The Effect of ICT use in Teaching and Learning on Students' Achievements

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Abstract- *Information and communication technologies (ICT) have become commonplace entities in all aspects of life. Technology is moving rapidly in recent times than our ability so we need to adapt and adopt the new way of technology to improve to gather information in our daily affairs to save our money, energy and large amount of time. Across the past twenty years the use of Information and Communication Technology (ICT) has fundamentally changed the practices and procedures of nearly all forms of endeavor within business and governance. Education is a very socially oriented activity and quality education has traditionally been associated with strong teachers having high degrees of personal contact with learners Nowadays, ICT plays a vital role to reduce mass illiteracy and help to overcome the educational problems faced during the development of Digital India. IT is a discipline deals with Science, Technology, Engineering and Management in handling information, its applications associated with social, economic and cultural matters. Currently, 90% of the world's population depends on internet technology and related gadgets to fulfil their basic needs of their routine life. This technological revolution is very important for all over human development in this smart world, especially in educational field. It makes the process of teaching-learning and evaluation more fascinating, easy to understanding and all involving with a smoother application. Even the government also promotes ICT based learning tools from primary level to degree level courses for practically sound knowledge and expanding expertise in their specific field. Students from any corner of the world can share their knowledge and solve their difficult experiments, problems with other researcher. In many fields of study, ICT based learning is useful to improve understanding of practical knowledge. There are so many applications based on ICTs. This paper focuses on methodologies of ICT in recent challenges of ICT in outcome based teaching and learning Pedagogy. Different Strategies for teachers to apply ICTs, various tools for different purpose like accessibility of distance learning, evaluation, scholastic Performance, e-courses and virtual classroom for qualitative and productive educational culture. In Kerala even though the government introduced IT@school project in general education schools from 2001 onwards, in teaching learning process ICT enabled education is not yet facilitated completely. In 2017 onwards it is started "Samagra" eResource portal to enrich the Hi-tech classrooms with ICT equipment and trained teachers.*

This study is aimed to identify the relationship between the Information and Communication Technology use in teaching and learning towards the achievement of secondary school students in Science subject. A total of 80 respondents were selected

amongst 8th standard students in Pantheerankave HSS, Kozhikode, and Kerala. Quantitative approach has been used in this study. Students were classified into two groups namely the teaching using ICT and teaching without using ICT. The t-test showed higher value for the ICT group as compared non ICT Group. The findings showed positive relationship between ICT use in Science lessons and the students' achievements/ learning outcome. The usage of ICT during lessons conducted in classes has improved the learning outcomes of students and therefore the contribution should be recognised by all teachers in order to enhance students' achievement in academic. Based on the findings, several recommendations have been made to provide some insights into the application of ICT in Science subject. The result indicated that ICT use in teaching and learning process increased the students' achievement in Science subject in the school.

Keywords: Information and Communication Technology, teaching and learning, Science subject, education, achievement/learning outcome, secondary school, Qualitative education, Teaching-learning pedagogy, ICT based learning tools.

Introduction

In order to fully participate in the global economic activities, needs to sustain productivity driven growth through critical thinking workforce and technology literate workers. To achieve and support that vision, the educational system has to be changed. Hence, various initiatives have been introduced by the government to facilitate the use of Information and Communication Technology (ICT) and enhance the capacity and capability in all fields, including education. ICT to be used in education system as a teaching aid was one of the transformations has introduced.

The main contribution of ICT is that it offers access to a lot of data and information which the teachers can utilise for teaching and learning in class. ICT is a tool and a way to improve the pedagogy of teaching, building a more effective organisational structure in schools, stronger links between schools and the community, and empower students.

The General Education department of Kerala believes that ICT has the potential to revolutionise education and improve learning as it has changed the medical, financial, manufacturing, and other sectors in society.

The Department has formulated three main policies for ICT in education. The first policy insists on ICT being used by all students to reduce the digital gap amongst schools. The second policy emphasises the role and function of ICT in education as a teaching and learning tool. Apart from radio and television as a teaching and learning tool, this policy stresses the use of the computer for accessing information, communication, and as a productivity tool.

The positive impact of ICT on pupils' learning such as increased students' motivation to stay on-task and drive them to behave better and produce high quality work. Besides, through ICT, students learnt more independently and did more works at a fast pace. Since the importance of ICT and its contributions to all fields including education had been proved in

previous studies, this study will demonstrate the impact of ICT use in teaching and learning on the achievement/LO of secondary students in Science subject. ICT refers to the use of computer-based communications technology that serves as a network to find information. This includes computer hardware and software that can be used for teaching and learning and information resources.

From 2003, the Department of General education of Kerala started to IT@school project to enhance the ICT based education in Secondary schools in Kerala. The new millennium witnesses a great transformation of society through global competition and the power of information and communication technology. This development poses a lot of implications on education system, school management and also for the formation of Smart Schools. The study revealed that awareness of ICT amongst teachers and headmasters was generally low and needs improvement.

Skills and the willingness of teachers refer to skilled teachers who are ready to use ICT in learning and teaching. To achieve a comprehensive teaching by using ICT, teachers need to be convinced of the importance and benefit of ICT use in teaching and learning. Indeed, teachers should be given adequate training to use ICT tool effectively and efficiently. Findings also showed that teachers who have attended training courses in Science and ICT were more efficient, capable at using computers and willing to implement the teaching of Science compared to teachers who have no training.

The increased use of ICT in the community provided opportunities for students to gain experience that will encourage them in learning. They added, if the use of ICT in learning and teaching produced favourable effects, teachers will be more confident of the education system in the future. The minimum level of the skill of using computers and ICT amongst teachers in teaching and learning of Science was high.

However ICT will enhance learning if teachers plan to incorporate into learning activities carefully in lessons but it will, in turn, becomes useless without good plans. Students must be encouraged to understand the process involved. Becker suggested that teachers' expertise in ICT is an important factor in its successful use in lessons. Government has provided materials and facilities such as laptops, LCDs, CDs, guide books, textbooks, reference books, activity books to help teachers in teaching. Therefore, teachers were encouraged to take advantages of ICT in teaching and learning in order to produce a big impact in education field.

Lim found that the use of ICT in teaching and learning allowed students to be active in finding information and build knowledge from information obtained by the chance to cross-link between knowledge of subjects without restricted by time and distance. A study on the attitudes of the secondary students during computer-aided activities showed that students have positive attitudes towards the use of computer which was considered as an effective technique of teaching and learning pedagogy by students.

According to Kubiatko, the results of students' attitudes toward ICT use in teaching and learning Science subject among high school students were based on statistical evaluation. Students seemed interested in using ICT in the Science subjects. The same study also concluded that ICT can enhance students' learning in Science from early age. Smart Schools promotes the use of ICT has created significant positive attitude towards Science among students.

Method and Procedure

Stratified Random Sampling was used to ensure the generalisation and the accuracy of the data. Population of this study is 80 students of Pantheerankave Higher Secondary school. Respondents were randomly selected amongst the 8th class students (In Kerala Class 8 students are the part of secondary education) 40 students were selected for the Control Group (the group without ICT) and another 40 students for the Treatment Group (the group with ICT). The selection of sample also was based on the final examination grade of Science subject.

For this experimental study, a set of pre-test questions were given out to the Control and Treatment groups at the beginning of the study. A set of post-test questions (that same as the pre-test questions) were given out to both groups after the experiment is conducted.

The pre-post test questions were divided into two parts: Part A (30 Questions) and Part B (12 questions), whereby all the 42 questions were related to the topics Science subject of Class 8. Part A consists of 30 objectives questions worth 60 marks that cover the topics on *States of matter*, *Health and Nutrition* and *Unit and Measurement*. Part B consists of 12 subjective questions worth 40 marks based on the topics on *Chemical changes, Static electricity* and *Plants and Animals*. The total mark is 100%. The pre-test was conducted for both groups and data was collected for analysis. Then, an experiment was carried out for both groups. For the Treatment Group, they have to use ICT during their Science lessons for 6 weeks whereas, for the Control Group, their Science lessons were carried out without use of ICT. Following the experiments, a post-test session has been conducted for both groups for collecting the data.

Data collected from this survey were then presented by using descriptive and inferential statistics. Descriptive analysis was used to study the effect of ICT use in Science lessons on the achievement/learning outcome of Class 8 students as well as to find percentage and mean of items. The t-test and correlation were used to investigate the relationship between the effects of ICT use in teaching and learning on the achievement/learning outcome, and to determine the direction and strength of the relationship between achievement in Science subject by ICT use, and without ICT use. Moreover, three teachers were deputed to teach Science subject for physics, chemistry and biology in both group of students. During the project work the teachers were writing electronic and paper-based reflection journals based on open questions.

The research questions given to the teachers are:

1. Are the learning objectives clear and to which extent you are able to fulfil them?
2. Are you facing any problems in doing your work, without and with ICT (if so please describe them)?
3. What is the experiences without and with ICT you have in your lesson planning and teaching process to achieve learning outcome?
4. How do you use ICT in your professional learning?
5. How the new curriculum assists mutual development of ICT didactical and technical competences?

Finding and Analysis

Table 1: The comparison of students' achievements/learning outcome in pre-test session between the Control Group and the Treatment Group

Test	Group	Number	Mean	Deviation	t value
Pre test	Control	40	13.55	3.10	-1.21
Pre test	Treatment	40	14.45	3.45	-1.21

The mean score for the Treatment Group was 13.55 and the mean score for the Control Group, was 14.45. The t-test analysis showed that the t value was -1.21. These results showed that there was no significant difference in students' achievement/learning outcome in Science subject between both groups in pre-test session.

Table 2: Students' achievements in post-test session between the Control Group and the Treatment Group

Test	Group	Number	Mean	Deviation	t value
Post test	Control	40	14.55	3.87	2.91
Post test	Treatment	40	17.45	4.12	2.91

As seen in Table 2, the Treatment Group attained mean scores of 17.45, while the Control Group attained 14.55. These results showed that there were significant differences in the achievement/outcome of both groups in the post-test. Results indicated that performance of students from the Treatment Group increased in post-test. This concluded that ICT use in Science teaching affected students' achievement.

Table 3. The comparison of students' achievements in pre and post-test session between the Control Group and the Treatment Group

Test	Group	Number	Mean	Deviation	t value
Pre-post	Control	40	0.21	3.48	0.32
Pre-post	Treatment	40	4.02	5.42	4.58

The t-test was also conducted to analyse the achievement of student for both groups. The aim was to prove that there was a significant improvement for both groups of 8th Standard students in Science subject. The mean and standard deviation values (mean = 4.02; SD = 5.42) proved that there was a high improvement for the Treatment Group. Hence, these indicated that there were significant differences in student achievement/outcome between pre-test and post-test sessions. The t value for the Control Group showed that there was no difference on students achievement in pre-test and post-test. The value of standard deviation (SD = 3.48) showed that there was only a slight achievement in the Control Group. These results indicated that teaching without using ICT did not improve the achievements of students in the Control Group.

Data gathered showed that correlation between the ICT use and students' achievement was very high which indicated that there was a positive relationship between ICT use and students' achievements.

Table 4. The data collected from the teachers according to the research questions given the teachers also was processed. The data was analysed and transferred to the coding sheets according to research questions, so that all comments on the particular question could be analysed together highlighting trends and issues Frequencies are presented for teachers on the scale from 5-high to 1-none

Research question with frequencies	5-high	4	3	2	1-none
Are the learning objectives clear and to which extent you are able to fulfil them?					
Control	X				
Treatment			X		
Are you facing any problems in doing your work, without and with ICT					
Control			X		
Treatment					X
What is the experiences without and with ICT you have in your lesson planning and teaching process to achieve learning outcome?					
Control	X				
Treatment				X	
How do you use ICT in your professional learning?					
Control	X				
Treatment					X
How the new curriculum assists mutual development of ICT didactical and technical competences?					
Control	X				
Treatment					X

The Effect of ICT Use in Teaching and Learning on 8th class Students' Achievements in Science Subject

The main purpose of this study was to investigate the effect of ICT use in teaching and learning towards students' achievement in Science subject at secondary level. As a result of this study, it was found that the use of ICT in teaching and learning has improved the achievement in Science for the Class 8 students.

The comparison of students' achievements showed that the Treatment Group had higher achievement than the Control Group. It was concluded that there was a significant difference in achievement of Science subject between both groups. This indicated that the achievement of students was increased when teacher used ICT in their teaching and learning process. According to Pittard, Phil and Jessica (2003), ICT provided significant contribution to teaching and learning in all subjects and to all ages. ICT can motivate children and engage them in learning, besides meeting individual learning needs. According to the Bruner theory, to achieve better results, children need motivation to learn. It has been proven in this study where ICT has been used in teaching for 6 weeks in the Science classes. As a result, the students were more interestedto studyand this helps to improve students' performances. Deaney, Ruthven and Hennessy (2003) also found that ICT has increased the interest and motivation for pupils in schools. Similar study proved that teaching and learning using ICT improved the achievement of moderate learners (Norzita, 2004)

Correlation between the Use of ICT in Teaching and Learning with the Students Achievement in the Science Subject

Findings showed that there was a positive correlation between the use of ICT in teaching and learning with students' achievements. According to the findings of this study, students' achievements increased when ICT is used in a lesson. Students' achievements were found decreasing in a non- ICT based lesson. Using ICT in lessons can enhance self-esteem leading to expectations of achieving goals. And may help students in mastering subject skills. ICT used in lessons especially in the Science subject produced higher quality output of students. ICT can be used effectively in the Science subject to show video sequences of things that are hard to explain or visualise. Students would be able to construct knowledge easier with the support of ICT.

The analysis of teachers' journals

Changes in teaching and learning methods were applied by the teachers. Teachers defined teaching and learning methods which foster the ICT use in classrooms and plan them in alignment with learning objectives and outcomes. The link between lesson planning and lesson performance was crucial. As early as in pre-service education, teachers need to be trained in planning and organising pedagogical activities which hold an important place in a teacher's daily routine. The teachers' reflection from journals the teaching process with help of ICT the students' achievements/learning outcome, professional learning, didactical and technical competences shows high frequency. But the teachers are facing some problems with ICT shows the teachers are not well equipped with ICT and the teachers are to be enhanced the capacity to manage the modern technologies with ICT.

Conclusion

The use of ICT in teaching and learning helps students to expand knowledge, experience and increase understanding, especially in   the Science subjects that require visual, audio, flow chart, video presentation and so on. The findings concluded that using ICT in Science lesson has positive impact on students' achievements. Schools must strive to increase usage of ICT amongst teachers. On the other hand, teachers should put more effort to use ICT in their Science lesson in order to increase students' achievements. Teachers who are weak in the use of ICT need to participate in ICT training courses. ICT facilities provided by the government in schools must be fully utilised by the teachers. Using ICT in Science lesson can also help students to understand Science concepts through a relationship with a real life situation. The use of ICT in Science lessons can improve students' achievements compared to using traditional approaches. Moreover, it can make teaching and learning process become more interesting, encouraging and effective. Using ICT in study encourages 21 students to process information better and thus enhances the understanding and improves students' memory. The conclusion from this study reveals that ICT has a significant and positive impact on teaching and learning specifically for Science subject. ICT contributes greater performance or achievement of students. Teachers should replace traditional teaching approach with attractive learning style by involving ICT in their lesson. Science field that needs investigation and practical works needs ICT to assist in teaching.

Recommendations and Implications

Students have to be facilitated for reflective action when taking up the role of a teacher:- that digital divide of the students can be reduced with improved access to computers and internet in the context of school work which could enhance digital literacy and e-participation of students in a society; - that ICT assisted learning environments can be used for fostering student centred teaching and enhancing individualisation with tools for learning and evidencing students learning achievements and progress. Educational technology curriculum has to incorporate the ICT competences, in conjunction with competences of cooperation, management, organization, and of other generic and subject-specific competences. ICT competences are developed as inter-subject result, as interface of generic and subject-specific knowledge. Among key teachers' competences ICT competences had been recognised as weak. The educational curriculum course has to prepare future teachers for recognising ICT as enabler of own professional learning and development and as one of main drivers for change of pedagogical practice for student centred teaching in the classroom

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