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Teacher Practices that Hamper Effective Integration of Information Communication and Technology in Biology Instruction in Secondary Schools in Migori County, Kenya

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ABSTRACT
The study investigated Information Communication and Technology (ICT) use in teaching and learning of Biology and how it enhances students' achievement in Biology in Migori County**,** Kenya. It employed descriptive survey design which utilized stratified, simple random and purposive sampling techniques. The theoretical underpinning for the study was that learners seek to make sense of their surroundings by integrating new knowledge with that which they have already learned. The study targeted teachers, students, principals, Sub County Education Officers and County Director of Education. A sample size of twenty four (24) secondary schools was used. The objective was to investigate ICT integration in Biology instruction. Research instruments included; questionnaire, interviews, Observation schedules and ICT resource checklists. Data was analyzed through Descriptive and Inferential statistical procedures. The major findings included: teachers and students did not use ICT, teachers ICT illiterate, poor ICT infrastructures, inadequate resources and lack of streamlined guide to ICT use. Major conclusions made included: most teachers are ICT illiterate, teachers were uncomfortable with ICT use, ICT use very demanding on teachers' time, absence of streamlined guide to ICT integration, , lack of digital content, information overload and pace of change, inadequate modeling of pedagogical uses of ICT integration.
Keyword: teacher, practice, hamper, effective, integration, learning

INTRODUCTION

The teaching landscape is rapidly changing, the technological rise of the 21st century and widespread integration of those technologies into our society, combined with access to the internet has integrally changed teaching in just a few years (Umit and Murat, 2012). Our children, and their following generations are already and will continue to grow up in a world that's a stark reminder of how rapidly the human civilization has changed, a society and world where Smartphones and Tablets are widespread, affordable, and replacing most computers and laptops. The rapidly changing landscapes should be a marker to show that teaching methods need to evolve to keep up with the times and incorporate integrated technologies into the learning modal, these technologies aren't going to go away, they'll continue to be integrated into our society and it's time the teachers embrace them for the advantages they bring.

Biology plays a vital role in modernization, social and economic development in the world in general. It is a life science and all the processes in the human body involve Biology. For instance we need Biology in everything we do as animals for we walk, eat, sleep, and talk Biology (Orodho, 1996). Students therefore interact with Biology as a science in everyday life and therefore it is expected that they show better achievement in the subject though this is not the case in Migori County.

Excellence in Biology education calls for the integration of various media, technologies and techniques to the teaching and learning **e**nvironment (Jesse, 2010). Access to a new generation of ICT

has brought new opportunities to teachers and learners in Biology. However the effective integration of such applications depends on teacher's familiarity with and command of the new resources. A study on the integration of ICT in the Biology classroom is therefore a valuable addition to progressive Biology teacher's development.

Computerization has set off new image identities and subjectivities in the learning environment. It is therefore not surprising that modern curriculum, instruction and education thinkers and practitioners all over the world have been swept off-balance by the new technological transformation taking place around the world. According to Rumpagapon (2007) many learners are more informed about the possibilities that a computer can provide more than their instructors. Jesse (2010) says that, since 1980s integration of ICT in education has been compulsory in the developed nations, this is not so in developing world nations like Kenya, where ICT featured in 2005 as one of the priority areas identified by the government.

According to Musyoka in Jesse (2010), it is common knowledge that students' achievement in these subjects is wanting as reflected in the national examinations. The feedback from formal examinations and observations by stakeholders constantly indicate a shortfall in these subjects. This poses a great threat to all the stakeholders in education given that the same subjects are expected to assist Kenya achieve its vision 2030 of becoming an industrialized country of middle level income providing quality life for its citizens.

Table 1.1 shows Migori County students' performance in science subjects as compared to other curriculum subjects for the past four years. The other subjects beside Biology have been included to contextualize the problem in Biology which was the interest of this study.

Table 1.1: Migori County KCSE performances from 2010-2013 (Percentage mean score)

Year	Biology	Chemistry	Physics	Mathematics	English	Geography	C.R.E
2010	23.2	34.0	36.6	24.5	41.3	42.0	46.7
2011	22.3	29.0	39.6	23.1	44.0	44.1	55.1
2012	22.6	30.0	40.3	25.9	37.2	47.0	60.5
2013	21.3	31.1	42.1	28.0	43.4	49.0	62.8

Source: **C.D.E's Office, Migori, May 24TH, 2014.**

On average, sciences were poorly done compared to the other subjects though the interest of this study was in Biology only. Despite the determination shown by many classroom teachers, administrators, curriculum developers, educators, Biologists and policy makers, persistent poor achievement in Biology makes it clear that many students may not be learning the Biology that they are expected or needed to learn. The constant low achievement in Biology is a problem to parents, teachers and the school administration and therefore appropriate intervention strategies need to be devised to enhance students' achievement in the subject in the County.

The performance of students in science subjects in secondary schools in Kenya has continued to be low for many years (Jesse, 2010). Reforming and improving instruction using ICT is one way to enhance quality and relevance of science education (Ajelayami, 1990). The government of Kenya has an important role in shaping national ICT policies and encouraging education institutions to utilize new technologies to transform pedagogy, research and development as far as education development and advancement is concerned. Use of ICT in education at all levels is limited by poor ICT infrastructure, weak policy and regulatory framework, limited number of teachers who are ICT proficient, low telecommunication services penetration and poor quality services. Access to ICT facilities is presently one of the major challenges in Kenya and other African countries.

ICT integration is important because it breaks down the traditional walls of teaching, ones that don't work for all students and now with access to present day technologies and resources we can tailor the learning experience for each students (Moersch, 1995). It also offers flexible time frames that can be personalized to each person, offering them the ability to learn at their own pace. The use of ICT is changing teaching in several ways. With ICT, teachers and students are able to create their own material and thus have more control over the material used in the classroom than they have had in the past.

Rather than deskilling teachers as some scholars claim, it seems that technology is requiring teachers to be more creative in customizing their own material in Biology for instance simulations of the blood circulatory system (Hinostroza et al, 2012). It is evident that involving students in the creation of useful materials as part of a learning exercise is a way to make learning more meaningful for students.
As Biology includes complex relationships of both familiar and abstract concepts, it is quite challenging to learn and teach and therefore require technologies that can help simplify the content. The fact that educational situation and some Biology concepts are abstract and complex causes students to experience difficulty in understanding certain areas and to learn them via memorization without understanding (Aija and Inga, 2012). In order to solve this problem, the use of information and communication technologies (ICT) has become increasingly important. It is especially important in Biology if computers can present the information visually.
Well-prepared pictures, three-dimensional models, animations, interactive environments among others help comprehend the target information more easily. When ICT-aided applications reported in related literature are examined, it is seen that certain conceptual and technology-based factors (motivation, lack of technological sub-structure and others) influence the application process and thus the quality of learning and academic achievement.
Aija and Inga (2012) say that ICT integration has a lot of advantages on the students which include:

- **Motivate students to learn by stimulating interest and curiosity:** when technology is integrated into Biology lessons, learners are more likely to be interested in, focused on, and excited about the subjects they are studying. Including the ones that might be monotonous for some – like mathematics and science in general and Biology in particular and also increasing information retention.
- **Increase students' attention span when learning:** The use of computers to look up information and data is a tremendous lifesaver, combined with access to resources such as the internet to conduct research. This engagement and interaction with the resources keeps students focused for longer periods than they would be with books or paper resources. This engagement also helps develop learning through exploration and research.
- **Makes learning real by empowering students:** The use of E-learning materials increases a student's ability to set appropriate learning goals and take charge of his or her own learning, which develops an ability that will be translatable not only in Biology but across all subjects.
- **Instills a responsibility for ones' own learning:** Students become self-driven and responsible, tracking their individual achievements**,** which helps develop the ability to find the resources or get the help they need, self-advocating so they can reach their goals.
- **Allow instant diagnostic information and student feedback:** The ability to rapidly analyze, review and give feedback to a student's work, gives the teacher the ability to tailor his teaching methods and feedback for each student, while improving time efficiency.
- **Caters for learner's individual differences by enabling students to learn at their own pace:** Due to the flexibility of integrating ICT in learning and the ability to access internet resources allows students to learn at their own pace, meaning a teacher can help speed up the learning process or give more advanced resources if necessary.
- **Encourages student ownership:** ICT integration instills a sense of 'student ownership over learning' which can be a powerful force propelling the learning. It's this feeling of responsibility that helps the feeling of ownership.
- **Prepares students for the future:** ICT integration offers a multitude of real-world skills, that directly translate into life skills, from: research skills, self-learning, self-engagement, helps to develop a 'self-driving force' , better decision making, offers a larger sense of responsibility and computer literacy.

However, technology should be used in the teaching and learning process as a tool not the end in mind. ICT integration should be a planned and purposeful use of information and communication technology tools with the goal of engaging students and helping them develop high levels of thinking skills that yield better achievement results.

Aditi Rao at Teachbytes tried to bring out the differences between merely using technology and technology integration in instructional process and created a handy chart that outlined her thoughts in table 1.2. This table is relevant to those teachers who are concerned about transforming the thinking skills of their learners through ICT integration. The best results would be realized in terms of students' improved academic achievements in Biology in Migori County if the teachers in the county embrace technology integration with their learners.

Table 1.2: Differences between Using and Integrating Technology

Using Technology	Technology Integration
Usage is random, arbitrary and often as an afterthought	Usage planned and purposeful
Technology is rarely used in the classroom	Technology is a routine part of the classroom environment
Technology is used to instruct students on content	Technology is used to engage the learners' with the content
Simply focuses on technology use	Focuses on creation and development of thinking process
Technology is used to deliver information	Technology is used to construct and build knowledge

RESEARCH METHODS

The study was conducted in Migori County which is one out of the forty seven (47) Counties of Kenya. Migori County is on the Western part of Kenya, about 500 kilometers from Nairobi. It borders Homa-bay County and Tanzania as a neighboring country. The choice of this area was purposive due to poor achievement in Biology in particular and science in general at KCSE levels.

It should be clarified that Migori County is not the only county displaying low achievement in Biology but unlike the other poor performing counties such as Wajir, its choice was determined by the fact that Migori County is a cosmopolitan county comprising a number of ethnic communities with different socio-cultural backgrounds that provided the various expected differences in the respondents. It was also convenient to the researcher in terms of financial, time constraints and also the researcher's familiarity with the geography of the area ensured effective collection of data.

The study employed descriptive survey design which utilized stratified, simple random and purposive sampling techniques. The study targeted all secondary schools, teachers, students, principals, Sub County Education Officers and County Director of Education. The study used a sample size of twenty four (24) secondary schools. The main objective was to find out the extent to which ICT is used in Biology instructional processes in Migori County. Pilot study was conducted prior to data collection in three schools inorder to find out the weaknesses in the research instruments.

Research instruments included; questionnaire, structured interviews, Observation schedules and ICT resource checklists. Data was analyzed through Descriptive and Inferential statistical procedures. The findings were presented in tables, frequencies and percentages. Responses from close-ended questions were organized, coded and analyzed quantitatively using Statistical Package for Social Sciences (SPSS). Qualitative Analysis was used in responses from interviews and open ended questions where key statements from interviewees were quoted verbatim. Inferential statistics, specifically test of significance, was used in order to determine whether the respondents' scores regarding their views towards ICT integration in Biology teaching and learning differed depending on their positions and role in schools.

RESULTS AND DISCUSSION

The study found out the following teacher factors that hinder effective Information Communication and Technology integration in Biology in Migori County, Kenya;

ICT literacy among teachers

From the interviews, sixty (60%) of the teachers who were interviewed indicated that they were computer illiterate while forty (40%) indicated they were computer literate. According to Rampagapon (2007) research confirms that many students found learning in a technology-enhanced setting more stimulating and much better than in a traditional classroom environment. Technology improves learning considerably and that is why teachers need to know the mode of operation thereof.

This reality challenges us more, because teachers need modify their instruction in relation to educational technology. We must, as soon as possible, face this reality.

Teacher training

Training needs to continue to support innovative pedagogy among teachers. Teachers have increased their use of ICT in lessons where students look for information on the net and use it afterwards for subject specific areas, but hardly any use of ICT for class presentations. According to Bracey (2005) many teachers use ICT to support traditional learning methods, for example, information retrieval in which students are 'passive learners of knowledge instead of 'active producers able to take part in the learning process.

ICT can change the lessons' pace and learners in modern society need to develop sufficient potentials and skills that enable them to take full advantage from the new opportunities that ICT offer. Hadda and Jurich (2000) claim that there are groundswells of interest of academic researchers in how technological tools can enhance the quality of teaching and learning in schools, and so help learners to achieve better outcomes. The study revealed the following as presented in the table 1.3

Table 1.3: Teachers' training

Item	Frequency	Percentage
Teachers reported to be computer illiterate, had no competencies in computer applications and this reduces most teachers' motivation to fully integrate ICT in instruction.	15	62.5
Teachers who had not participated in any training	1	4.2
Teachers had participated in less than 50 hours of professional development and training which included ICT integration	5	20.8
Teachers reported to have participated in more than 50 hours of professional development including ICT Integration	3	12.5
Total	24	100

From table 1.3, it is clear that slightly more than sixty (60%) of Biology teachers in Migori County are not trained in computer application use, four (4%) had not participated in any training at all, twenty (20%) had participated in less than 50 hours of ICT integration training and a further twelve (12%) had participated in more than 50 hours training on ICT use. This clearly indicates that Biology teachers in Migori County still have a lot to do to be able to use ICT in their instructional processes to enhance students' achievement.

Why teachers shy away from ICT use

Nonetheless, when teachers were asked why they shy away from ICT use, they gave the following reasons as shown in table 1.4.

Table 1.4: Reasons why teachers shy away from ICT use

Reason given	Percentage (%)
Computers available not functional	72
Computer illiteracy	60
Classrooms not ICT friendly	74
Electricity or power problems	69
ICT use requires time, resources and patience	33
Information overload and time wasted browsing	87

Table 1.4 above shows various reasons the teachers gave to justify why they do not use ICT in their instructional process. Seventy two (72%) said computers available not functional, sixty (60%) indicated that they were computer illiterate, seventy four (74%) claimed that the classrooms were not ICT friendly, sixty nine (69%) claimed that they experience constant electricity or power problems and thirty three (33%) said that ICT use requires time, resources and patience which is very demanding on the teachers' side.

Eighty seven (87%) of the teachers felt that they do not always get the right information from the internet due to information overload and therefore considered it wastage of time that can be used effectively in class. With 21 out of 24 teachers agreeing that educational technology allows them to be more effective than ever in the classroom, it's clear that technology will continue to be ingrained in

mainstream teaching methods in the future despite the fact that teachers in Migori County have not yet fully adopted ICT use in instructional process.

Nonetheless, teachers may have difficulty in relation to the integration thereof. Teachers must guide the students so that they do not use technology for purposes other than education and learning. The teacher must have control at all times on the navigation of students during school hours and enhance their understanding that not all websites are reliable or acceptable for effective learning. In short, students need to make better use of ICT that leads to effective learning. As Rampagapon (2007) states, researchers believe that when integrating ICT, learners who have access to information, are more likely to isolate themselves from the rest of the group since they can hardly play when children are team. When writing on the computer, it cannot be two people at once. Therefore, the integration of technology has its limits.

The advantages of ICT integration don't just stop for the students; but also improves various things for a teacher which includes but not limited to: better engaged students, better information and feedback on work, team teaching, extended time with students, more leadership roles, focus on deeper learning, motivate hard to reach kids, new options to teach at home, more earning power and individualized professional development plans (Muyaka, 2012).

ICT integration also leads to improved teaching conditions for it tears down the traditional 'chalk and talk' approach to teaching, which can improve conditions such as: reduced isolation, more opportunities for collaboration, meaningful professional development, better student data, improved time efficiency and role-differentiation.

CONCLUSIONS

The study found out the following as teacher – based factors that hinder effective integration of Information, Communication and Technology in the teaching and learning process of Biology in Migori County;

a) Sixty three (63%) of the teachers felt that there was insufficient comfort with ICT use among teachers in Migori County due to lack of sufficient training.
b) Eighty seven (87%) of the teachers stated that information overload and pace of change was another big hurdle when it comes to ICT integration process. This meant that teachers were incapable of selecting what is relevant from internet sources and availing the same to Biology students.
c) Eighty nine (89%) of teachers reasoned that there was inadequate modeling of pedagogical uses of ICT in training institutions and school, that is they needed to see more of how and when to use technology in their instructional procedures from their mentors and other teachers.
d) Eighty seven (87%) of the teachers neither used any ICT in the instructional process nor did they interact with any ICT resources during actual classroom observation.
e) Thirty three (33%) of the teachers said that ICT use requires time, resources and patience which is very demanding on the teachers' side.
f) Sixty seven (67%) of the teachers responded that they did not test students in ICT use in Biology.

The Biology teachers gave the following recommendations based on the major findings of the study;

a) Seminars and workshops should be organized by the Ministry of Education to ensure Biology teachers have the necessary ICT knowledge and skills.
b) The Kenyan government should provide ICT advisory services to educational institutions to help the management make better decisions on issues to do with ICT and its utilization for improvement of students' academic performance.

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