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The Influence of the Low Use of ICT on Teaching Biology in Nine Years Basic Education Schools of Rwanda

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Abstract: *This study examined the influence of low use of ICT on teaching biology in Nine Years Basic Education schools Nyaruguru district Rwanda. It aimed to determine the potential factors of low use of ICT in teaching biology in terms of teaching with ICT based materials in Biology lesson, identify the barriers of using ICT in teaching biology and suggest the strategies of overcoming them. The population of this study was 56 teachers from the selected schools of Nyaruguru district. This study adopted a descriptive research and correlational design coefficients according to Pearson have been determined so as to look at the correlation between different variables which have an effect on low use of ICT. A lack of sufficient computers (r=0.410, p= 0.002), a lack projectors and other IT equipment in a number of schools (r=0.352, p=0.003), low level of ICT skills (r=-0.373, p=0.005), a lack of raining in ICT (r=0.411, p=0.001) and a low confidence in ICT (r=-0.331, p=0.002) posed themselves as potential factors which influence the use of ICT in teaching biology, with an effect of the lack of the ability to prepare ICT based content and lessons by the teachers of Biology. The provision of sufficient computers which can help teachers in their teaching work. The provision of computers, projectors and other IT equipment, training of teachers in ICT will boost the use of ICT among teachers of the nine years basic education schools of Nyaruguru district.*

Keywords: *Influence, ICT, Teaching, Biology, Nyaruguru District*

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1. Introduction

Today, the world is quickly evolving with Information Communication Technology and its use at different aspects of life is aligned with online social collaboration. The use of ICT especially in education can play a huge role in effective and efficient practical biology teaching by providing transferable knowledge and helping to achieve education goals (Rahimi, 2010).

The ICT tools in teaching and learning has been adopted in a number of countries. In Japan, the use of ICT in education has been put in place using audio-visual movies, focusing on teaching of sciences subject learning including biology for a certain period of time, then the comparison of practical skills of students' interaction with the biology test score was to be made. It showed a rise in score in students, due to the high level of interest, activity and motivation in learning (Kanda, 2004)

Some issues of integrating ICT in teaching biology are still being the challenge to the most governments of the developing countries, but more concentrated in the sub-Saharian part of Africa. Among African countries many teachers are behind in using ICT and that affect negatively biology teaching and learning outcomes (Bower, 2018).
In the context of Rwanda, the government is resolved to becoming a technology-led country as it aspires to promote quality of teaching and learning including biology by digitized contents where by the technology plays medium role (Nizeyimana, G. 2021), and different application software have been developed which can help in quick learning and teaching activities. MINEDUC through REB has distributed a big number of computer machines, projectors, tablets and other ICT

tools in all secondary schools, with the aim of equipping teachers and learners with ICT tools in teaching and learning.

Despite such efforts,some schools, many MINEDUC reports illustrate that one of the major issues which have been identified is the lack of all those tools, and where they are available, some teachers have not the skills of using them in order to help learners during in the process of learning biology. The absence of a culture around the use of ICT also prevented the widespread adoption of such tools in education, as did the limited availability of digital content, expertise, especially in rural areas of the country (Mineduc, 2008)

This study examined the influence of the low use of ICT in teaching biology in selected nine years basic education schools of Nyaruguru District in terms of teacher's preparation of ICT based material in Biology.

Nine years basic education is a system of education in Rwanda, in which students continue their education from their primary schools after six years to the secondary school studies of 3 years of the ordinary level, at the same school. Six years of primary school plus three years of secondary total to nine, hence the name nine years basic education.

2. Literature Review

Various variables that affect teaching biology in Nine years basic education have been identified during different studies. Through these studies, the significance of an effective use of ICT has been evaluated and therefore ascertaining the extent to which it reduces the possibility of having poor performance by integrating ICT in teaching and learning process. Among the studies that have been conducted, a significant number has concluded that an influence exists between a ICT use and teaching biology (Gunter, T.2011)

2.1 Importance of ICT in teaching and learning Biology

Science teachers, including Biology ones, are required to have literacy on using ICT in their daily classroom practices for the sake of increasing their knowledge as well as helping learners to increase their knowledge and skills. In teaching Biology, ICT makes the learning environment more enjoyable, motivating and attractive as it increases learners' attention to the subjects thus increasing the effective teaching and learning process It has been found that no single size can fit all, so ICT can be used for presenting contents in different models like using text, audios, animated graphics, and pictures for helping all learners to learn effectively (Akcay, 2003).

The effective use of ICT in the teaching and learning process prepares learners to be adaptive in the technological era. Therefore, using ICT in teaching Biology helps them to be prepared for living in the real world which is now relying on ICT. Using ICT in the teaching and learning Biology, is very significant in terms of creating an active mode of learning which stimulates learners' interest and curiosity. Some Biology topics are difficult in traditional teaching methods, so Biology teachers have to think about how ICT can simplify the task (Koomson, 2020)

2.2 Individual factors that influence the use of ICT in teaching and learning Biology

Different individual factors can influence the level at which ICT is used in teaching and learning process. These factors may be related to the gender, age, teachers' attitudes, ICT skills and knowledge and teaching experience.

These factors and their effects on the use of ICT in teaching and learning process are discussed below.

2.3 Effect of gender on the use of ICT in teaching and learning

Different studies have identified that gender plays a great role on the use of ICT in teaching and learning process. Moone (Moone, 2010) has found that gender plays important role in teachers' self-assessment towards the knowledge of ICT use, perceptions and its integration in teaching and learning, so, gender differences in terms of using ICT in classrooms is a common phenomenon. Based on the study conducted in Australia in 2005, the female teachers were less confident compared to the male teachers while using ICT in teaching and learning (Jamieson-Proctor, Burnett, Finger & Watson, 2006). In the same context,(Akcay, 2003)found the higher level of using ICT tools in classroom among male teachers compared to their female counterparts. However, the Ghanaian females who taught in Primary Schools were found to have a high level of using ICT in teaching compared to their male counterparts (Akcay, 2003)

2.4 Impact of teacher attitudes on using ICT in teaching and learning process

Based on the study of (Gambari, A. 2016) on the beliefs and attributes of teachers; the beliefs of teachers and use of ICT in education were found to be inconsistent. However, according to (Pantelidis, 1995)the attitudes and beliefs of teachers are closely connected with their degree of using ICT in the classroom. They also carried out a study through a compilation of data from a 1989surveyon776 instructors of Knowledge and Information and other academic institutions workers in the southern United States. In their study, they have found that instructors with negative attitudes presented fewer skills in using computers and were not motivated to receive and adapt to technology compared to those with positive attitudes. This showed that a negative attitude formed a barrier to the quick acquisition of ICT skills. It has been noted that the positive attitudes in

using educational technologies in many teachers, make them free for using ICT in a classroom with students. This clarifies how the levels of self-efficacy and a positive attitude influence the use of ICT in the teaching and learning process.

The study in Nigeria revealed that ICT attitude amongst teachers may be associated with their competence. However, the study identified affective and perceived usefulness as the main components of the attitude which significantly predict competencies. Also, freedom from ICT anxiety, and the extent to which teachers believe ICT could assist their work wouldenhancegoodICTcompetenceandpreparednessam ongstteachers.Inthesamevein, the study of Lumumba in Kenya identified that effective integration of ICT in the school environment was associated with the attitude of implementers (Lumumba, 2007). He pointed out that the positive attitudes of teachers towards e-learning could offer the learners opportunities provided by this technology while the negative attitudes of teachers in terms of using e-learning could critically limit the opportunities of learners towards this technology (Uzezi, 2020)

Wegerif et al (2003) agreed with the statements of Lumumba and asserted that the achievement of meaningful use of computer technology in the teaching and learning process is greatly influenced by teacher's attitudes. According to him, the teachers' attitude predicted the computers acceptance and actualization. Therefore, positive attitudes in Biology teachers are needed for effective use of ICT in teaching and learning Biology. Different studies indicated that some teachers are convinced by using ICT in education while others are not. Consequently, those who are not convinced resisted its effective integration in educational activities. Young teachers showed a higher positive perception in using ICT in education compared to their older counterparts Indeed, positive attitude in using ICT have to be promoted in different teachers for effective integration of ICT in the didactic process (Wegerif, R.2003)

2.5 Effect of age and teachers' experience on using ICT in teaching and learning process

Regarding to the effect of teachers' experience on using ICT in teaching and learning process, it has been found that young and fresh teachers use more ICT in their classroom practice compared to the experience ones. This may due to the trainings obtained by these new teachers compared to the older ones who might have finished their studies before the introduction of this new paradigm in education system. This aspect creates a digital divide among young and old teachers where young teachers shows a positive attitude towards the use of ICT compared to their old counterparts (Fagbemi, P.2011)

In their study, they have also identified that as the age of teacher decrease their attitude towards the use of ICT in education increases. In, they have reported that teachers' ICT experience is significant correlated to with their age and teaching experience. In this context, teachers with more experience are less familiar with the ICT use in education. Somoretrainingsandcatchupsareneededtointegrateallthe seoldbutexperiencedteachers in teaching in a modern teaching world (Fagbemi, P. 2011).

2.6 Effect of training on the use of ICT in teaching and learning process

For effective implementation of any educational program, professional development was found to play a great role. Therefore, in terms of successful implementation of ICT in education, teachers have to be trained on different aspects of using ICT in teaching and learning process for reducing their anxiety hence increasing their confidence and ICT use willingness. These trainings should be tailored in line with the need of teachers for integrating ICT in education. Some of the trainings that should be provided to teachers include: trends of ICT in education, relevant applications and platforms to be used by teachers and students, and how to create engaging and motivating multimedia content (Goharinezhad, Z.2012).

It has been found that only teachers who are engaged in their self-professional development are the ones who are well motivated and successful in using ICT and innovation in teaching and learning process. It has also been identified that teachers who are able to implement changes in their teaching practices are the ones who search for their own professional development. This is the one way of lifelong learning that helps them to overcome fear by developing skills and ability in ICT domain. On the hand, adequate trainings and facilities have been found to increase ownership in teachers for using ICT in teaching and learning process by helping them to overcome some challenges faced while using ICT for educational purpose (Williamson, 2018) .

3. Methodology

3.1 Research Design

A research design refers to the plan of action the researcher intends to use to answer the research questions formulated out of specific objectives of the study. It includes all the steps to be followed by the researcher from the point of coming up with a research project to the final point of analyzing the data in the questionnaires.
This study adopted a descriptive research design Nyaruguru District being used as a case study. According to Odoh and Chinedum (2014), a case study was described for the influence of low use of ICT on teaching biology in Nine Years Basic Education of Rwanda, assuming that the researcher can acquire knowledge regarding the subject under review to

descriptive research design of a single case which involves careful observation of a situation.

3.2 Target Population

The population target under this study were teachers who could witness the influence of ICT on teaching biology in Nine Years Basic Education schools in terms of the preparation of an ICT based lesson. The researcher presumed that those members were placed to provide the required information.

3.3 Sample Design

(Uzezi, 2020) said that a sample design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure the researcher adopted in selecting items from the sample. Sample design may as well lay down the number of items to be included in the sample i.e., the size of the sample.

3.4 Sample Size

Fifty six teachers of Biology from the nine years secondary schools of Nyaruguru district were randomly involved to participate in this study.

3.5 Sampling Techniques

Sample is a small number selected group from the population. In this research, there was no sampled population as we involved all the biology teachers of nine year basic education by considering students results in biology from NESA reports. The researcher used purposive sampling where the selection was done according to the purpose of research which is to determine the influence of ICT on teaching biology in Rwanda nine years basic education.

3.6 Data Collection Procedures

The researcher used primary data from teachers. The researcher used questionnaires during the process of data collection. In this research, the researcher used questionnaires to collect the information related to research topic. The structured questionnaire was used, and was designed in terms of five Likert- scale where 1=Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree. The scale is named after its inventor, psychologist Rensis Likert. Likert distinguished between a scale proper, which emerges from collective responses to a set of items (usually eight or more), and the format in which responses are scored along a range. Technically speaking, a Likert scale refers only to the former. The difference between these two concepts has to do with the distinction Likert made between the underlying phenomenon being investigated and the means of capturing variation those points to the underlying phenomenon. The participants will answer by ticking according their understanding about the statement or a question.

In this research, for data procedure I wrote a letter to Nyaruguru district authorities requesting for permission to administer questionnaires and conduct interviews, and group discussions with the biology teachers, students and head teachers in nine years basic education of Nyaruguru district schools on the influence of ICT on teaching biology.

Before administering questionnaires and conducting interviews, and focus group discussions, the researcher introduced himself and explained the purpose of the research and assured the participants of confidentiality. The data collected was processed and analyzed. The purpose of all these was to make the information clear and understandable for readers.

3.7 Data Analysis

In this research, descriptive statistics was used to analyse the results and draw conclusions. Descriptive statistics rely on the same set of data in order to make generalizations about a larger population. Furthermore, this study used SPSS for data analysis and the results interpretation by Pearson correlation tests.

4. Results and Discussion

The objective of this research was to investigate the influence of the low use of ICT in nine years basic education schools of Nyaruguru district. According to the analysis of variance, the factors associated with the low use of ICT have been identified and their influence on the preparation of ICT based materials, content and lessons in Biology has been proved through Pearson.

Table1: Correlation coefficients between different variables influencing the use of ICT in teaching Biology

Factors of low use of ICT in teaching Biology	Pearson coefficient (r)	P-Value Sig. (2-tailed)
Lack of sufficient computers	0.410	0.002
Presence of projectors and other IT equipment	0.352	0.003
Level of ICT skills	-0.373	0.005
Training in ICT	0.415	0.001
Confidence in ICT	-0.331	0.003

All of the above identified factors have shown a statistically significant level of correlation which is p-value <0.05, which means that they all have an influence on teaching Biology in terms of the teacher's preparation of ICT based content and lesson.

5. Conclusion and recommendations

5.1 Conclusion

This study looked the influence of the low use of ICT on teaching biology in selected Nine Years Basic Education schools of Nyaruguru district in Rwanda and different factors have been identified, with their effect on the preparation of ICT based biology content and lesson

1. Lack of sufficient computers which can help teachers to develop Biology ICT based lesson
2. Lack of projectors and other IT equipment in a number of schools
3. Low level of ICT skills, as a number of teachers claim that they did not get training in ICT and the exposure to ICT is low
4. Lack of training in ICT for many teachers
5. Lack of confidence in ICT for many teachers to the lack of training and exposure

5.2 Recommendations

The following are recommendations which may boost the level of ICT use in teaching Biology in nine years basic education schools of Nyaruguru District.

1. NGOs, Faith organization, private school, and civil society organization should partner with the government in Nyaruguru district and organize training of the teachers in ICT and provide computers and other IT equipment in a possible way.

2. The government should put monitoring and evaluation procedures in place to ensure that application of ICT in teaching and learning sensitize teachers to follow the guidelines of using ICT in their daily teaching activities.

3. The community and students should understand how ICT plays a great role in teaching biology in Nine Years Basic Education schools suggesting that there is need for the community to show support.

In general the following factors should be considered:

1. The provision of sufficient computers which can help teachers in their teaching work
2. The provision of projectors and other IT equipment in the nine years basic education schools of Nyaruguru district
3. The provision of training in ICT for teachers

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