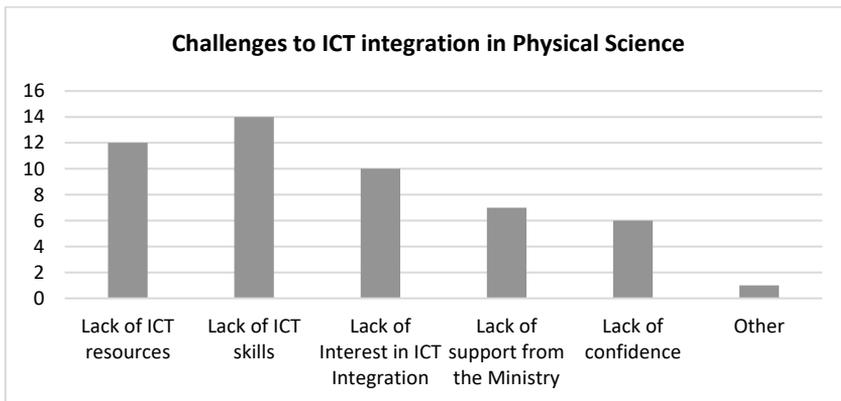


Figure 1: Barriers to ICT integration

The figure above shows that various factors are affecting the effective integration of ICT in teaching and learning. The main factor as indicated by the majority of teachers being lack of skills which had 14 participants, lack of ICT resources has 12 participants, lack of personal interest has 10 participants, lack of confidence had 6 participants, lack of support from the Ministry had 7 participants and finally other factors had only one participant.

Based on these findings, it can be started that the most barrier to ICT integration is lack of skill. This aspect is an important component in ICT integration because one cannot use the ICT gadget if he doesn't have the skill and the technical knowhow of how to use it. The Technology Acceptance Model (TAM) which forms the theoretical framework of this study indicated that one need to accept and acknowledge that the use of a technological innovation can improve their teaching and learning for them to be able to use such technology. On the note the theory of reasoned action stipulates that one need to perceive a technological

innovation as being effective before they can accept its use in the teaching and learning.

These findings corroborate with the earlier findings of Beggs (2000) and Becta (2004) who indicated that availability of skill in the use of an ICT innovation is needed for teachers to effectively integrate ICT in their teaching of various subjects. No teacher would want to embarrass themselves in the sight of the learners they teach after trying to use a technology innovation they will fail to utilise in the teaching process. Skill is very important in the teaching of any subject matter. These skills include the skill to interpret the technology findings, the skill to teach i.e using the technology to benefit the learners, the skill to eradicate the perceptions that come with each and every learner who has to be taught using a technological innovation, and the skill to synthesise the information output from a technological innovation. Thus skill is an important aspect in the effective integration of ICT as indicated by the teachers in the study.

One of the factors that is affecting effective integration of ICT in teaching is the in availability of the ICT resources as indicated by the teachers in the study. A teacher cannot use or utilise an ICT gadget if he doesn't have it available. Such gadgets include the computers, audio visuals, use of mobile phones in teaching and learning, availability PowerPoint projectors, availability of the necessary softwares etc. This finding harmonizes with the findings of Rodden (2010) who indicated lack of availability of ICT skill inhibits the teachers from utilising ICT in their teaching of various subjects.

The teachers in the study also indicated that teachers do not integrate ICT in the teaching of Physical Science because they have no interest in the use of ICT. Lack of interest in the integration of ICT is a major inhibiting factor that affect the integration of ICT in teaching and learning. Lack of interest has nothing to do with whether the ICT equipment is available or not but it has to do with the technology integrator who is the teacher. The Theory of Reasoned Action indicates

that one need to accept that the technology is necessary in teaching and learning before he or she can utilise it in this process. This acceptance is also affected by one's personal interests and ones' perceptions about the technology use. Bingimlas (2009) state that technology usage need to be accepted by the technology user before he or she can accept it. Lack of interest in technology utilisation is key to all that will follow in technology utilisation. It affects one's ability to seek help to use the technology of the individual doesn't know how to use the technology; it also affects one's ability to take any proactive action in the seeking to know the benefits that came with technology utilisation. On this note Ngololo (2010) indicate that interest is key to all that the teacher can do in the classroom.

The teachers' failure to use technology in their teaching process has several effects on the success of the learner. The study tried to find out from the teachers what some of these consequences could be in their various schools if they do not utilize technology.

The lack of support and motivation is one of the challenge that teachers are facing when it comes to the usage of ICT in mathematics, mentioned that apart from ICT being support and motivating, it is also updated. This was also supported by Hukongo & Shafuda (2010) emphasised on the current situation in the Namibian schools that they are basically dominated by the lack of leadership and support for the physical science and mathematics teachers to enable them to use ICT in their Classroom and the lack of resources and inaccessibility to ICT resources.

Respondents stated that they only used ICT tools occasionally because it was always difficult to take learners either to the computer lab or viewing rooms as they needed to book for the computers or TV in advance and it frustrated teachers if they find the computer lab or viewing rooms occupied already as it could lead to chaos and disturbance of the entire lesson or the whole school. This has supported by Hukongo & Shafuda (2010) many of the Namibian schools are not

able to purchase ICT resources as they are very costly and the government cannot cater for all schools at a time. Even though the resources were distributed to the schools countries wide they were not distributed enough to all mathematics teachers to cater for their learners to all have full access at all the time. Such resources are placed on the laboratories and only few are equipped by mathematics teachers. The ICT resources includes mainly computers, photocopy machines, overhead projectors, tape recorders, DVDs and television sets.

Respondent strongly emphasized on this point by saying that “moving learners to the place where the resources are could be a challenging exercise, as some places may be far from each other, therefore it will be better if each classroom can be equipped with at least a computer or a TV or an OHP. Teacher can quickly download some mathematics video and activities from the computer and use the OHP to display information for the learners.

Respondents: Emphasised that they were not trained indicated that they were unable to operate or work with ICT in the mathematics classroom and this has given the teacher a very limited skills and this is the reason why most of teachers are so unwilling to integrate ICT in teaching. Teachers need support from the government or the ministry of education to endeavor for excellence.

This has been supported by Mellon (1999) points out that forcing technology down the throats of teachers without adequate training or support, and without allowing a reasonable time frame, is unlikely to improve students’ performance in every classroom. Although there is limited or no training for the teachers in the integration of ICT in English, the Namibian government has made provision for teachers to be trained in how to utilise computers and access the Internet to obtain relevant information that can be used across the curriculum. Teachers are offered a course which is government-funded and allows them to obtain an International Computer Drivers Licence (ICDL). Through the said

initiatives, teachers are expected to meet their needs regarding access to ICT, training in ICT skills and on-going support. Williams, Coles, Richardson, Wilson, & Tuson (2002) also reveal in their study that similar initiatives in the United Kingdom are in place to improve computer access and provide training to teachers.

Respondents emphasised that training should be given to all teachers in the education system including those one who were trained during colonial era as they were disadvantaged for this opportunity and as there were no modernized tools available in that time. Respondents also mentioned that lack of ICT resources was one of the major interruptions towards successful integration of ICT in mathematics classrooms. According Mellon (1999) states that forcing technology down on the throats of teachers without adequate training or support, without allowing reasonable time frame, is unlikely to improve the learners performances in every mathematics classroom.

One respondent commented that the resources are very limited in the school that they are not even enough for learners in one class group, as our schools cannot afford to purchase ICT resources as they are costly and government cannot cater for all schools at once. Respondents mentioned that even though ICT resources were distributed to many schools in the whole country, they were not enough all the learners to have full access at any time. This was supported by Mehlinger & Powers (2002), & Pelgrum, (2001) point out that there may be obstacles which prevent teachers from using technology in the classroom such as insufficient infrastructure and weak technical support. They emphasise that lack of training for teachers is one of the hindrances in integrating ICT with minimal problems. Another issues is that schools had been broken into several times in an attempt to steal computers and other components. In the end this would be extra costs for the school as broken windows and vandalised buildings have to be fixed.”

Another problem was that our learners do not have laptops, computers or smart phones so that they can replay the similar videos when they are at home to what we have done at school, some of our learners come from houses that does not have electricity. It is very difficult to plan a lesson where by ICT need to be used, when you know that there are no enough ICT tool and sometimes you prepare the lesson but at the end of the day you will find out that the computer room is already booked by other colleagues. On the other hand, Mumtaz (2000) stated that many scholars proposed that the lack of funds to obtain the necessary hardware and software is one of the reasons teachers do not use technology in their classes. Also, a report on teachers' use of technology by the National Center for Education Statistics (September, 2000) using ICT is completely time wasting as our learners and some of us teacher don't have the relevant skills to integrate ICT in the teaching of mathematics, in this case the teacher will need to train learners how to hold the mouse, where they can find the calculator on the computer and by that time the bell is ringing already for the next lesson. the lack of time available in classes, and in their own schedules for planning; and the lack of a national policy on the use of computers in schools (Kozma, McGhee, Quellmalz, & Zalles, 2004, p. 376). Technology is nice to use, especially when you become used to it. You get more convinced that you can do better in the next class. Balanskat, Blamire, & Kefala (2007) also noted that teachers who do not have the relevant ICT skills may find ICT use as time wasting and unfriendly. Jones (2008) also noted that lack of appropriate ICT equipment may hamper maximum benefits that can be gained from ICT integration in various schools.

Respondents believe that preparation of lessons that required the integration of ICT require skills and takes so much time. At the same time ICT can fail people just while you are busy in the middle of the lesson and this can be a very serious shame. The lack of ICT tools exposure can make a teacher to have fear of touching or using ICT equipment. When using ICT tools such as PowerPoint with a projector

in my mathematics classroom, learners do not concentrate well anymore as they just look at the equipment the teacher is using and how the teacher is operating the ICT tools, instead of following what is being taught. This means that learners have little awareness of ICT, and this will make it more difficult to use it with them. These findings tally with the earlier findings of (Jones, 2008; Jones, 2008; Cox & Abbott, 2005) who noted that lack of skills and appropriate ICT equipment makes it difficult for teachers to fully utilise ICT in their teaching of various subjects.

Table 2: Consequences of not integration ICT in the teaching of Physical Science and mathematics concepts teaching

Increased learner failure in Physical Science and mathematics concepts	22
Lack of Motivation in the learning Physical science and mathematics concepts	23
Wastage of government resources	40
Learners failing to understand and explain complex Physical science concepts	35
Other	12

The table shows that 35 teachers indicated failing of Physical Science and mathematics concepts as one of the greatest consequence that comes with lack of effective Integration of ICT in teaching and learning of Physical Science, 23 Participants indicated lack of Motivation in the learning Physical science, 22 indicated increased learner failure in Physical Science and mathematics concepts, 40 indicated that lack of integration of ICT in the teaching of physical science and mathematics lead to a wastage of government resources and 12 participants indicated other consequences not indicated on the questionnaire.

Based on these findings, it can be said that most of the participants in the study are quite aware that the teaching of Physical Science and mathematics can be made more meaningful by the integration of ICT in the classroom. These findings cement the earlier findings of (Ngololo, 2010; Bingimlas, 2009) who indicated that lack of effective integration of ICT in the teaching and learning process leads to learners low success rates in Physical Science. The use of ICT makes learners understand complex aspects which are difficult to explain in a classroom environment. Some Physical science and Mathematics concepts are difficult to explain to the learners for them to create an image of the reality but through the use of simulations using the computers and projecting the reality on a white board makes learners to understand and to be able to explain them properly when they are asked to do so and thus improving their overall pass rates in Physical Sciences. Archer, Childs, Covadu, & De Young (2012) argues that through the use of simulation, reality is brought in the classroom and this creates an everlasting image in the minds of the learners and they will be able to explain complex processes.

The effective integration of ICT makes learners to become motivated to learn rather than when the chalk and boards are used to teach learners. This makes the learners want to understand more about a particular idea. If learners are not motivated to learn they may even sleep during the lesson or may even absent themselves from the lessons and this will ultimately lead them to fail their subjects.

## **CONCLUSION AND RECOMMENDATIONS**

The findings above are similar to earlier findings of Balanskat et al. (2006) who suggested that, schools should provide training courses in dealing with new devices, modern technologies and new pedagogical approaches and teachers should prepare themselves (pre-service) by training. The type of training should be a hands-on training, whereby the teachers are doing it themselves. Ngololo (2010) also stipulated that

should be an on-going process to meet up with the demands of technology, as technology is an ever-changing phenomenon. She further argues that the Ministry should offer continuous support to the schools by working together with the circuit to provide the equipment, making follow-ups on how teachers in various schools are utilising the supplied resources/equipment in the various schools. Lack of Ministerial support makes it impossible for schools to purchase the needed ICT equipment and also to provide schools with personnel that is primarily responsible for the management of the ICT equipment in every school, guiding, providing training and servicing the equipment which the schools have been provided. Teachers need a holistic support

Becta (2004) recommends that the Ministry should have monitoring evaluation protocols to assess teachers' success in their integration of ICT on their teaching of various subjects. Becta (2004) further emphasizes on the provision of sufficient time that schools should cooperate with teachers and provide sufficient time for teachers to implement the new technology skills into the classroom. He further advises that this can be done by reducing the number of teacher lessons or increase the daily lesson time, and they should also acquire appropriate ICT skills of time management so that they will know how to suitably allocate and use their time during teaching and organizing the lessons.

Schools should make available sufficient time for ICT integration are likely to benefit more from the results of using ICT in the teaching and learning of various subjects in a school environment.

The study unveiled that the barriers to ICT integration range from in availability of ICT equipment, lack of skills and lack of Ministerial and circuit support. While the most prevalent consequences for poor ICT integration were failure of the learners in Physical Science, and

mathematics poor comprehension of the complex Physical Science and mathematics concepts and lack of interest in ICT integration. The study recommended that the Ministry need to fully support the schools in the provision of ICT equipment and also should help to train teachers in the development of the appropriate ICT integration skills for them to improve their teaching and learning processes.

## **RECOMMENDATIONS TO THE MINISTRY OF EDUCATION**

The Ministry of Education Sports and Culture is the one responsible for the management of all the public schools and for the provision of the ICT equipment and also to monitor the teaching that takes place in schools.

- Therefore, the study recommends that more comprehensive monitoring and evaluation of the schools that have been provided with ICT equipment should be done on regular basis.
- There is need to equip those schools which have not received any ICT equipment so that that cannot be left out in this important information age proceeding.
- There is need to continuously train teachers on how to utilise ICT equipment in their teaching of various subjects.
- The circuit should continue supporting teachers with the most needed ICT skills and also to have regular follow-ups on how teachers are progressing in their ICT accusation in schools.
- It is vital for stakeholders to be involved in regional planning and budget for the implementation of activities related to reducing heavy drinking amongst women.

## **RECOMMENDATIONS TO THE TEACHERS**

The teachers' role is very significant in the enhancement of effective integration of ICT in the teaching and learning process.

- Therefore, the school management need to constantly remind the teachers on their responsibility in to integrate ICT in the teaching of various subjects.
- Teachers need to understand that the world is changing and they have to keep in pace with the incessantly changing world of technology so that they can meet the modern demands for technologically equipped scholars.

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