Comparative Study of the Impact of Instructional Materials and Technology on Traditional and Distance Education Systems.

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Abstract

Recent changes in information and communication technologies have significantly impacted teaching and learning processes. Methods of doing business have also changed. Many experts now recommend that students' educational experiences be reformed to better prepare students for their future, which entails incorporating technology in the teaching process. The objective of this study is to assess the importance of technology and good instructional materials on two educational systems – distance and traditional systems. We conclude, among others, that good instructional materials should be clear, precise, and must deliver accurate message as were initially designed to do irrespective of traditional or distance educational system. We further conclude that whereas technology may have greater influence on distance education than on the traditional classroom system, however, when applied appropriately, technology will also enhance learning in the traditional classroom system. Students will comprehend faster, and it will make the teaching task less difficult. Education planners and instructors must ensure that application of technology; especially in distance education does not jeopardize the quality of learning.

Keywords: Instructional material, technology, traditional education, distance education.

1. Introduction

The use of appropriate instructional materials is very vital to the learning and/or educational process. The term instructional material is used to describe specific items used in a lesson and delivered through various media formats [1]. Other workers [2] describe instructional materials as "the specific items used within a lesson that influence student learning". This later definition suggests that instructional materials play significant part in the learning process as they help to make learning more meaningful. Smaldino et al. [2] went further to say that the design and use of instructional materials are critical, because it is the interaction of the students with those materials that generates and reinforces actual learning.

Instructional materials are diverse and include both the printed and audio-visual materials. Printed instructional materials include, but not limited to textbooks, journal articles, instructor manuals and guides, student workbooks, assignments, and other reference materials. Audio-visual materials consist of electronic videos, audiotapes, slides, filmstrips, radio and/or television. Advances in computer systems and technology have resulted in the introduction of Internet resources and use of interactive multimedia instructional material [3]. Based on the forgoing, it can be said that appropriate instructional materials must be selected such that they suit the characteristics of the learners and the teaching methods. For example, instructional materials designed for middle school students in a traditional classroom may be different from those used for 12th grade students, and from those used in the distance educational system. Similarly, the methods used in presenting those materials to learners in both the traditional classroom and distance educational systems may be different. If the presentation methods are appropriate for the desired system, then learning or knowledge outcomes would be enhanced. Therefore, instructional material should be considered as part of communication, and should be used in a manner that is truly effective. The question that needs to be addressed is "do instructional materials influence learners in a traditional classroom and the distance educational systems equally or differently?" Before discussing this issue, it would be proper to look at the other major theme of this study, that is, impact of technology.

Technology in itself is a broad concept. It deals with the usage and knowledge of tools and crafts, and how it affects our ability to control and adapt to its environment [4]. Some earlier researchers [2] distinguished between *Technology* and *Instructional Technology*. While they refer to technology as having different interpretations, ranging from hardware to a systematic way of solving problems, instructional technology is taken to be the specific use and knowledge of tools and crafts in education. These tools include computers, electronic learning devices, Internet, and online learning equipment/hardware.

Proliferations in information and other communication technologies, including desktop and laptop computers, handheld devices, cell phones, portable video players, and the Internet have transformed the world in which we live. The processes of doing business have significantly changed. Consequently, many experts now insist that students' educational experiences be reformed to better prepare students for their future. Whereas information and communication technologies place increased demands on numerous business sectors, they also have the power to enhance and extend formal and informal educational opportunities. When educational technologies are used properly and in coordination with good school reforms they enrich the learning environments and enhance students' abilities in understanding the subject matter.

Technology in the classroom is changing the ways lessons are prepared and delivered. No doubt, technology will continue to be increasingly relevant in schools and classrooms. Hence, today's learners (often referred to as "millennials") can be described as belonging to digital communities with easy access to computers for research, learning, Internet browsing, video game playing, and instant messaging. They are connected or networked through hand held cellular devices and are accustomed to fast-paced information presented in a manner that requires multitasked responses. Stressing the importance of technology, Jonassen et al. [5] emphasized the importance of learning with technology instead of learning from technology. In a study on the effect of technology on learning, it was concluded that technology is essential in teaching and learning (mathematics) and that it influences the mathematics that is taught and enhances students' learning [6]. It was further remarked that schools are increasingly investing in technology, and that researchers, educators, policy-makers, and parents are exploring the best ways to integrate technology in classrooms to enhance teaching and learning [7]. In a survey to determine the status of technology education in the United States, researchers concluded that technology literate populace and continuous dissemination and implementation of standards in technology and advancing excellence in technological literacy are imperative [8]. While some stakeholders are apprehensive of the impact of technology integration in classrooms [9], many educators insist on enhancing learning with technology [10]. However, to what extent has technology influenced the traditional classroom and distance educational systems? Let us firstly distinguish between the two systems.

2. Traditional Classroom Education System

In discussing the traditional classroom system, we emphasize a classroom situation where the teacher is always physically present to deliver lessons to students. It is not the intention of this study to discuss the teaching method(s) used by the teacher. Whether he/she employs the teacher centered, student centered, didactic questioning, demonstration, cooperative models, *etc*, are outside the scope of this study.

Duffin [11] gave a useful description of the traditional classroom educational system. Here are his descriptions of the traditional system, "….*a system that boasts of the chalkboard lectures taken straight from the text. Teachers utilizing traditional techniques may sometimes incorporate stimuli such as pictures, maps, diagrams and videos into their lectures, but they are not crucial to the teacher's goals for the course. Thus a traditional classroom structure incorporates readings, lectures and tests. The teacher embodies the entire classroom's authority. This responsibility occurs through the practices of giving tests, maintaining classroom order, and looking out for the well being of well-behaved students and to the detriment of the "bad guys". Instructional materials such as textbooks, instructor guides, student workbooks, reference materials, assignments, and directed reading are very necessary in the traditional classroom. Technology in the classroom would be a useful tool to the teacher in a traditional classroom to make teaching and learning very effective*". In his contribution to the debate, Mashhour [12] described the traditional classroom educational system as on-campus educational method where students have to attend classes at specific places and times. The class durations have to be specified and exams must be taken at specific times. Although the views of Duffin [11] and Mashhour [12] are

similar, however, Mashhour has no views about the use or impact of technology in the traditional classroom system. Nevertheless, one can decipher that teaching and learning rooted in the traditional classroom model can still proceed unhindered in the absence of technology. The teaching methods most likely to be used include cooperative method, demonstration, drill and practice, discussion, games, and question and answer. The traditional classroom setting is used for instruction from the kindergarten level to the university. However, the intensity of the system is very relaxed at the university level where students can accomplish some aspects of learning on their own.

2.2. Distance Education System

To many people, the term distance education is synonymous to the use of technology in the learning process. While this thinking is not unfounded, at least at the present time, however, it is important to note that distance education predates the advent of computer and information technology. During the early period, distance education was conducted mainly by use of the surface postal system, and it was described as "correspondence school or college". Students receive lessons sent to them through the post office in printed form. They complete the assignments and mail them back to the instructor through the same system. The advent of technology has tremendously changed the system of doing things, and the *modus operandi* in distance education is not an exception.

Smaldino et al. [2] described distance education as instruction without the teacher's direct presence. They went further to explain that the instruction can time-shift, that is, experience it at some time after the live lesson, or place-shift, that is, experience it at some place away from the live teacher. Some elements have been introduced for a more meaningful definition of distance education [13]. They include, physical separation of learners from the teacher, organized instructional program, telecommunications technology, and two-way communication. In a similar contribution, Mashhour [12] described distance education in two formats. "The first and historically older kind is the synchronous, "Open University" style of education. In this form of education, students get the bulk of their education through media other than physical attendance. They start their studies at a specific time and have their exams at a specific time as well. The time and pace are pre-determined. The students get their tuition through printed materials, audio, video, radio and television. They have to attend on-campus activities a few times every year. The second recent kind, named asynchronous (or Internet) distance education benefits from the recent advances in computer and communication technologies [12]. It provides the student with the benefits of learning at his/her own time and pace. The course materials are provided via electronic media that can be accessed by the student when and where it suits him/her. He concluded that this form of education does not impose any restrictions on the time of enrollment, duration of study, or the dates of exams. Normally, the student does not have to attend any on-campus activities. This form of education utilizes the Internet technology".

Distance education uses several avenues in the delivery of knowledge. It may be in form of audio teleconference, audio recordings (tapes or digital), television, online video, video-tape or DVD, multimedia, bulletin board posting, e-mail, text messaging, online learning with the appropriate software, etc. A typical example of a common method of learning in distance education is the interactive classroom television based system. In the interactive classroom, the instructor may be at one location and the student groups may be in two or three different classrooms in different locations. The students and the instructor are able to see, hear and respond to one another in the same manner as in a traditional classroom. The interactive classroom offers traditional classroom courses to be taught at the satellite campuses, eliminating the need for the student to come to the main campus to attend a class [12].

We have seen from the above discussion that distance education has gradually moved from the old system of correspondence courses facilitated by the post office service to computer based, and multi-media application systems. This suggests that the future of distance education hinges on technology applications. In the present discussion, Mashhour's [12] views are in agreement with those of Smaldino et al. [2] and suggest that technology is absolutely necessary in the present day distance educational process. In contrast to students who patronize the traditional classroom system, those who use the distance education system are mostly adults. Some

are mature adults who are seeking enhanced job opportunities or who want a change in their careers. These students need flexibilities in their time and place of instruction.

3. Impact of Instructional Materials

Instructional materials, whether in the traditional classroom situation or in the distance educational system are very vital to the success of the learning process. Let us now discuss how the instructional materials have impacted learning in both educational systems. While expatiating on the usefulness of instructional materials in the learning process, Smaldino et al. [2] maintained that limited knowledge will occur if the materials are weak, improperly structured, or sequenced in a poor manner. On the other hand, good materials can be experienced in such a way that they are easily encoded, retained, recalled, and used in a variety of ways. They concluded that instructional materials will be what the learners will remember and they must be created, integrated, and presented in a manner that allows them to have the needed impact. However, in a study on multimedia visual illustrations, researchers concluded that "the types of visual illustration did not have an effect on learners' information recall or on comprehension" [14]. Nevertheless, others [15] are of the opinion that learning is improved by using a dual mode presentation involving visual diagrams and auditory, rather than written text.

The above discussions are very consistent with the situation in a traditional classroom or in a distance educational system where learners can see the teacher as in the interactive classroom and television broadcast. It is clear that textbooks, pictures, workbook, and chalkboard are absolutely necessary and influence learning and recall when used appropriately in a traditional classroom. There is no doubting the fact that some instructional materials such as the chalkboard may have limited or no influence on the outcome of learning in a distance education system. This suggests that instructional materials can only be effective if it is designed to suit and address the needs of users. Therefore, instructional materials that serve the needs of traditional classroom learners may not be useful to learners in the distance education system. The two questions that need to be address are: i) which instructional materials are absolutely essential for the learners in the distance education system, and ii) what impact do they have on learners? Materials or resources such as the computer and Internet are absolutely necessary in the present day distance education. These will be discussed under the "impact of technology". Apart from the Internet and computer, instructional materials such as the audio, CD-ROM, and video (including DVD) materials are essential to distance education learners. The video and/or DVD could be played as many times as may be necessary to enable the learner fully understand the knowledge that is being conveyed. This has obvious advantages in the learning process since the learner can refer to the materials at will. Therefore, it can be construed that the teacher and the student in the distance education system have equal access to the instructional materials. Since most instructional models in the traditional classroom system are teacher-centered, the learners often depend on the teacher to provide appropriate instructional materials. These materials such as pictures are displayed during the lesson and removed at the end of the lesson. Hence, student's access to the particular material is momentary since he/she may not refer to the material at will. Instructional materials would have the greatest impact if they can be accessed or used by the learner when he/she desires.

Comparing the influence of instructional materials on the two educational systems, it can be seen that both systems need appropriate instructional materials. However, at least in our view, the traditional educational classroom learners may be mostly influenced by type of instructional materials the teacher uses. There must be the chalkboard or whiteboard, chalk or erasable pen with which the teacher can write. The distance education students do not need these materials and can still function without them. Although it is not mandatory for the teacher in the traditional classroom to write on the board, however, such a teaching method makes traditional classroom education very incomplete and unappreciated. Almost all the materials needed by the distance education student can be used by the traditional classroom student, and if properly utilized they would facilitate learning and make the teaching task easier for the teacher.

In summary, it has been established that learning can be very effective, and recall can be enhanced if teachers present learners with appropriate instructional materials. Also, instructional materials must be designed to suit the purpose and characteristics of the users. Again, the instructional material should not be ambiguous and must deliver precisely the message it is expected to deliver. Another point is that instructional materials will

make greatest impact on learners if they can access and use the materials at will. Finally, the use of instructional materials has greater influence on the traditional classroom system than on the distance educational system.

3.2 Impact of Technology

The impact of technology on learning cannot be overemphasized. Whereas some workers [2, 12] believe that the traditional classroom can function with minimal or no application of technology, however, when applied correctly, technology can significantly enhance learning in the traditional classroom system. Technology has had great impact on learning of the physically able students and physically challenged students. In a study on the digital access to learning materials for people with perceptual disabilities, it was concluded that Digital Accessible Information System (DAISY) talking books represent an advancement in learning technology for those who are blind, visually impaired, or print-disabled [16]. Digital talking books created with the DAISY standard have the capacity to combine human or synthetic voice narration with digitalized text, offering the advantages of electronic publishing and improved navigation capabilities.

Advances in technology have greatly impacted the methods of delivering lessons in traditional classroom system, and also technology has enhanced learning in areas such as medicine, agriculture, education, and engineering. For example, engineering designs were conducted by hand drawings using pencil and paper. In the present day engineering studies, students use computers and learn how to apply them in different designs and simulations. This approach is very motivational as it makes learning to be fun and also makes the teaching task less difficult. In a study of the impact of technology in the classroom, Li [14] reported that over 73% of the students agree that they find technology to be very useful because it allows easy access to information and cutting-edge research and also it makes learning easier. The study also showed that technology has tremendous effect on pedagogy. I here present the students' opinion on technology versus pedagogy. "The use technology enabled diverse approaches to teaching and learning, sometimes in ways that could not be achieved by traditional textbook-based methods. Using technology to provide concrete examples or visual materials such as animated models and simulations for abstract concepts proved to be effective for students learning. For example, sometimes in the Physics class, reading about fields and forces are hard to visualize. Seeing these things demonstrated on websites is very helpful and effective. It can help you learn in ways you can't with books. Technology helped bring the real world into learning and gave a more hands-on approach to learning". The students concluded by saying that "technology is effective in my learning because it teaches me to expand my thinking, and helps me to understand the mathematical relationships I have programmed visually". In a different study involving the use and impact of the Internet in the classroom, it was suggested that Internet use by the teacher and students should be divided into five levels [17]. The researchers contended that Level 1 can be reached when the teacher obtains content information; Level 2 is reached when the teacher shares this information with the students; Level 3 is reached if the teacher infuses the Internet information into a lesson. The class reaches Level 4 if the teacher facilitates a student directed project; and if the teacher plans and implements students' use of the Internet, then Level 5 is reached. They are of the opinion that involving students in Internet based projects support the constructivist learning environment in the classroom. Also, the use of computers and Internet is related to teachers' use of constructivist teaching practices and may change their pedagogical beliefs underlying such practices [18]. However, it has been found that the teachers' use of the Internet in teaching is very limited due to many factors, including limited access to the Internet in the classroom, low level of expertise, lack of equipment or connectivity, and lack of time [19]. In a related study on what makes teachers use technology in the classroom [20], it was concluded that the following six factors are responsible: adapting to external requests and others' expectations, deriving attention, using the basic functions of technology, relieving physical fatigue, classroom preparation and management, and using the enhanced functions of technology. These factors suggest that technology is already in the traditional classroom and its presence will ever continue to increase.

Technology has also impacted learning in the traditional classroom of the at-risk students. In a study on how technology can help at-risk adults in a classroom of mathematics, researchers [6] concluded that computer assisted instruction (CAI) can be an effective method for at-risk learners. The study showed some positive gains in various achievement tests as well as increased student confidence and satisfaction with mathematical learning. In addition, CAI provides alternative learning resources that can better address diversity in language

abilities, disabilities, skill levels, and learning styles among the at-risk population. Taking this discussion further, let us look at how technology has impacted learners in the distance education system.

Mashhour [12] maintains that distance education is offering a viable alternative for those seeking university education and are unable to obtain it at traditional institutions either because of shortage of spaces, or because traditional residential education does not suit their special circumstances. Distance education is expanding worldwide. The numbers of students enrolling in distance education are increasing. One may then ask, "what makes distance education attractive, possible, and successful?" As said earlier, the present day distance education may not be possible without the use of technology. Take for instance, technology makes it possible for adults who had left school for some time to return and complete schooling or to pursue higher education or degrees. Online degree programs and interactive classroom systems are becoming very popular due to the advances in technology. It has been shown that the advent of information and communication technology (ICT) is part of the key factors that influence the spread of distance education in Asia [21]. However, Loh-Ludher [21] cautions that the ICT-based methods can only become a viable supplier of distance education and training to women learners in Malaysia when the social and gender-related challenges faced by this vulnerable sector of the society have been overcome. On the impact of ICTs on the Open and Distance Learning (ODL) in the Philippines, researchers observed that the evolution or development of ODL in the Philippines has clearly been shaped by the use of ICT [22]. They further observed that each successive distance education generation has been shaped by the dominant technology in use at that particular point in time. As such, adoption and integration of ICT into distance education has resulted in new models of learning like _m_-learning, _e_-learning, and _u_-learning. Education in general has been transformed by the use of ICT. Experts are now talking about the 'School of the Future' [23], which must grapple with the ever changing characteristics of distance learners. Pena-Bandalaria [22] is of the view that the technology used to deliver instructional content has influenced instructional design methods used. For example, while the pedagogy has always been the central consideration, the delivery characteristics of the technology used is also on the minds of instructional designers charged with designing pedagogically sound distance education learning materials.

From the foregoing, it can be seen that technology has tremendous impact on knowledge delivery and success of the traditional classroom and distance education systems. Distance education, particularly the online learning has come to stay, thanks to the advent of the computer and Internet technologies. As learners discover and embrace distance learning, so also will technology meant for the delivery of lessons continue to expand and improve. Nevertheless, education planners should take a critical look at some technologies used in some teaching methods, especially in online classes. Whereas it is outside the scope of this study to critique learning techniques, but we would want to mention that even though many college (university) students embrace online classes, several reject them and say, "we don't learn much". Whether this apparent negative response is as a result of applicable technology or teaching method or individual perception or a combination of factors needs to be fully investigated.

4. Comparative Analysis

We have established from the above discussions that instructional materials and technology are very important in education and learning. They positively impact both the traditional classroom and distance education systems. However, if we define traditional classroom education from the standpoint of its original meaning (as in above), we then find that instructional materials have greater impact on the original traditional classroom system than on the distance education system. Also, while technology may not be greatly appreciated in the traditional classroom system, it has far greater impact on the distance education system. Indeed, the practicability of present day distance education is dependent on technology. Nevertheless, the present day face-to-face classroom instruction is moving away from the "traditional" system. Technology is now in the "traditional" classroom. Technologies such as the PowerPoint and Audio Response (Clicker) systems help teachers in the traditional classroom to be more efficient in knowledge delivery and testing techniques respectively. They also enhance students' learning and comprehension. In closing this comparison, we present the findings of earlier workers [24] in a study of the effectiveness of computer-based instruction (CBI) in the traditional classroom: i) when CBI and traditional instructions are compared, students receiving CBI demonstrate equal or better achievement and in less time; ii) the use of CBI improves student attitudes towards the use of computers in learning situations;

iii) the positive effect on learning achievement occurs regardless of the type of CBI used, the type of computer system, or the age of the students; iv) teacher interaction proves to be effective in CBI situations; v) there is little evidence to support the claim that learning to program will result in higher level cognitive skills and capabilities to learn; vi) tutorial and drill modes seem to be more effective for low-ability students than for more- or high-ability students; vii) the effect on learning achievement seems to be greatest for pre-college (pre-university) age learners [24].

There is strong evidence to believe that technology has come, and is taking over from the old technique we are used to in delivering instructions. "Traditional" teachers would also attest to the fact that they use technology, no matter how little in their present day traditional classrooms. Technology has also impacted on instructional materials. It may be possible that future instructional materials would be digitalized to reflect the level of technology in the classroom. Technology has "revolutionalized" distance education and has helped many individuals who hitherto may not have had the opportunity to enter the university/college to now acquire higher education.

5. Conclusions

From the above research, we conclude as follows:
1. Instructional materials are very vital to the success of both the teaching and learning processes in the two educational systems under consideration.
2. Instructional materials seem to have greater impact on the traditional classroom system than on the distance education system.
3. Instructional materials should be tailored to fit the characteristics of the learners.
4. Good instructional materials should be clear and precise, and must accurately deliver the message it was designed to deliver irrespective of the education system.
5. Technology has greater influence on distance education than on the traditional classroom system.
6. Technology would positively impact the design of "future" instructional materials.
7. Although the traditional classroom may still function without technology; however, when applied appropriately, technology will enhance learning in the traditional classroom system. Students will comprehend faster, and it will make the teaching task less difficult.
8. Education planners and instructors must ensure that application of technology in distance education does not jeopardize the quality of learning.

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