

LEVERAGING INSTRUCTIONAL TECHNOLOGY FOR TRADITIONAL AND NON-TRADITIONAL STUDENTS: QUEST FOR QUALITY EDUCATION

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Area of Specialization: Technology in education

DOI: <http://dx.doi.org/10.37500/IJESSR.2021.4401>

ABSTRACT

There has been a steady growth in the provision of technology tools and related infrastructure in schools in recent times. This growth has been necessitated by the increasing acceptance that technology helps enhance both teaching and learning to improve the performances of students who are taught with this technology. To be able to bring advanced technologies to teaching and learning, most educational institutions, especially in Africa have failed to tackle one problem that is perhaps the most important. The issue is “what is the impact that technology is having on the learning styles and capabilities of the students exposed to it?” This study investigated if there were any differences in the way traditional (conventional) and non-traditional (nonconventional) students perceive the impact of the use of instructional technology on their understanding and retention of content material taught using technology. A non-experimental descriptive design was adopted where a stratified random sampling technique was used to select two colleges of education and three senior high schools for the study. A sample size of 146 students was drawn using a simple random sampling technique for which subjects responded to a carefully designed semi-structured instrument. It was found out that there was no statistically significant difference between traditional and non-traditional students in making better grades. However, there was a significant difference between traditional and non-traditional student populations in terms of remembering information, clarity of content and testable material signaling a difference in the way traditional and non-traditional students perceive the use of instructional technology on their understanding and retention of information.

KEYWORDS: Instructional technology, information, retention, traditional students, non-traditional students.

INTRODUCTION

Institutions of learning are increasing their investment in technology and its related infrastructure to meet the ever-growing demands of instructional and educational technology. This high-tech approach is being pursued because of the advantages computing brings to communication and the learning experience. It appears that limited research has been conducted to aim at the specific effects instructional technology has on the learning styles of students. The use of instructional technology has become a necessity in today’s world and for that matter, the impact of those technologies must be

researched and studied. Too often in the past, educators have employed “new and improved” methods for teaching at the blind side of instructional technology.

There has been a recent abundance of research involving the problems associated with teachers attempting to apply technology. Much is also being studied about how to teach the teacher how to become accustomed technology in the classroom. The student, however, has been left out of the chain in most cases (Almekhlafi & Almeqdadi, 2010). To be able to do this, there is every need to know the learner or student’s subjective idea about the use of instructional technology. Research is the key to survival and fast changing technologies demonstrate this. It was against this backdrop that the researcher wanted to undertake this study to ascertain the impact of instructional technology on the comprehension and retention levels of students who benefit from its use and those who do not.

Several studies indicate statistical data that instructional technology can improve achievement in courses/subjects. The United Kingdom’s (UK) largest impact study spectacles a growth in subject accomplishment through the use of instructional technology in English, science and design, and technology (Willey & Gardner, 2010). Equally, specific ICT uses, such as interactive whiteboards in the UK, had an encouraging effect on pupils’ performance in literacy, mathematics and science tests compared to students in other schools where ICT use was not prominent. ICT use especially improved the performance of low achieving pupils in English and impact was greatest on writing.

Another large impact study in the UK employed to look at ICT effects from an economic direction validates ICT investment influences constructively on educational performance in basic schools, especially in English but its impact on science and mathematics was stumpy. On an international level, the analysis of the Programme for International Student Assessment (PISA) results indicates that longer use of computers by students is related to better results in mathematics in PISA results (Organisation for Economic Co-operation and Development, 2010). As regards better results in national test, two other UK studies show that ICT can make a difference (Organisation for Economic Co-operation and Development, 2010).

Internet access in classrooms is one essential condition to gain from new technologies for learning. It gives access to volumes of information and interactivity from which learners and teachers benefit. Overall, proof from the UK studies earlier reviewed shows that achievement improves as a result of incorporating ICT into teaching and learning (Clark & Wenig, 1999). Schools with higher levels of “electronic maturity” exhibit a speedy increase in performance scores than those with lower levels. Most opinion-based studies investigating ICT impact on students’ performance, such as the e-learning Nordic study gave a positive picture with teachers being convinced that pupils’ subject related performance and basic skills (calculation, reading and writing) as well as educational achievements improved (Gikas & Grant, 2013).

An overwhelming majority of studies confirmed wider positive benefits of ICT on learning and learners, such as motivation and skills, concentration, cognitive processing, independent learning, critical thinking and teamwork. Increased motivation goes together with a positive learning attitude and leads for example, to more attention during lessons with students being more involved in the learning activities (Chen & Peng, 2008). The fact is that ICT enhances a more student-centred learning approach which is frequently allude to as among its most key benefits. ICT can also benefit academically strong and weak students as well as students with special needs. Studies also reveal that the benefits cannot only remain technology driven but should be more intentionally exploited following a pedagogical approach. Case studies show, for example, that teamwork does not automatically means increased collaboration (Davidson, 2003).

ICTs by their very nature are tools that encourage and support independent learning. The use of ICT in educational settings, by itself acts as a catalyst for change in this domain. Students using ICTs for learning purposes become immersed in the process of learning and as more and more students use computers as information sources and cognitive tools (Margaryan, Littlejohn & Vojt, 2011), the influence of the technology on supporting how students learn will continue to increase. If this is true, then there was the need for this study to ascertain the veracity of this assertion.

Education in Ghana is approaching the point at which Information and Communication Technology (ICT) plays a part in nearly all phases of the educational process, from basic to tertiary. They are commonly used in school settings, in the home, and in social settings. Children are using computers (laptops, tablets, smartphones, etc) both at home and in school for educational and recreational purposes (Kim & Sin, 2016). Many resources that were once distributed to individuals in hard copy are now available on the internet, including newspapers, magazines, and scholarly journals. In this age and time, computer knowledge is a must.

The computer networks these days have a powerful impact on the ways which individuals, private organisations can communicate with each other. It propels all sorts of communications including social media. ICT currently provides a growing range of tools to manipulate digital data, as well as access to the vast range and variety of content. This perception underpins the introduction of computers and the internet in all educational institutions in Ghana. The application of Information and Communication Technology (ICT) in schools is perceived as a means for transforming the teaching and learning processes, and has thus been met with significant interest and keenness. Ghana recognises ICT as a tool that will promote socioeconomic, political and sustainable development to meet the short term and long-term goals of the country.

Education policymakers in Ghana have hailed the introduction of Information and Communication Technology (ICT) in Ghanaian schools as a remarkable step that will contribute to knowledge production, communication and information sharing among students and teachers in the school system. This perception stems from assertions in the literature about the benefits that come with ICT literacy

in schools (Mucherah, 2003; Thinyane, 2010). Thinyane (2010) points out that ICT is a transformative tool and its full integration into the school systems is necessary to prepare students for the information society they will inherit (Dankwa, 1997; Parthemore, 2003). Parthemore (2003) points out that many secondary schools in Ghana can now boast of computer labs through which students are gaining basic computer literacy. A number of these schools have internet capabilities which enable students to deepen their connection to the outside world. Although this is encouraging information, extensive review of documents of Non-Governmental Organisations (NGOs) that are spearheading ICT implementation in Ghanaian schools reveals that most secondary schools now benefiting from ICT are either located in urban areas or are classified as premier secondary schools (Dankwa, 1997; Hawkins, 2002; Parthemore, 2003). According to Parthemore (2003), computer literacy education in Ghana has been concentrated in major urban areas. A few better schools in outlying areas have attempted to "catch up" with their urban counterparts by contracting private companies to provide computer education. The costs for private computer training are prohibitive and it is rarely the case to see that all students have access. Other schools have taken part in the Ghana Education Service sponsored scheme where for every hundred textbooks they purchase from a private firm, they receive one computer system.

A review of the available literature reveals significant inequity in the implementation of ICT in Ghanaian schools. The literature (Dankwa, 1997; Parthemore, 2003) reveals that ICT provision in schools is skewed in favour of schools categorized as elite schools and schools in urban areas. Unfortunately, this is not a new trend. Since the introduction of formal schooling in Ghana, educational resources have been unequally distributed in the school system (Folson, 1995; McWilliam & Kwamena-Poh, 1975). It is critical that policy makers ensure that ICT does not become another tool for perpetuating educational inequalities in Ghana's school system. Educational policy makers, non-governmental organizations (NGOs), bilateral and multilateral donor organizations, and school administrators are making the collective efforts to promote ICT in Ghanaian schools. Recently, the government reiterated its commitment to extend computers to all schools in the country in the news media. The government also emphasized its commitment to promote impartial distribution of ICT in the school system so that all students will equally benefit from ICT regardless of their geographical location. The successful implementation of such a policy would be a great achievement in the educational system of Ghana. However, existing inequality, poor infrastructure and the nation's present economic situation is likely to pose a big challenge to implementing equitable ICT in the school system especially where the government of Ghana just introduced its free senior high school education for the citizenry.

Accessibility of ICT in schools also interconnects with other development issues, such as accessibility and connectivity to electricity and telephone networks. The ideas that emerged from the policy areas challenges to ICT in rural schools are lack of telecommunication and resources (finance, infrastructure, personnel and their training, software, and textbooks). Since 1998, the government of Ghana has extended electricity to many rural communities in the country even to the most remote and inaccessible areas. However, a lot more of the rural community are yet to be connected to the electricity grid. Most

rural communities that have secondary schools now currently have access to electricity but not telephone services. In such localities, the idea of promoting the use of computers connected to the internet in classrooms will require more financial backing, and a considerable amount of time, considering the pace of development in Ghana. In a Ghanaian case study (Amankwah-Amoah, 2016), it became evident that the absence of electricity and telephone services are major setbacks to providing ICT in rural areas in Ghana. Students enrolled in premier schools like the Wesley Girls School, Achimota School, and Prempeh College and those in urban areas who have easy access to computers and Internet services have already made a considerable increase in the use of computers and the Internet do not face such challenges. Conversely, most students enrolled in rural secondary schools have never set eyes on a computer as is the case in most deprived areas of the northern parts of the country. While students in urban areas can now boast of their proficiency in the use Internet and basic computing, the silent majority of their colleagues in the rural secondary schools do not have a clue as to how to click a mouse. Availability of an appropriate environment for ICT facilities is another issue that will determine accessibility of ICT for rural schools. Some schools have successfully implemented ICT projects because they have the infrastructure to accommodate ICT equipment donated by benevolent organizations. Insufficient infrastructure is a challenge many rural secondary schools face. The infrastructure of most rural schools lacks the appropriate environment and the needed security for storing ICT equipment, even if they are supplied. Such concerns are also impediments to ICT provision in rural schools.

There are many possible uses of computers in the learning process. In some situations, changes in relevant industries make computer use in schools essential. For example, to provide courses in music, technical drawing, statistics, and business which do not incorporate computer use reduces the relevancy of the courses to the real world. Here the rationale cries out from the work place but needs to be responded to with carefully constructed learning experiences. How much of our curriculum is made up of historical solutions to past problems? The curriculum needs to be updated continually to take account of the technology prevalent in society. Any rationale for the use of computers in the large proportion of schooling devoted to 'general' education, such as: mathematics, social science, science, communication and language, requires much more critical examination. Consider the teaching area of mathematics and the problems associated with student learning. Mathematics has tended to be very abstract while most students tend to operate on a concrete level. The use of concrete materials in some lessons is useful but often not convenient. Applications such as Matlab, Geogebra, Stepping Stones 2.0, Geometry Pad, FluidMath, etc can make students feel connected and develop the urge to learn mathematics.

The computer can provide experiences with virtual concrete materials. In approaching problems associated with remedial and extension, students' computer use can provide appropriate material and overcome classroom management problems. However, a computer solution is not necessarily the best solution. The problems associated with student learning are most often discipline and even teacher

specific. Therefore, each teacher needs to consider the problems associated with student learning in his/her subject area and be aware of computer solutions.

While it would be convenient to be able to make a direct connection between the use of ICT and learning outcomes, most reputable educational researchers today would agree that there will never be a direct link because learning is mediated through the learning environment and ICT is only one element of that environment. Studies that have tried to identify this mediated impact of ICT on learning have found it impossible to entirely remove the effects of other elements of the learning environment. It was for this reason that this study sought to ascertain if there was any impact of technology use and relationship if any, of the presumed variables on students' comprehension and retention levels.

METHODS

Considering the purpose of this study, the non-experimental descriptive survey design was used. This was because it specified the nature of the given phenomena and involved the collection of data to assist the researcher answer questions framed about the problem under the investigation.

The study was conducted in the Ashanti regional capital (Kumasi) of Ghana. Kumasi being an urban focal point was purposely selected as the study area because the students studying in the various institutions have had at least a subject or two taught using instructional technology as compared to their counterparts in other parts of the region. The selected schools had their infrastructural advantage which sought to attract qualified teachers with knowledge in the use of technology to handle their subjects hence the need to use those schools for the study. In these selected institutions, some programmes/subjects are taught using technology whereas others are not.

The sample consisted of two colleges of education and three senior high school students who have been exposed to some level of educational technology during their learning experiences in the Kumasi metropolis through a purposive sampling technique. In all, 146 students responded to the research questionnaire.

A stratified random sampling was used to select the schools, because learners were from different schools with different student populations. This was followed by simple random sampling to determine which subjects the questionnaire should be administered to. From this students' sample, information relevant to study was collected. The surveyed sample consisted of 146 subjects: 90 males and 56 females.

The researcher administered a carefully designed questionnaire as the only method of data collection. Descriptive statistics; frequency, percentages, means and standard deviations were computed and ranked for the descriptive data. The research questions were answered using frequencies and percentages. The research hypotheses were examined using the independent t-test and Pearson's correlation co-efficient to determine relationships.

RESULTS

It was hypothesised that there are no differences in the way traditional and non-traditional students perceive the impact of the use of instructional technology on their understanding and retention of content material. This hypothesis sought to find out if there were differences in the way traditional and non-traditional students perceive the impact of the use of instructional technology on their understanding and retention of material or content. Testing for the differences between the two groups, traditional and non-traditional student groups, the independent t-test was conducted. The t-test gave an indication of the separateness of the two sets of measurements, and this was used to check whether the two sets of measures were essentially different (and usually that an experimental effect has been demonstrated). The independent samples t-test was used because measures from the two samples being compared do not come in matched pairs. Table 1 gives the t-value of the two groups, traditional and non-traditional students.

Table 1 The t-test value for the independent groups

Group	N	Mean	SD	Mean Difference	t	p
Traditional Students	80	4.51	2.17	1.40	0.04	0.993
Non-traditional Students	66	3.50	3.57			

*P<0.05

From Table 1, it can be seen that the mean difference of 1.40 produced a t-value of 0.04. This is less than 0.05 and therefore means there is a statistically significant difference between the two groups.

The group-type related difference on the scales was explored using the instrument. The scale means and standard deviations for the perception scores for traditional and non-traditional students obtained for each of the four CLEI scales were tabulated in Table 2.

Table 2 Independent t-test analysis of differences in students' perception on understanding and retaining information using instructional technology between traditional and non-traditional students

Variable	Traditional Students (n=80)		Non-traditional Students(n=66)		t-value	p
	Mean	SD	Mean	SD		
Assistance	4.18	8.718	3.39	4.868	1.026	.048*
Making better grades	3.63	6.403	3.44	4.868	0.01	.128
Remembering Information	4.04	12.787	4.00	4.207	0.04	.010*
Clarity of content and testable material	3.32	9.083	3.92	5.76	0.03	.018*

*p<.05

From Table 2, it can be seen that there is no statistical significant difference between traditional and non-traditional students in terms of making better grades [$t(146) = 0.01, p < .128$]. However, there was a statistically significant difference between traditional and non-traditional students in terms of assistance, $t(146) = 1.026, p < .048$; remembering information, $t(146) = 0.04, p < .010$; and clarity of content and testable material, $t(146) = 0.03, p < .018$. This result shows that there is a statistically significant difference in the way traditional and non-traditional students perceive the use of instructional technology on their understanding and retention of information and concurs with the findings of Wiley and Gardner (2010) when they investigated the capacity of self and peer assessment activities to engage students and promote learning. The difference is in the mode of remembering information, clarity of content and testable material as well as assistance. The research hypothesis is therefore rejected.

Also, it was hypothesised that instructional technology has an impact on the information a student understands and retains when compared to traditional teaching tools and methods.

Examining whether there is a statistically significant difference between traditional and non-traditional students in remembering information presented when using technology gave a value of $t(146) = 0.04, p < .010$ from Table 2. This is less than the reference value of 0.05 and this suggests that there is a significant difference between the two groups. This comes to buttress the point that information presented using technology is more understandable and is retained for long. This finding agrees with Park (2009), Bennett and Maton (2010), and that of Pamuk (2012). The study therefore rejects some

earlier ones such as Taylor and Todd (1995) that students' retention and knowledge levels decrease significantly with the use of instructional technology.

Anecdotal comments made in response to the question of making better grades using instructional technology as compared to traditional teaching methods included:

"I really felt my interest was increased in the content which probably caused me to receive better grades than I otherwise would have".

"I was really able to visualize the information from my classes better by remembering the animations and digital replays from my instructor. This helped me when I studied."

Another indicated, *"I don't know how I ever made it through high school without classroom technology. The courses I am taking here are so cool and I can relate to the way that my teachers use the multimedia to teach me."*

Table 2 shows statistically significant differences in three out of four cohorts on understanding and retention of information when presented using instructional technology. The study, therefore, accepted the research hypothesis that instructional technology has an impact on the information a student understands and retains when compared to traditional teaching tools and methods.

Conclusion and implications/recommendation

The study was conclusive on the fact that although a majority of respondents used for the study felt their ability to retain information was impacted positively through the use of technology in the classroom, the influence was quite low. Perhaps this may be due to the fact that they were introduced to technology late in their education and might have some mixed feelings about how they felt about technology use in the classroom, something which is common in developing and under-developed nations.

The findings have some implications for the government, PTAs, school management committees and the various stakeholders of education in Ghana. First, since students remember and retain information easily using instructional technology, schools that lack ICT tools and equipment might not be able to deliver information to their students to take advantage of the benefits instructional technology brings to students. Every effort should be made to equip schools with ICT infrastructure and where possible, train teachers to be tech savvy to take advantage of the benefits of instructional technology. Students admit that the use of instructional technology helps them make better grades. This presupposes that student must be given the opportunity to interact with computers (smartphones, laptops, handhelds, etc.) to facilitate their learning process.

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