



Facilitating Physics Classroom Instruction Through the Use of Modern Electronic Device

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/PSIJ/2020/v24i530189

Editor(s):

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Complete Peer review History: <http://www.sdiarticle4.com/review-history/57012>

Received 10 March 2020
Accepted 16 May 2020
Published 22 June 2020

Opinion Article

ABSTRACT

The use of modern electronic devices (MED) in teaching and learning in classrooms has become imperative especially at this period of Covid-19 pandemic. This necessitated this paper which is to show the uses of Modern Electronic Device (MED) as an educational tool for impacting and prospecting in Physics Education and to highlight a few devices that can be used in the areas of Reading and Writing. Through the use of low-tech and high-tech devices, MED will be able to help students become better readers and writers. In the area of Reading, the use of MED will help students improve upon and build on their spelling abilities, and also better students' decoding, listening, and oral skills. In the area of Writing, the use of MED will enable students to write neatly and legibly, to form letters correctly, and to write sentences that are grammatically correct. Electronic-learning tools such as internet, computers, e-mail facilities, multimedia, scanner, printer, VCD player and digital camera were discussed. The prospects of electronic learning in secondary schools were identified. The paper conclude that if teachers plan carefully and use modern electronic devices to enhance instruction throughout the school curriculum, Basic Science, reading and writing will not be the only subjects that students will benefit. It was suggested among other things that, the government should embark on computer training program for teachers. Teachers should be trained and retrained through in-service training, seminars, workshops and conferences for acquisition of the knowledge and skills needed for e-learning application in secondary schools in Nigeria. It was suggested that teachers need also to explore other avenues in their instructional curriculum where they can enhance learning through the use of MED.

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Keywords: Modern electronic device; physics classroom; reading and writing.

1. INTRODUCTION

Physics classroom learning helps bring an awareness of special unique attributes such as the science process skills and cognitive values to the surface and the classroom is the ideal location where these attributes can be nurtured and developed. In those settings, the teacher is the one who facilitates this process, by giving the students the opportunity to grow academically and socially. In so doing, teachers add a whole new realm of experiences to students' lives which be can accomplished with the aid of modern electronic devices, where students' lives can be enhanced tremendously. Using modern electronic device (MED) is a strategy that is not only geared towards students learning but it can also be used to help all students in all subject areas, and at any age level. Modern Electronic Device (MED) can help students achieve these tasks and also help them perform better academically, socially and even physically [1]. MED can help not only the students but also their teachers, by making adaptations to teaching strategies in each of their respective grades. The purpose of this paper is to show the uses of MED as an educational tool, and to highlight a few devices that can be used in the areas of E-Learning and Physics Education for students. Through the use of low-tech and high-tech devices, MED will be able to help students become better readers, writers and mathematicians.

2. CONCEPT OF MODERN ELECTRONIC DEVICE (MED)

Electronic-Learning generally has been variously defined. It is defined as learning using electronic means. It is also regarded as the acquisition of knowledge and skills using electronic technologies such as computer and internet-based courseware and local and wide area networks, it is a new form of teaching device by which students, most especially the distant learners are provided access to the learning materials. E-learning is usually associated with the use of computer but generally, it is a form of instructional delivery which can be provided through any appropriate electronic media such as the mobile phone, television, radio, etc. E-learning is of two major forms. One is called synchronous and the other is called asynchronous. The synchronous form is so-called because of its comprehensive features

that allow for interactivity between the learning content and the learners. It has in built features like the forum chatting, audio-effect. In distance learning students are separated from the teacher, therefore, synchronous form of e-learning aims at providing multi-outlet opportunities to meaningfully engage the learner and therefore aid comprehension [2].

Asynchronous form of e-learning on the other hand is the direct opposite of synchronous form. Whereas, the latter by design has multifarious features, the former does not. It only present the learning content for the students to read, internalize and download if need be, also. Whereas synchronous e-learning allows for immediate feedback as much as possible, asynchronous may not necessarily allow for immediate feedback. According to [3], modern electronic device (MED) means any item, piece of equipment, or product system, whether acquired commercially, off the shelf, modified or customized that is used to increase, maintain, or improve functional capabilities of individuals. The law goes on to say that, "a modern technology service is any service that directly assists an individual in the selection, acquisition, or use of a modern electronic device. These devices, equipment or systems can be very cost effective to schools and the end result will be very beneficial. They range from "low-tech, low-cost items to high tech, more expensive devices. Low-tech devices require little or no training; high-tech devices may require extensive training" [1]. Assistive technology can be a fundamental tool in special education because many students with disabilities require instruction that can be tailored towards their needs and MED can afford them that type of instruction.

3. USE OF MED AS AN EDUCATIONAL TOOL TO ENHANCE PHYSICS CLASSROOM LEARNING

According to [4], MED can be an educational tool that can be of great importance to students in four ways:

- i. By making it possible for them to correct or build on deficient skills that will make them more self-sufficient;
- ii. To make their learning experiences more effective and enjoyable whereby a greater volume of learning will take place;

- iii. To allow for self-monitoring, and self-evaluation;
- iv. To allow for self-instruction.

With society moving towards the technological age, it is necessary for schools to use documented research that would reflect such a change. Teachers now have to deliver instruction to students with diverse learning needs who bring with them a variety of learning styles, languages, cultures, abilities and disabilities. Teachers have to gear their instruction to suit those learners needs and in so doing implement programmes consistent with the curriculum. According to the Council for Exceptional Children [5], the teacher creates varied and inclusive learning situations that use digital and assistive devices. Numerous studies have shown that assistive device as an educational tool has had a profound impact on the learning of students with learning disabilities [6,7,1]. The manner in which teachers use and make adaptations to the technology is what makes the difference in the students' learning. According to [8], MED is a supportive instructional tool that would enhance the learning of science students in academic, social, functional and community living skills.

4. MODERN ELECTRONIC LEARNING STRATEGY IN PHYSICS CLASSROOM

It is a general observation that the use of e-learning particularly the internet can lead to improve students' performance in thinking logically, formation of concepts, problem solving procedure and understanding relationships [9]. For example, computer programming allows students to improve those skills by participating in classroom exercises. Such instructional stimulations are particularly useful in situations where first hand experiences are not available and are not appropriate.

5. MEANING OF ELECTRONIC-LEARNING

E-learning in education is the wholesome integration of modern telecommunications equipment and information and communication technology (ICT) resources, particularly the internet into the education system. According to [10,11] ICT is defined as all the digital technologies, including: computer, scanner, printer, internet, telephone, digital satellite system (DSS), direct broadcast satellite (DBS), pocket-switching, fiber optic cables, Laser disc, microwaves, and multi-media systems for collection, processing, storage and dissemination

of information all-over the world. E-learning as an aspect of ICT is relatively new in Nigeria's educational system. It is a departure from the conventional approach in curriculum implementation. The main purpose of e-learning is to transform the old methods and approaches to curriculum implementation and not to silence the curriculum or to extinguish or erase the contents curriculum. E-learning is driven by the curriculum. It should follow the curriculum and should not rob the curriculum of its essence.

Electronic learning strategy has become the popular term to describe learning via telecommunications. The term telecommunications is used here to embrace a wide variety of media configurations, including radio, telephone and television [12]. Distance education therefore is used as a general term to describe whatever form of education that is received without the direct presence of the teacher, but usually with the aid of one or a combination of instructional media. Distance education/distance learning refers to the teaching/learning arrangement in which the learner and the teacher are separated by geography and time. According to [13], distance education is a planned teaching /learning experience that uses a wide spectrum of technologies to reach learners interactions and certification of learning. The acceptance of distance education as an effective means through which high quality education can be provided has generated a wide range of some terminologies which you may need to know at least a little about. Such terminologies include: open learning, flexible learning, e-learning among others. According to [14], the primary purpose of curriculum implementation is to achieve the objectives of instruction, and achieve retention and transfer of knowledge. E-learning is an instructional medium that permits alternative approaches to curriculum implementation in an ICT age. The call for application of e-learning in secondary education is to infuse and inject efficiency and effectiveness in curriculum implementation. However, in developing countries like Nigeria, e-learning is challenged with the problem of material devices such as computer, computer laboratories, internet and e-mail facilities, videophone systems and teleconferencing devices, fax and wireless application digital library, digital classroom, multimedia systems and the problem of multimedia courseware development among others. Studies of [15,16], indicated that there is

dearth of trained teacher for e-learning lack of facilities infrastructures and equipment.

6. FACILITATION OF READING AND WRITING SKILLS IN PHYSICS CLASSROOM THROUGH MED

Reading and writing are core areas that need to be addressed when teaching students. These areas are the foundation of these students' academic learning disabilities and, if attended to efficiently, students will be able to achieve some measure of success. MED enables students to compensate in areas where they lack the necessary skills for learning. It can help improve on certain skill deficiencies. Some students may not be able to function academically without the use of MED whereas there are other students who just need MED as a support [5]. MED can be effective for students, it does not remove or eradicate the deficiency, however, it can assist children in reading and help them achieve success. A student who struggles with reading but who has good listening skills might benefit from listening to books on tape [2,17]. There are some common everyday low-tech devices such as color highlighters that are inexpensive that will allow students to identify troublesome words that may look similar like found and fond. When students use such a device it will enable them to differentiate between the words [18]. The following are other ways in which MED can help Science students with reading:

- i. A student who has difficulty reading can look at a series of pictures in sequence from a view finder/computer, and be able to write a story based on what the pictures portray. If the student can not write the story then he/she will be able to produce the story orally.
 - ii. A student can learn to read the sounds of the letters in the alphabet by listening to a listening device. A student with dyslexia with the help of MED can read aloud in the classroom.
 - iii. A student can attempt more challenging reading materials with assistance from an MED that will be able facilitate him/her.
 - iv. A student who may have difficulty reading on a flat surface may use a slant board.
- A student who has difficulty with reading comprehension can get the reading material tape recorded.
 - It can also be presented using graphic organizers/story mapping [2]. There are

various other ways in which teachers can use MED to assist students with reading. Reading using the "talking" computer can help students master decoding skills. The MED device also helped readers with dyslexia read above their reading ability [19]. Electronic book is another device that can improve the reading of students. Through the use of E-books, students are better able to read and interact with their reading text [20]. There are other available tools that can help teachers such as audio books, graphic organizers and outlining, audio cassette players/listening devices, word prediction programs, proofreading programs, portable word processors, and the list is too numerous to mention all [6].

Writing is another area where MED can be very beneficial to Physics students with learning disabilities. According to [3], students with learning disabilities often have difficulties with writing. According to [21], writing is one of the basic skills that create problems for all students irrespective of abilities. It is a demanding task that requires students to make use of their motor skills and cognitive processes. Writing is a communication tool that puts ideas, information, knowledge and feelings into a written format that is readable by others. Each learner brings his or her own experience, and knowledge to the educational learning environment but it is up to the teacher to use the students' skills and abilities to develop good writers. This is extremely difficult for students with learning disabilities because they come to the educational learning environment deficient in skills and abilities that are below those of their peers. As a result, this makes writing more challenging for them and their teachers. This means that teachers have to find innovative ways of getting students to write, and be motivated to write. One fundamental way in which this can be achieved and help students overcome some of these deficiencies is the proper use of MED. As a result, MED should be included as part of the instructional strategies. Studies have shown that the use of MED in writing can be very beneficial to students with learning disabilities [1,4,8]. Just like with reading, there are quite a number of devices that can help students. The word processor is an MED that is very effective in assisting students with writing. Students using such a device can achieve a greater success output than students of the same ability who do not use the device [3]. Not all MED have to be bought commercially. There are quite a few

devices that teachers can produce on their own without spending any finances such as using an empty gallon bleach bottle which can be used as a white board when cut into a rectangular shape. There are other low-tech, inexpensive devices that can be adapted to suit students' needs such as a pencil which can be adapted for proper gripping with the help of a low-tech device. This can be done by "building up the shaft of a pencil to improve a student's control" [6]. This would enable students to feel more comfortable holding the pencil when expressing any kind of thoughts [4]. Literacy (i.e., the ability to read and write) can be promoted through the use of technology [4]. Writing is a powerful tool and once a student has grasp the conventions of it especially when interacting with technology, the reward of expressing oneself in print can be quite motivating. This statement is further illustrated in a report that was concerned with the use of technology for the promotion of literacy. The report found that the writing status of children with mild disabilities rose to the point where they produced more creative and longer pieces of writing after using a Web-based literacy learning environment called TELE-Web [6]. Word processing and other computer software are very good tools that can assist students put their ideas down on paper without having to worry about spelling or grammar.

These software programs come with spelling/grammar checkers that are easy for students to manipulate or they can be assisted by their teacher if the need arises. These software programs also help with the editing process of writing. According to [22], "Researchers have found that students are more willing to edit their work and to make necessary corrections on a word processor than on handwritten drafts" This device is especially helpful to students who have problems with their fine motor skills, and those who are constantly rewriting in an effort to give their readers a clearer perspective [22]. Where typing may be difficult for students, there are devices called voice recognition software or speech synthesizers that can be used to enable students to talk into a computer while their work is being transcribed. It does not only support reading and writing but it can also be used for Basic Science.

7. ASSISTIVE TECHNOLOGY DEVICE AS A SUPPORT FOR PHYSICS EDUCATION

Physics Education is a subject that requires logic and thinking skills, and poses considerable

problems for all students. Most students lack those skills and as a result are unable to make sense of information given to perform proper calculations [7]. With the use of MED, students can be motivated to function as well as their peers in a Physics environment. The demand for technology is increasing rapidly and physics skill is a strong requirement of high tech technology. This demand is not only in the world of work but also in everyday life. Students need to be involved with math in interactive ways, and be able to build positive attitudes toward it which can be done with the use of MED. There are a number of low-tech and high-tech devices that students can use that would make physics interactive and motivating. There are students who have difficulties placing numbers correctly in each column when adding vertically, and they can be assisted with the use of color coded graph paper. This is a low-tech device that allows the students to put the answer in the correct column. Highlight markers are another such device that enables students to write numbers on the line. A hand-held calculator is a device that can also assist students in writing numbers correctly. Many students have reading difficulties and this interfere with their ability to solve word problems. MED enables students to interact with and access the curriculum in settings that would not have been possible or plausible [23]. There are computer-assisted devices that can help students with the identification of mathematical symbols especially if they have difficulties with visual perception. These devices also help students differentiate between symbols that may look similar like addition and multiplication signs [24]. MED can help students in all aspects of the math curriculum; basic computation, fractions, algebra, geometry, calculus and across the spectrum from pre-school to university level, and this can be achieved with the full support of teachers.

8. CONCLUSION

Technology is the vehicle that drives the twenty-first century and teachers need to make use of it in their teaching and instruction in order to meet the diverse needs of all the students that they teach. There are a number of ME devices that are available that can help teachers meet those students needs. Teachers have found that technological innovations can help level the playing field for special needs students and enable these students to succeed in the regular classroom. MED have had a significant impact on science education students' learning in the

areas of reading, writing and mathematics and which should not be restricted to those three areas. E-learning enhances curriculum implementation through the development and use of multimedia courseware relevant to teaching/learning situations. Some multimedia courseware includes learning activity package (LAP), power point slides and diskettes, software may be ready-made or teacher developed instructional software, all these modern electronic devices makes teaching and learning easier.

SUGGESTIONS

The following suggestions were made:

- If teachers plan carefully and use ME devices to enhance instruction throughout the school curriculum, basic science, reading and writing will not be the only subjects that students will benefit.
- Professionals should organize training for teachers on how to utilize ME facilities in solving everyday educational problems.
- Federal, state and local government, corporate bodies and PTA should extend helping hands in the provision of ME facilities to schools within their locality.
- Conferences, workshops and symposium should be organized to train people and enlighten them on the need for MED

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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