



## **Integrating ICTs into the environmental science primary school classroom in Chegutu district, Zimbabwe: problems and solutions.**

Mandina Shadreck

Department of Educational Foundations Management and Curriculum Studies, Midlands State University, P Bag, 9055, Gweru, Zimbabwe

For correspondence: mandinas@msu.ac.zw

### **Abstract:**

This study investigated primary school teachers' perceptions of the barriers and challenges preventing them from integrating ICTs in the environmental science classroom. The study adopted a qualitative research approach that is in line with the phenomenological perspective as it sought to acquire knowledge through understanding the direct experience of others by engaging with participants through semi structured interviews and classroom observations. The participants of this study were 14 7<sup>th</sup> grade primary school teachers purposively sampled based on based on qualities like class level, working experience and gender. According to the findings of the study primary school environmental science teachers are not yet ready to integrate ICTs into their classrooms due to a number of obstacles that include unavailability of infrastructure, equipment and web based resources in the classrooms. Teachers also lacked competence, in service training and technical support, as well as technological pedagogical content knowledge on how to integrate ICTs into teaching and learning of environmental science. Teacher education programs should therefore adequately prepare new teachers and equip them with skills and pedagogical skills necessary integrate ICTs into their teaching. The study recommends that government forms partnerships with public and private sector to enable internet access, affordability, connectivity and coverage for all schools.

**Keywords** - ICT, Teaching and Learning, Integration, Barriers, Technological Pedagogical Content knowledge

### **Introduction**

The important role that information and communication technologies (ICTs) play in many educational and business institutions of the 21<sup>st</sup> century cannot be overemphasized. The potential that these ICTs have in supporting the school curriculum and education through the provision of effective communication opportunities for students and teachers have been noted by Dawes (2001). The importance of ICTs in education calls upon educationists to identify the challenges to the integration of ICTs into teaching and learning in order to improve the quality of teaching and learning. Becta (2004) notes that literature abounds with information on barriers to ICT integration in general, but very few studies look at obstacles that exist in specific subject areas, thus investigating the challenges that educationists encounter in specific situations is very essential as it assists educationists to overcome these obstacles and integrate the ICTs into their teaching and learning.

The use of ICTs in the classroom in this information age is very essential in providing opportunities for students to learn. Furthermore, the use of ICTs in teaching and learning has been shown to provide numerous opportunities for teachers and students to efficiently work in an information age (Salehi and Salehi, 2012). Buabeng-Andoh (2012) further notes that educational institutions of the 21<sup>st</sup> century are obliged to use ICTs to teach the skills and knowledge that students need for the workplace and everyday life by restructuring their curricula and educational facilities in order to bridge the existing technology gap in teaching and learning processes. Thus the adoption of ICTs into classroom learning

environments will provide learners with adequate knowledge of specific subject areas consequently promoting meaningful learning as well as enhancing professional productivity.

Bransford et al. (2000) opines that ICTs have various roles they play in teaching and learning chief among them including enhancement of student achievement and teacher learning. Contributing to this debate, Wong et al. (2006) note that ICTs are critical in supporting face to face tuition in the classroom. Romeo (2006) further asserts that the use of ICTs helps learners to acquire knowledge, reduces the amount of teacher directed instruction as well as increasing opportunities for teachers to help with specific and particular needs. Apart from enhancing teachers' pedagogical practices, ICTs have been shown to enhance students' learning skills, knowledge, motivation as well as the completion of learning tasks (Grabe and Grabe, 2007).

Anderson (2002) further notes that the integration of ICTs into the school curriculum enables students to work independently and constructively. The teacher's responsibility will be to design the ICT related activities, advising and assessing the learner. It has also been noted that the integration of ICTs empowers both teachers and learners leading to a transformation of the instructional process from being highly teacher centered to student centered result in increased learning gains for students, creating and allowing for opportunities for learners to develop their creativity, problem solving abilities, informational reasoning skills, communication skills and other high order thinking skills (Trucana, 2005).

While the effective integration of ICTs contributes towards a number of benefits in the teaching and learning process, teachers cannot be able to use ICT effectively if there are factors that hinder their pedagogical practices. Ertmer (2005), Keengwe, Onchwari and Wachira (2008) have categorized barriers that hinder effective integration of ICTs into teaching and learning by teachers into two levels : external and internal barriers. According to Khan, Hasan and Clement (2012), Lim and Pannen (2012), Yan,Xiao and Wang (2012) and Dionys (2012), external barriers include inadequate access to the technologies, lack of funding , lack of digital resources and infrastructure, inadequate training, and staff support. When these barriers are present ICT integration would not be possible hence removal of these barriers is essential to facilitate effective ICT integration into teaching and learning. However, it has been noted (Sang et al., 2010, Ertmer, 1999, 2005) that the removal of the external barriers does not necessarily mean successful classroom integration as internal barriers come into play to stall ICT integration by teachers. Internal barriers include teacher related factors such as teacher beliefs, teacher self-efficacy and teacher attitudes (Sang et al., 2010) as well as school-level factors, such as organizational culture (Keengwe, Onchwari and Wachira ,2008). A review by Bingimlas (2009) on the barriers to successful integration if ICT into classroom learning environments identified teacher level and school level barriers as hindering the successful integration of ICT into teaching and learning. Teacher level barriers include lack of teacher confidence, lack of teacher competence, resistance to change and negative attitudes while school level barriers include lack of time, lack of effective training, lack of accessibility to ICT-based resources and lack of technical support in classroom (Unal and Ozturk, 2012).

Buabeng-Andoh (2012) summarises the barriers to include lack of teacher ICT skills; lack of teacher confidence; lack of pedagogical teacher training; lack of suitable educational software; limited access to ICT; rigid structure of traditional education systems; restrictive curricula, etc. Thus knowledge of the extent to which these barriers affect teachers in integrating ICT into teaching and learning will help in making decisions on how to deal with these barriers. This study examines the barriers for using ICT in environmental science teaching and learning at the primary school level and how to assist the educators to overcome the obstacles and integrate the ICT in everyday teaching and learning. This study therefore investigates the teachers' perceptions of the barriers and challenges preventing them from integrating ICT in the environmental science classroom.

### **Statement of the problem**

Despite the political will shown by the government through the presidential computerization programme, rapid growth in ICT access by teachers and students both at home and school and availability of educational software, most environmental science teachers are reluctant in adapting and integrating ICT tools during teaching and learning. It appears that they are facing challenges in adopting and using efficiently the ICTs in the classroom. It is against this background that an investigation of the challenges preventing teachers from adoption and using ICTs in environmental science teaching and learning in Chegutu district Primary schools in Zimbabwe was conceptualized.

### **Research Questions**

The study was guided by the following questions:

What are teacher perceptions on challenges and barriers that prevent environmental science teachers from using ICT in the primary school classroom?

What can be done to enhance environmental science teachers' adoption and integration of ICTs into their teaching and learning?

### **Significance of the study**

The findings and recommendations of this study are expected to provide strategies that can be adopted to assist primary schools and teachers in making decisions on how to adopt and use ICTs in environmental science teaching. Furthermore, the findings of the study can be used by policy makers and planners to revamp the current ICT policy in order to overcome the challenges hindering smooth adoption and use of ICTs in environmental science teaching and learning. Further, this study will also be helpful for environmental science teachers to take into consideration the obstacles that they face in during adoption and integration of ICTs into teaching and prepare themselves to become better teachers.

### **Research Methodology**

#### **Research design**

This study adopted a qualitative research approach that is in line with the phenomenological perspective as it sought to acquire knowledge through understanding the direct experience of others by engaging with participants through semi structured interviews and classroom observations (McMillan & Wergin, 2006). As pointed by Creswell (2006) a phenomenological study describes the meaning for several individuals of their lived experiences of a concept or a phenomenon by focusing on a description of what all participants have in common as they experience a phenomenon.

#### **Research Participants**

The participants of this study were 14 7<sup>th</sup> grade primary school teachers. Their selection was influenced by the aim of the study and also on the aspect of trying to get variations in experiences as far as possible (Kimaryo, 2011). In this study, the phenomenon of our interest was to explore primary school teachers' perceptions of the barriers to integration of ICTs into environmental science teaching and learning at the primary school level. The participants were purposively sampled based on based on qualities like class level, working experience and gender. Since the researcher wanted to gather useful information relating to the phenomena being studied, limit of teaching experience was not set because the researchers wanted to get experiences of both short and long servicing teachers. Teacher professional qualifications were not considered as a criterion for selection because almost all the participants had the same qualifications (Diploma in education).

### **Data collection and analysis**

The data was collected during the second school term in 2013. The observations took place in 7<sup>th</sup> grade environmental science classrooms. Each teacher was observed for four lessons lasting forty minutes each. After the classroom observations, the researchers interviewed the participants. A semi-structured interview guide designed by the researchers was used to elicit information for this study. The interviews lasted for one hour, and were digitally audio recorded and then transcribed. The reliability of the data was enhanced through probing and restatement of questions in a slightly different form later in interviews. Further probing beyond the answers given was done to obtain clarification and to provide opportunity for elaboration. The data was analysed in a manner consistent with approaches suggested and outlined by Bell (2005). The data was sorted into categories with identifiable commonalities and recurring themes which reflected the purpose of the research for interpretation and analysis.

### **Results and discussion**

Data were analyzed for themes and patterns in reference to the two research questions. The focus of the questions was in discovering the barriers teachers face in integrating ICTs into environmental science teaching and learning and how these can be overcome.

#### **Research Question 1 : What are teacher perceptions on challenges and barriers that prevent environmental science teachers from using ICT in the primary school classroom?**

The following discussion provides a list of all barriers that were mentioned during the interviews or noticed during the observations.

#### **Unavailability of infrastructure, equipment and web based resources in the classrooms**

The effective integration of ICT requires the availability of equipment, infrastructure, supplies of computers and their proper maintenance including other accessories (soft ware and hard ware). The study found that all classrooms were not properly equipped. They lacked equipment such computers, projectors as well as internet connectivity. All the teachers interviewed and observed lack ICT equipment in their classrooms. The teachers also noted that their schools do have computer labs but the computers were lying idle due to unavailability of electricity or had broken down and needed repairs. Internet connectivity does not exist in all the schools under study hence teachers have no/limited access to internet. As noted by teacher A

*“ lack of internet connectivity is one of the barriers against the use of web-based resources and materials for environmental science teaching. The other barrier is old, obsolete and broken down computers. We are also not connected to the internet due to prohibitive costs ”*

The majority of teachers who participated in the study emphasized on these barriers. The findings of the study are consistent with those of Unal and Ozturk, (2012) who found lack of ICT equipment in social studies classrooms in Turkey. Goktas, Yildirim and Yildirim (2009) also found out that integration of ICTs into preservice teacher education programs is affected by , lack of appropriate software and hardware materials. Studies by Becta (2005) have also shown that lack of internet connectivity and where connectivity is not readily available hinders the process of ICT integration. Hodgkinson-Williams, Sieborger & Terzoli (2007) further allude lack connectivity predominantly the cost of Internet connectivity. Since the schools lack internet connectivity, the teachers have no access to web based teaching resources

#### **Lack of competence, in service training and technical support**

The successful integration of ICTs requires teacher who are technologically competent, well trained and supported technically. The findings of the study show that teachers lacked the knowledge and

skills on how to use computers into their daily teaching practices thus most of the teachers do not use computers in their classrooms. On this issue teacher C had this to say  
*“lack of skills is a barrier preventing us from using ICTs for teaching and learning. Furthermore inservice training opportunities are not adequate enough to equip us in the use of ICTs in the environmental science classroom”*

Teacher B also noted that *“as teachers we lack training and inservice training programs for environmental science teachers are insufficient”*.

The study also noted that the teachers need technical assistance on the use of ICTs in the classroom. Technicians are required to monitor and fix serious technical problems. The findings indicate a lack of competence by teachers on ICT usage. Bordbar (2010), has noted that teachers' computer competence as a major predictor of integrating ICT in teaching. He further notes that a lack of technical competence results in a negative attitude towards the integration of ICT into teaching and learning. The findings are consistent with those of Albirini (2006) who reported teachers' lack of technological competence as the main barrier to ICT integration. Al- Alwani (2005) has also observed that a lack of ICT skills is a serious obstacle to ICT integration in science education.

### **Lack of technological pedagogical content knowledge**

Technology integration in teaching and learning can be enhanced if teachers possess sufficient technological pedagogical content knowledge. This calls upon teachers who are creative and have excellent design capabilities to be able to adapt as well as create learning materials that suit the needs of the learners. Classroom observations in this study have showed that teachers lack this capability. Regarding this issue teacher D had this to say  
*“the professional development courses as well as teacher training programs we have had have focused on the acquisition of ICT skills and not on the pedagogical practices related to ICT as a result we do not know how to use ICT in our classrooms”*.

The findings of the study are consistent with those of Tsai and Chai (2012) the importance of teachers having design thinking capacities for the effective implementation of ICT integration into teaching and learning. They further call upon the enhancement of such capacities into teachers and its inclusion into teacher training programs. Hence the design thinking capabilities should be cultivated in every classroom teacher for effective integration of ICTs into teaching and learning.

### **Research Question 2: What can be done to enhance environmental science teachers' adoption and integration of ICTs into their teaching and learning?**

Based on the challenges resulting from the findings, respondents interviewed suggested a number of strategies that can be implemented to enhance integration of ICTs into environmental science teaching and learning. Among these includes the development of appropriate teaching methodologies for integrating ICT as well as the development of effective strategies the care and maintenance of ICT resources. Furthermore, the respondents also felt the need for the Ministry of Primary and Secondary to empower schools with adequate funding and infrastructural facilities to enable schools to integrate ICTs into teaching and learning.

The interviewed respondents felt that they need also to be equipped with resources, technical as well as pedagogical skills to enable them to effectively to integrate ICT in environmental science teaching. One of the respondents had this to say

*“Environmental science teachers need resources and training on the use of computers and their application in teaching and learning in their subject to enable them to use various application software programmes”*

The respondents also identified the need for internet connectivity to improve communication and collaboration amongst themselves. One of the teachers had this to say

*“We need to be supported with internet connectivity in schools so that we can be able to access learning materials, update software and content areas from various websites. We also need to communicate educational matters and collaborate with other environmental science teachers on matters affecting the teaching and learning of the subject so that student learning can be enhanced”.*

The findings of the study have shown that teachers feel that they are not adequately prepared, hence there is a high likelihood that they will not integrate ICT into teaching and learning. In order to address their state of preparedness, the respondents suggested the organization of professional development conferences, workshops, seminars for teachers so that they are equipped with both pedagogical and technical skills on integration of ICT into environmental science teaching. The need for further training as well as professional development is key to successful integration of ICTs into teaching and learning (Yıldırım, 2009).

The respondents further suggested the need for government to harnessing public and private sector investments to enable internet access, affordability, connectivity and coverage for all schools. One of the respondents had this to say

*“ integration of ICT into teaching and learning requires teachers to have an understanding of the technological tools that will enhance student understanding and should also possess basic technological skills and knowledge on how to use ICTs effectively in the classroom”.*

As noted by Ihmeideh (2009), teacher training is critical to prepare teachers to use technology in their classes with their students. The respondents also indicated the need to integrate ICTs in teacher training programs as a means to influence how they will use technology upon completion. The study also noted that this essential task of preparing teachers to use information communication technologies has mainly been left to their post-university experiences, hence the need to include it their initial teacher training experiences at college level.

## Conclusion

Based on the findings of the study, it can be concluded that primary school environmental science teachers are not yet ready to integrate ICTs into their classrooms due to a number of obstacles that include unavailability of infrastructure, equipment and web based resources in the classrooms. Teachers also lacked competence, in service training and technical support, as well as technological pedagogical content knowledge on how to integrate ICTs into teaching and learning.

Teacher education programs should therefore adequately prepare new teachers and equip them with skills and pedagogical skills necessary integrate ICTs into their teaching. The study recommends that government forms partnerships with public and private sector to enable internet access, affordability, connectivity and coverage for all schools.

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