

## Effects of ICT on Teaching and Learning: A Review of Related Literature

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### ABSTRACT

The advent of ICT has made monumental changes in the world presently. This digital phenomenon has had effect in every facet of human life or endeavor. The introduction of ICT in education helped to improve the quality of education at the point where teaching and learning eventually became an engaging active process related to real life. The present study intends to collate the findings from a review of array of available literature related to the effects of ICT on education. The 21<sup>st</sup> century teaching and learning skills emphasize the need to transform the conventional teacher-centered pedagogy to more learner-centered methodology. Active and collaborative learning conditions facilitated by ICT helps to develop a knowledge-centered student community. This research work gives an insight into the use of ICT in the field of education, focusing on its impact on teaching learning process, quality, and accessibility of education, motivating learners, learning environment and students' academic performance.

**Keywords:** ICT integration; accessibility; ICT for education; motivation; learning environment; academic performance; teaching and learning

### INTRODUCTION

The 21<sup>st</sup> century's world-wide explosion of Information and Communication Technology (ICT) has clear manifestation of the fact that there is an increasing utilization of ICT in schools. The transformation in education has become possible as a result of ICT's driving force (Fisher, 2006; Nivala, 2009). There is an increasing demand for educational institutions to use ICT to teach the skills and knowledge students need for the current information age (Japhet & Usaman, 2018). There is virtually no area that has not been influenced by this digital phenomenon.

Gunton (1993) defines ICT as electronic devices or technological equipment for collecting, processing, retrieving and communicating information. Also, according to (Addy et al, 2018; Hamian et al, 2018; Luthra et al, 2018), Information and Communication Technology (ICT) is made up of an extensive variety of hardware, software, communication lines and information management tools to handle and analyze information. The advent of ICT has made many new opportunities for the 21<sup>st</sup> century and education is not an exception. As a result, ICT has made it possible for people to learn at a distance, virtual learning, internet training, technological learning and web-based learning. It is an indisputable fact that ICT is important in education globally (Ikediashi & Ogwueleka, 2016; Sabir & Naureen, 2017). The internet has made it possible for education and for that matter learning to be at the door step of students. Learners are able to study at their own pace, convenience, anytime and anywhere. It is therefore imperative to state that ICT plays a major role in education by enhancing teaching and learning processes (Akhavan et al., 2018; Nikolic et al., 2019). Educational institutions that train their students in yesterday's skills and outdated technologies are not meeting the needs of tomorrow's world (Bindu, 2016). If changes are not made, those children will not fit into future professional development. The teaching and learning procedures are complemented by the availability of and usage of ICTs in society, which causes students and teachers to use these digital tools (Ibieta et al., 2017; Kaya & Erkut, 2018; Othman & Elsaay, 2018).

The impact of ICT is very profound on society and it affects every aspect of human endeavor. According to Bindu (2016), the spread of quality education has been possible as a result of the pivotal role ICT plays in education.

Undoubtedly, teachers play a crucial role when it comes to the integration of ICT into education in the four corners of the classroom. Teachers are the implementors of ICT policies and programs. It is one of the reasons why the present-day teachers should not only know the content of what they teach or the syllabus but also the pedagogy to impart knowledge effectively by integrating technology. Globally, the importance of ICT in education cannot be disputed (Ikediashi & Ogwueleka, 2016; Sabir & Naureen, 2017). The impact ICT is making in education is tremendous. Most studies have found however that many learners, instructors and students don't have the requisite technological skills desired to effectively use these tools and equipment in the classroom.

Therefore, the potential effect of these technologies has limited significance and the consequences on the learning process might be negative, especially in developing countries such as Ghana (Hinostrroza, 2018; Souri, Navimipour, & Rahmani, 2018). Though these are challenges and limitations, yet ICT provides excellent standards for education and encourages new ways of learning to be explored by students and teachers. Basically, the aim of this work is to collate the findings from a review of an array of available literature related to the effects of ICT on teaching and learning.

### METHODOLOGY

Data collection for this study was done by using bibliography and conventional methods to determine the literature in an educational context. To compile data for the study, reports, research papers, conference proceedings, Masters and Ph.D. theses, news and peer-reviewed articles were retrieved for comprehensive and holistic analyses. Google and Google Scholar, Scopus, INFORMS, Sage Journals

and other open access journals were the databases from which the searches were done.

After identification and careful analysis, each of the categories was studied in detail. The keywords used were ICT integration, accessibility, ICT for education, motivation, learning environment, academic performance, and teaching and learning. After identifying a preliminary set of articles, bibliography sections were analyzed to identify additional studies of interest. Keywords were determined from these articles which were published from 1990 to 2019, to understand the major areas where studies have been focused in the past years. Finally, the rest of the data were analyzed individually, and their effect on teaching and learning discussed subsequently.

The study used 50 research papers from 1990 to 2019, using keywords such as "ICT integration, accessibility, ICT for education, motivation, learning environment, academic performance, teaching and learning". Research papers with higher citations counts and with relevance to the study were selected.

The key areas the discussion of the study emphasized include ICT integration, accessibility of ICT, learning environment and motivation, and student academic performance.

#### **ICT INTEGRATION ENHANCES TEACHING AND LEARNING**

According to Buabeng-Andoh (2019), many educational institutions and governments globally have taken the integration of ICT into teaching and learning as a major priority and that much premium is placed on its integration and implementation. Teaching and learning process is making great impact in education as a result of the application of ICT. Several millions of dollars have been injected into the education sector to help fully integrate ICT into teaching and learning activities (Grabe & Grabe, 2008; Player-Okoro, 2012). The conventional way of teaching has been emphasizing on content.

It is imperative to state that teachers' knowledge and skills in technology have great impact on the way in which they put technology into use in the area of teaching and learning (Aydin, 2013; Japhet & Usman, 2018). As far as ICT is concerned, teachers are major players or play an important role in the integration of ICT. Teachers in this technological era should not only be well versed with the content of what they teach but should also be able to impart knowledge effectively via the integration of technology (Bindu, 2016).

ICT enhanced learning stimulates augmented learner involvement. Engaging learners with ICT facilities, will enable them to build their capacity to the fullest for both research and independent study (Adu & Mireku, 2016). It is critically important for ICT to be fully integrated into education in order for society to benefit from these learners when they graduate and go back to the society. A study conducted by (Jennifer, Mohammed, & Adel, 2016) posit that, learners are able to improve their grades if ICT is completely integrated into teaching and learning. Conventionally, the main role of teachers has been as presenters of readymade information and as organizers of learning experiences. One way in which ICT can be used in the classroom is to take over these presentational and organizational roles. The implications for these are for both teachers and learners and the computer by providing an additional source of knowledge which may reduce the dependency of learners upon the teacher. Hence, the learner's autonomy will be enhanced in learning.

#### **ICT ENHANCES ACCESSIBILITY TO LEARNING**

In integrating ICT into teaching and learning, it is a necessary condition to have access to ICT infrastructure and resources in schools (Japhet & Usman, 2018). The advent of ICT has made education non-restrictive. Teaching and learning use to be at the four walls of the classroom where teaching was based on prescribed syllabus. A report by European Commission (2013) found that access to ICT is a major impediment to teachers use of ICT in the classroom. The introduction of technology has opened the flood gate for education to be delivered at any time and from everywhere (Gupta & Gupta, 2014; Pegu, 2014). ICT affects the way knowledge is imparted and students learning process, because the effectiveness of learning is upon learner driven strategies but not the teacher. It is extremely important to state that accessibility is not the same as availability and that in some schools there are ICT infrastructural development but are not accessible to students which contribute immensely to technological illiteracy in the system. Availability and accessibility are ~~very~~ essential for effective adoption and integration in education. ICT resources such as software and hardware must be readily available in schools and other learning facilities to ensure that access and availability are not denied. Hence, key elements including access to computers, software and hardware are fundamental to successful integration of ICT into teaching and learning. Technology should be accessible to students to ensure its use in schools. As a result of ICT, great flexibility is provided to ensure that learners have access to knowledge regardless of space and time (Akele, 2013; Angadi, 2014). Through the use of technology, learners are able to communicate, share ideas, and work as a team anywhere and anytime. Some of the means by which this is done are teleconferencing or videoconferencing, where other students are invited for discussion on a particular topic or subject matter. Upon receiving access to such a big platform, students are also able to share their learning experiences collectively with their colleagues, thus promoting global collective learning. iEARN International in Spain where over two million students and teachers each day are engaged in collaborative project work worldwide is a clear example of collaborative online learning. These kind of learning where ICT is the main facilitator not only help to establish connections for the learners but also build strong network for each other in achieving true and meaningful learning.

The introduction of ICT is a solution to most of the problems that developing countries like Ghana face regarding the use of technology in education. Some of these issues include the lack of teachers, teacher mobility, inadequate learning materials, poor educational facilities etc, hinder effective utilization of ICT in teaching and learning (UNESCO, 2002).

Each and every person needs to keep pace with recent development in order to access information through technology (Plomp, Pelgrum, & Law, 2007). Time and space are hinderances to communication which ICT helps to mitigate if not eliminated completely (Lim & Chai, 2004). ICT also makes it easy for the development of electronic resources such as electronic libraries where students, teachers and experts are able to access research information and study materials from everywhere at their own pace (Bhattacharya & Sharma, 2007; Cholin, 2005). This convenience provides people including academics and research scholars the opportunity to share research materials.

### ICT MOTIVATES LEARNING AND ENHANCES THE LEARNING ENVIRONMENT

According to Fathima (2013), there is a rapid change in students' performance when ICT is used in the learning environment. ICT is becoming an increasingly a powerful educational tool for promoting education. The processes of teaching and learning are being transformed in the education environment via the inclusion of vitality to the learning milieu. There are several sources of getting information which are available to students presently, and the education system insists on factors such as research, critical thinking and evaluation skills (Consortium, 2016). Therefore, the learning environment provided should follow an effective application of knowledge that students are required to master, in order to avoid the attained knowledge from becoming passive (Bransford, Sherwood, & Hasselbring, 1990; Duffy & Randy, 1990). It is also critically important that teachers will see the need to encourage students to be active learners so as to engage in active knowledge construction. This involves open-ended situations instead of learning conditions which focus on mere transmission of facts (Collins, 1996; Hannafin, Hall, Land, & Hill, 1994; Jonassen, Peck, & Wilson, 1999).

There are various ways ICT has the potential to create the powerful environments for learning. ICT has the potential to access numerous information using the various sources. It helps in the examination of information from different perspectives, hence promoting the credibility of learning environments (Amin, 2013). Also, through the use of ICT, complex concepts might be understood by the use of simulations, which is contributing to an authentic learning environment. As a result, ICT could be described as a facilitator of active learning and high order thinking (Alexander, 1999; Jonassen, 1999).

Curriculum differentiation is another functional instrument of ICT. Learning materials could be modified to suit the requirements and capabilities of every individual learner via the use of ICT, especially by giving personalized feedback (Mooji, 1999; Smeets & Mooji et al, 1999; Akele, 2013). In educational psychology, it is obvious that learners learn at different paces, i.e. fast learners and slow learners and with the advent of ICT, many of the learning needs of these people are satisfied. The influence ICT has on professional and personal lives of people and the rate of acceleration of information flow is very deep (Ghadimi, Akbarimajd, Shayeghi, & Abedini, 2017; McGee, 2018). Apparently, ICT has been one of the most vital tools when it comes to changing the style of the education process, upon the requirements of the modern information society (Mishra, Kishore & Shivani, 2018; Skryabin, Zhang, Liu, & Zhang, 2015).

Effective use of ICT can make it a transformational tool that can change the classroom settings to a learner-centered environment (Amin, 2013; Madhukar, 2013; Angadi, 2014). It is therefore necessary to equip the classroom with technological devices and tools in order to augment the learning opportunities for students through different curriculum activities. ICT environment develops the experience of both teachers and students so that they can utilize the learning time effectively ( Kennewell, Parkinson, & Tanner, 2000). It is therefore imperative to state that ICT-enriched learning is a motivating factor for both teachers and students ( Plomp, Pelgrum, & Law, 2007).

ICT can enhance the quality of education in several ways. The motivation and involvement of the learner could be booted via the provision of basic learning skills. Technology is making education possible everywhere regardless of the distance. Ding Talk is a software application that is making it

possible for students all over the world to link up to their colleges and universities in China for lectures online in the mist of the coronavirus. Thus, it is possible by the use of ICT for teaching and learning to continue, although it is not possible for face to face encounter between teachers and students amidst the coronavirus pandemic. Students have the motivation to learn and the platform is created for teachers to teach regardless of the prevailing circumstances in the world.

As stated by Jonassen, Peck and Wilson (1996) that the utilization of ICT by students for educational purposes get immersed in the learning process. The numbers of students utilizing the computer to source out information are numerous. The application of ICT in teaching and learning is imperative because it will not only improve the teaching environment but also help the next generation build their future lives and careers (Wheeler, 2001).

### ICT ENHANCES ACADEMIC PERFORMANCE

Student performance and ICT integration have been topical for some time now as far as research and discussions are concerned. There is a rapid change in the student's performance when ICT is used in the teaching environment (Fathima, 2013). While ICT has been used in various ways to support teaching and learning, some of the literature point to the fact that little evidence exists supporting the claim that ICT has transformed education (Twining & Henry, 2014). This assertion is contestable by some researchers and academics. In fact, there is sufficient evidence to back the assertion that, there is positive relationship between ICT integration in education and students' academic performance. The researchers (Salam, Yang, Shaheen, & Movahedipour, 2017) have examined the impact of using ICT on student's performance. A model was evaluated and both public and private school students' sample were analyzed. The findings obtained indicate that the use of ICT improves the quality of education and the performance of students (Salam *et al.*, 2017).

In this scope, there are other researchers (Cerretani, Turrioz, & Garay, 2016) who explored the effects of using ICT tools on students' academic activities, their performance and their psychosocial adjustment. It was revealed that younger students have a higher attitude in the use of ICT tools. Moreover, psychological beliefs and academic performance are associated with the use of ICT (Cerretani *et al.*, 2016).

### CONCLUSION

This literature review sought to explore the effect of ICT on teaching and learning in the modern education system. To a greater extent, ICT have influenced the practices of education and will increase considerably in the future. ICT is an agent of transformation and that it will continue to be a powerful agent for transformation in the educational sector. Consistently, ICT should be used in education to enhance teaching and learning. The persistent application and development of ICT in the education system will have significant impact on teaching and learning process, access to education, motivating learners, creating a conducive learning environment and improving academic performance. Therefore, ICT tends to expand access to education, as through it, learning can occur at anytime, anywhere and at the convenience of the learner. In the midst of the coronavirus pandemic, teaching and learning are made possible, easily and conveniently through telematic classrooms or virtual rooms.

Integrating ICT into education can have a positive effect on both teaching and learning process. There is significant difference in using technology in the delivery



of lessons in the classroom and education in general. Educational resources are readily accessible and available to current and potential users via technology. Furthermore, flexibility is enhanced, so that students and teachers can respectively have access to learning and teaching irrespective of time and geographical location. ICT also can have an effect on classroom management and the way students are taught and learn. It helps to motivate the learners by creating a rich and enabling learning environment which provides a new opportunity for both learners and teachers. The opportunities created by ICT can significantly influence the academic performance of students. Finally, wide use, availability and accessibility of ICT equipment and good educational practices and programs in educational centers can significantly have effect on teaching and learning, hence, enhancing the educational system.

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