International Journal of Advanced Education and Research
ISSN: 2455-5746
Impact Factor: RJIF 5.34
www.alleducationjournal.com
Volume 3; Issue 2; March 2018; Page No. 61-64

ICT as a catalyst for teaching-learning process: A meta-analysis study

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Abstract
Information and communication technologies (ICT) have become an important aspects of our daily life. In the past few decades the use of ICT has fundamentally changed the practices and procedures of nearly all forms of endeavor including the education sector. The advent of the internet has pressured new productivity and service demands as well as expectations in the field of education. The world is moving rapidly into digital media and information sector, the role of ICT in Education is becoming more and more important and this importance will continue to grow and develop in the 21st century. In this paper, a detailed literature has been reviewed regarding the proper use of ICTs in the field of education highlighting the effective use of ICT in the teaching and learning process.

Keywords: catalyst, information and communication technology, teaching and learning

Introduction

In the past few years higher education institutions have enormously invested their time and money in information and communication technologies. ICT has a major impact in higher education, both at the teaching as well as learning process. According to UNESCO (2002) information and communication technology (ICT) is regarded as the combination of 'Informatics technology' with other related technology, specifically communication technology.

The dynamic nature of ICT, emphasis the core educational purposes is inclusive in design and focuses on a broad exposure to technologies together aiming at enhancing creativity and imagination of learner. ICT as an institution helps teachers into exploring educational possibilities of technology, learning to make right choices of hardware-software interaction and growing to become a critical users of ICT. For student ICT in education sector is an initiation into creativity and problem solving, an opportunity to share carrier pursuits. The potential of each technology varies according to its use by the population. ICT in education is a medium that uses information and communication technology to support enhance and optimize the knowledge. Researches all over the world has shown that ICT can improve students learning behavior and can enhance teaching skills. National Institute of Multimedia Education in Japan reported that an increase in the use of ICT in education integrated technology to curriculum has a significant and positive impact on students' achievements. The study showed that students who are continuously being exposed to technology through education has better knowledge, presentation skills, innovative capabilities and are ready to take more effort in learning as compared to others. The effective usage of these technology on students' academic performance is one of the debating question. ICTs have good potential to motivate, enrich, accelerate and engage students in helping them to relate school experience with work practices as well as strengthening teaching learning process. In this changing scenario, basic education is essential for an individual be able to access and apply knowledge. Easy Access of course material through remote devices, Online academic management systems, Flipped classroom, digital repositories for lecture course materials, library, computers, projector, audio players are the technology that education sector uses in making teaching learning process more interesting. The rising number of Massive Open Online Courses MOOCs are in huge demands for learning facilities beyond classroom. Such help by the ICTs has helped in making world a global village.

Yousuf 2005 states that the field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research. According to Daniels (2002) [8] ICTs have become within a very short time, one of the basic building blocks of modern society. A great deal of research have proven the benefit of the ICT in making quality education. Although the relation between the use of ICT and students' academic performance is not very much clear, many researchers have shown contradictory results.

Effect of ICT on students' academic performance

Kulik's (1994) in his study showed that on an average students who used ICT-based instruction, learn more and score better. ICT based instruction makes the classroom interesting and attractive to the students. Attwell and Battle (1999) [2] examined the relationship between having a computer at home and school performance. The study was conducted on a sample of approximately 64,300 students in the United States. The findings revealed that students who have access to computer at home for educational purposes, have improved scores in reading and mathematics. Cabero (2001) reported "the flexibilization time-space accounted for by the integration of ICT into teaching and learning processes contributes to increase the interaction and reception of information. Such possibilities suggest changes in the communication models and the teaching and learning methods used by teachers, giving way to new scenarios which favor

both individual and collaborative learning". The use of ICT in the educational environment, acts as a catalyst for change in the teaching learning process. ICTs work as a tool to encourage and support independent learning among both students and teachers. The use of ICT for learning purpose is being increased day by day. ICT in education act as a catalyst for the change in teaching learning process. Terry, Lewer and Macy (2003) surveyed on 240 students in a programme offering courses in the three formats of online, on-campus, and hybrid. The final scores of the students is the dependent variable and student characteristics are the independent variable, a standard regression model was used and the study reported that the predicted exam scores for students in the online courses were significantly less than those of students in the on-campus and in the hybrid formats. However, with the comparison of exam scores between students in the hybrid and students in the on-campus classes there was no significant difference. Leuven *et al.* (2004) declared that there is no evidence for a relationship between increased educational use of ICT and students' academic performance. In fact, the study found a consistently negative relationship between ICT use and students' academic performance. Sosin *et al.* (2004) found significant, but low, positive impact on student performance due to ICT use. They also showed that some ICT have proven to be positively correlated to the academic performance of the students while others are not.

ICT enhancing the quality of education

ICT has undoubtfully increased the amount of flexibility in the delivery of education so that learners can access anything, anytime and from anywhere. It has also influenced the way students are being taught in the classroom and how their method of learning. As now the process of learning are mostly student centric and not teacher centric. This would help in preparing the student for lifelong learning as well as for improving the quality of education. One of the major contribution of ICT in the field of education is Easy Access to Learning. Learner are appreciaticating the capability to access educational material anywhere, anytime and anyplace.

With the help of ICT, students can now feed through e-books, sample papers, previous year papers etc. and can also have an easy access to resource persons, experts, guides, researchers from all over the world. This flexibility in learning has increased the availability of live time learning and has also provided opportunities for many more learners who previously were constrained by learning due to other commitments (Young, 2002) [27].

Through ICT sharing and availability of best course material in education became an easy task and may help in improving teaching. ICT also allows the learning institutions to reach the disadvantaged groups of the society. Seamless communication technologies support wide accessibility of teaching and learning process. Innovative use of SNS have potentially solve the problems like lack of learning materials, teachers etc. Thus, ICT empower education which ultimately lead to the democratization of education.

ICT enhancing the Academic performance

The extensive usage of ICTs in education has increased the need to unravel the impact it has on students' academic performance. ICTs has helped in expanding the access to education, strengthen the importance of education to the increasingly digital work environment, and has helped in raising the quality of education.

The direct connection between ICT use and students' academic performance has been the focus of extensive literature. Valasidou and Bousiou, (2005) [26] in their study stated that ICT helps students to their learning by improving the communication between them and the instructors.

Researches have shown that the appropriate use of ICTs can propel the essential and habitual shift in both content and instruction that is the soul of education reform in the 21st century.

Kulik's (1994) meta-analysis study revealed that, on an average, students who used computer based instruction scored higher than students without computers. The students also learned more in less time and liked their classes more when ICT-based instruction was included.

Fuchs and Woessman (2004) [11] used international data from the Programme for International Student Assessment (PISA), and showed that while the bivariate correlation between the availability of ICT and students' performance is strongly and significantly positive, the correlation becomes small and insignificant when other student environment characteristics are taken into consideration.

Attwell and Battle (1999) [2] examined the relationship between having a home computer and school performance, their findings suggest that students who have access to a computer at home for educational purposes, have improved scores in reading and math.

Becker (2000) [4] found that ICT increases student engagement, which leads to an increased amount of time students spend working outside class.

Coates *et al.* (2004) showed that students in on-campus courses usually score better than their online counterparts, but this difference is not significant here. ICTs especially computers and Internet technologies enable new ways of teaching and learning rather than simply allow teachers and students to do what they have done before in a better way. Fister *et al* (2008) [9] also showed the power of tablet PCs to improve mathematics instruction.

ICTs have the potential for expanding the access and improving the applicability and quality of education. The use of ICT in educational settings, acts as a catalyst for change in this territory. Students using ICTs for learning purposes been absorbed in the process of learning and as more and more students use computers as information sources and cognitive tools (Reeves and Jonassen, 1996) [12], the influence of the technology in aiding students how to learn will continue to increase.

ICT enhancing learning motivation

ICTs can improve the quality of education in number of ways, by increasing students' motivation to perform and by providing the acquisition of basic skills and techniques. ICTs work as a great transformational tools which, when used efficiently, can promote the shift to student centered environment. ICTs has enable new techniques of teaching and learning, breaking the old system by permitting teachers and students to do what they have done before in a better way. ICT has a major role not only on what learner should learn, but also on how the learner should learn. Along with this change

of domain from "content-centered" to "competence-based", the medium of information delivery has also now been shifted from "teacher centered" to "student-centered" method of delivery. ICT enhances motivation to learn among students. Videos, television and multimedia software have improved the text, sound, and animated images and helped in engaging the student in the interesting learning process.

ICT have changed the characteristics feature of the problems and learning tasks, and hence play a vital role as a mediator of intellectual and cognitive development, enhancing the acquisition of competencies as an important tool for life in our information based society. Students using technology for learning purposes become engaged in the process of learning and as more and more students use computers as information sources and cognitive tools (Reeves and Jonassen, 1996) [12], the roe of the technology on supporting how students learn will keep on increasing. Learning approaches using contemporary technology provides number of opportunities for constructivist learning through the provision and support for resource-based, student centered settings and by enabling learning to be related to context and to practice (Berge, 1998; Barron, 1998) [5, 3]. The instructor could make their lecture more interesting and lively by using multi-media technologies and the learners are able to capture the lessons taught to them easily. As they found the class very attractive and interesting, the concepts are also retained in their mind for a longer span of time which supported them during the time of examination. Computers with Internet connection can increase learner motivation as it combines the media richness and interactivity of other ICTs with the opportunity to connect with people.

ICT-enhanced learning as more student-directed, diagnostic and remedial. Unlike boring static, text or print-based learning. ICT has improved learning skills by recognizing number of different learning pathways and many different sources of knowledge. ICTs helps students to explore and discover rather than just listening and rote memorizing. The World Wide Web (WWW) also provides a virtual international gallery for students' work (Loveless, 2003) [19]. ICT can engage and inspire students, and this has been cited as a factor influencing ready adaptors of ICT (Long, 2001) [18].

Conclusion

ICT seems to have a huge impact on the process of learning in higher education by offering new and interesting opportunity for both the teachers and the learners. These possibilities seems to have an impact on student academic performance. There are number of contradictory results in the empirical literature in this field. Higher education institutions have invested heavily in technological equipment, and at the same time learner and instructor are using these technologies more and more often, there has been a very little change in the organizational sector. Education sector using ICT are changing. Students are promoting new skills and new chances – more collaboration, team building, project management - closer to the needs in the job market and perhaps less performance on curricula. Observing the academic performance of learners needs to deal more with these topics and less with knowledge of specific topic and curricula.

The role of each technology varies according to its use by the students and teachers. ICT in education is a medium that uses information and communication technology to enhance and optimize the knowledge and skills. Researches all over the globe have proved that ICT can improve student learning and better teaching method. Accessing of course material through remote devices, Online academic management systems, Flipped classroom, digital repositories for lecture course materials, library, computers, projector, audio players are the technology that education sector uses. The rising number of Massive Open Online Courses MOOCs are in huge demands for learning facilities beyond classroom. Thus making a huge impact of ICT usage on students' performance in higher education.

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