

CAMPUTER TECHNOLOGY IN BIOLOGY

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Abstract: Over the past decade, the number of students who gained satisfactory passes at the Caribbean Secondary Education Certificate (CSEC) in Biology in Guyana has been few. This poor performance may be attributed to the traditional method of teaching that was used to teach Biology. This study therefore ascertained if the integration of computer technology into the teaching of Biology would enhance students' academic performance. The study was guided by a null research hypothesis. Hence, the related literature reviewed for this study showed that integrating computer technology into the teaching of Biology can enhance students' academic performance in the subject. A quasi-experimental, pre-test, post-test, non-equivalent control group research design was used for the study. The study used two intact grade 10 classes. One class was assigned the experimental group and the other class was assigned the control group through a simple coin toss. The experimental group was taught Biology using computer technology, while the control group was taught the same topic using the traditional method of teaching. A 20-item multiple-choice Biology achievement test was prepared by the researcher and was used for both the pre-test and post-test. Face and content validation of the instrument was achieved through the contributions from two grade 11 Biology teachers and a measurement and evaluation specialist from the University of Guyana. A reliability coefficient of 0.75 was obtained using Pearson product moment coefficient after a pilot test of the instrument. Data collected were analysed using mean, standard deviation, and t-test. The results of the study showed that there was a significant difference between the academic performance of students in Biology who were exposed to computer technology and those exposed to the traditional method of teaching. It was therefore recommended that computer technology be integrated into the teaching of Biology to enhance students' academic performance.

Key words: computer, technology, academic performance Biology is the study of life. It entails what life needs to survive, what makes life possible and how life forms interact with each other.

Ministry of Education's Science and Technology strategic plan for Guyana 2008 to 2012, developed by Goolsaran in 2008, states that the study of Biology allows students to become aware of the presence and effects of the forces of nature in their everyday lives, and see themselves empowered to take responsibility for the care and protection of the environment specifically, and the earth in general. Biology therefore plays an important role in how humans interact with the biotic and abiotic components of their environment. This interaction is vital to the survival and sustenance of all living organisms on the planet. Thus, Biology is an imperative area of study, and as such, it is emphasized in the curricula of the Primary and Secondary schools in Guyana. It is part of the integrated or general science curriculum which is taught at the primary and junior secondary school levels. In the senior secondary schools, it is taught as a single subject and offered to those students who intend to pursue disciplines such as Medicine, Nursing, Dentistry and other areas in the natural sciences. A comprehensive look at students' performance in Biology has revealed that students' performance in the subject area has been quite discouraging. Studies showed that the performance in Biology among students at senior secondary schools in Nigeria were poor (West African Examinations Council (WAEC), 2008, 2009, 2010&2011; Almed, 2008 cited in Yusuf & Afolabi, 2010; Umoke & Nwafor, 2014). Leever (2010) pointed out that students in the United Kingdom were also performing poorly in Biology. In addition, the performance of students in Biology at Bruneian schools was the lowest among the sciences (Yong, 2009). This problem was also evident in the Caribbean Regions. Ogunkola and Fayomba (2009) claimed that the major challenge facing Science Education in the Caribbean was the underachievement in the science subjects among the secondary school students. Sweeny (2003) cited by Ogunkola and Fayomba (2009) noted that of particular concern in the Caribbean was the relatively low extent of Science Education, as suggested by the number of students who successfully pass the secondary level science examination.

As such, they were not able to recognise the importance of the subject to real life situations. Usman (2010) emphasized that the present mode of teaching biology in secondary schools whereby teachers' adopt only the lecture method does not in any way provide for sequence of learning experiences. This may have led to the poor performance in the subject area. Hence, the quality of teaching which students were receiving has contributed to their decline interest and performance in science (Leever, 2010). It must also be noted that student achievement in any course of study

is a function of instructions. Therefore, approaches to instruction must be considered a serious factor in science education (Umoke & Nwafor, 2014).

As a result of the poor performance in Biology, educators are faced with the challenges of improving students' performance in the subject area. In their search for more innovative instructional pedagogy, the use of computer and other forms of technology are being analysed for their impact on students' academic performance. Research showed that Technology can be used to perpetuate old models of teaching and learning (New Horizon for Learning, 2005) and motivate students to achieve. Studies have also shown that technology used interactively with discussions and guidance can become a tool for the development of higher order thinking skills (Walker, 1998). Computer technology therefore, might provide students with the opportunities to actively explore Biology as an experimental subject instead of a descriptive one. This active participation in their learning might improve their performance in the subject area. It was against this background, the researcher sought to ascertain if the integration of computer technology into the teaching of Biology would improve student's academic performance.

Fundamental to the understanding of the theoretical perceptive of the use of educational technology in the classroom, is that students in a Biology classroom who are exposed to computer technology will be active knowledge seekers. They will be given the opportunity to explore and construct their own understanding of biological concepts. Thus, instructions in Biology which integrate computer technology can facilitate extrapolation of content, where students will be able to internalize and make sense of the material presented to them. Computer technology in the classroom encourages students to discover the principles and processes of Biology. The discovery may be guided by the teacher, while sometimes it may be a matter of the individual progress. Piaget (1974) cited in Schunk (1996) postulates that active methodology (computer technology) can foster self-motivation and independent learning, rather than merely transmitting facts and rules. Thus, self-motivation, independent or cooperative discovery can lead to better academic performance in Biology.

Computer technology. The term technology is not a new terminology neither is the use of the computer in the classroom a new idea. But, computer technology is not widely utilized in the classroom. The use of computers in the classroom can help students' complete assigned tasks effectively and efficiently. Hence, Lemon (2005) indicated that computer technology used with the appropriate pedagogical strategies can be used to assist learners in

understanding biological concepts and processes. Honey (2001), as cited by Jonassen, Howland, Moore, and

Rose (2003), claimed that computers can ensure students' mastery of a particular topic. Riel (2000) added that under the right conditions computer technology can advance students' academic achievement. Thus, computer technology has the potential to foster students' abilities, revolutionize the way they work, think and learn (Berson, 2003). The use of computers in teaching also gives students' greater access to information, promotes critical thinking and problem solving and gives meaning to learning. Therefore, integrating computer technology into the teaching of Biology might enhance students' achievement.

Lemon (2005) stated that computers displaying visualization and activities on a projection screen can be used to illustrate and explain concepts in Biology. According to Krulik (2010) it can mean mimicry, making working replicas or representations for demonstration or analysis of problems that clearly illustrates real life or hypothetical situations. Computer simulation therefore permits the learner to manipulate variables or parameters and then to observe the consequences of their choices. Lemon (2005) further added that web-based stimulations can be used to engage learners in exploring complex phenomenon when materials or activities cannot be duplicated. Hence, computer stimulation is a visual tool that provides the concreteness that is needed for students, especially those in special education (Bennett, 2000). Honey (2001) as cited by Jonassen, Howland, Moore, and Rose (2003), stated that with proper software, questions in the subject can be repeated in many ways until students master the content, adjusting the level where necessary. Hence, the use of computer technology in the teaching of Biology is appropriate, since the subject involves many complex phenomena that students with special needs may have problems comprehending. Lemon (2005) further stated that students with mild disabilities may lack specific basic skills necessary to perform laboratory activities. The teacher can engage such learners in pre-labs activities to assist them in understanding biological processes. Therefore, by using computer technology as an instructional tool, he advocates that teachers can model effectively the use of appropriate laboratory tool, and organize data so that students could more easily see patterns in order to analyse them. Hence, computer technology has the potential to be beneficial to students of all abilities. Computer technology can provide a supportive environment that is rich in resources and exploration, creating an atmosphere in which ideas can be expressed freely and provides encouragement when students make an effort to understand

(Ragasa, 2008). Morton (1996) explained that when computers are used the following learning processes are engaged:

1. Greater access to information.
2. The teacher is the facilitator of students learning.
3. Students are involved in experimental learning.
4. Face to face communications happens.
5. Expanded creativity is noticed
6. Testing of new knowledge occurs.

Besides, Murphy (1995) postulated that the use of computers will also have the following benefits:

1. Social growth- computer encourages active interaction among students as they constantly exchange and test ideas and share experiences with each other.

2. Problem solving- computers allow for experimental learning; students can test ideas to find solutions for problems.

3. Peer teaching- students work in small groups. This allows them to share knowledge with each other. Thus, the use of computers in the classroom can lead to cooperative learning.

4. Independent work- students who are high achievers can move ahead with tasks and therefore would not feel frustrated that they need to work at the same pace with slow learners. The use of the computer can address the issue of mix abilities in the classroom.

5. Exploration- computers allow students to explore information given and discover principles for themselves.

These skills highlighted by Morton (1996) and Murphy (1995) can promote active physical and cognitive participation of students in constructing their understanding of Biological concepts. These skills are critical for the adolescents' social and cognitive development. However, Nickerson (1995) as cited by Ragasa (2008) claimed that while technology does not promote understanding in and of itself, it is a tool that can help students view learning as a constructive process and as a stimulant to draw students' attention. Therefore, in order to ascertain the effectiveness of integrating computer technology into the teaching of Biology, it was necessary to compare its effects with that of the traditional method of teaching.

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