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IMPACT OF INFORMATION COMMUNICATION TECHNOLOGY ON SCIENCE

Tajwar Firoz [*]
Sheena Thomas [**]
Dr. P. P. Joseph [***]

ABSTRACT

The purpose of this research paper is to study the fruitfulness of ICT based learning of XII standard science students. The conceptual knowledge of the molecular basis of inheritance was tested by administering pretest and post test. This paper accounts for a pilot study, in which the researcher wants to investigate the creative impact of information and communication technology (ICT), and increase level of scientific learning in the schools of Bhopal city. A group of 40 students was taught, with teach next module and engaged in various activities over the year and this will reflect in their attitude. The result indicates that ICT based learning process not only create a better learning atmosphere, it also originates conceptual learning related to the science, which is very helpful in developing scientific temperament among school going children and induce positive attitude toward science as a subject.

KEYWORDS: *Constructive Approach, Scientific Creativity, ICT & Learning.*

Introduction

In the absence of the aptness of thinking, The students will lose the direction and the pace of learning. (Osborne & Hennessy, 2003) put emphasis on changes are taking place in science education because of ICT For creating creative ambiance in schools, two chief components which needs to be stressed upon, are science and ICT. (Abdullahi, 2013), also find that ICT can promote students intellectual qualities through high order thinking, problem-solving, improve communication skill, and deep understanding of the concept learning. In position paper NCERT (2006), also puts emphasis on at secondary level science should be introduced as a separate discipline with experiments and technology use with the help of ICT, students appreciate the impact of the language of science and its communication (Ryan, 2009) Whenever we are talking about education system we should remember that we have to uphold the dignity and values on top. Education is very important for the development of an individual's personality, as well as equally important for the growth and development of our country.(Buabeng-Andoh & Yidana, 2014), found that students ICT competencies were the most valid predictor of their technology use.(Mann, 2014), also found that importance of content based technology learning for transforming technology is more common in teachers. India is developing at a higher rate and its most powerful pillar is education. With authentic and valid education system we can make the strongest foundation of our country.(NCF2005), (Saxena, 2006), also emphasized on the use of ICT for quality improvement in education. Revised education policy (1992), PoA (Program of action), modified in 1992, stressed the new educational technology to improve the quality of education. Education helps us to

[*] Research Scholar, Department of Education, Barkatullah University, Bhopal, M.P., India.
[**] Assistant Professor, (Head of the Department), Bhopal School of Social Sciences, Habibganj Bhopal, M.P., India.
[***] Research Supervisor, Bhopal School of Social Sciences, Habibganj Bhopal,M.P., India.

decipher what we want to communicate. We all are living in the age of science and technology.(Noor-Ul-Amin, 2013), also found that ICT is becoming a strong agent for change, among many educational practices it will increase flexibility, so that learners can access the education regardless of time and geographical barriers, piece of Information's are unplugged in nano seconds. The world has become a global village. Every information is at the click of a button, we are able to cure dreadful diseases, and we can reach anywhere with high speed and less time. All this happened just because of the boon of ICT.(Deaney, Ruthven, & Hennessy, 2003), says that the diversity of technical experience pupils now brings to the classroom poses the considerable challenge for teachers in designing and supporting technology-enhanced activities. Information communication technology is becoming the buzz word in contemporary society. ICT enables our students to team up and converse the world widely, that means globalization of education is in the process, as the Government of India ran the program of education named as Sarva Shiksha Abhiyan (SSA). Again, ICT has figured out as the most important one by the Central Advisory board of Education (CABE). Gradually ICT captures all domains of living and became an important part of our lives and plays a vital role in education and the world is becoming a knowledge driven. In national policy on education (1986) importance of science and technology has been recognized, which enforces its standard and we start thinking about reform of our education system.(K. J. Aina, 2013), found that work sheets, database and processor are very helpful in teaching biology. ICT fosters positive changes among the students in that we have to focus on what we need. For the development and innovation in science, we have to draw up a felicitous spur for the students as well as for teachers.

Learning of science is not an easy job, Students feel difficult to understand the concept of Biologically which create a problem in developing cognitive domain. Like molecular basis of inheritance, RNA, DNA Central Dogma of Biology, etc. So they come to the class unwillingly and they are further disappointed because they cannot understand the concept. Due to their prejudices, they move away from meaningful learning. Two way traffic is desired which means whatever the teacher wants to inculcate it should reach to the minds of the learner otherwise all efforts are beneath contempt. Students should be encouraged, and motivated for asking questions. It develops a positive attitude for science, think divergently and accelerate problem solving ability, so that they can synthesize and analyze the things in a better manner. For everything discussed above the teacher should adapt and develop new strategies and try to expand the range of interesting forms of learning.(Jackson & Kutnick, 1996) also studied that Student's achievement level increases with the use of ICT. These opportunities may update them through self study-based tasks or through active group activities. In the present scenario educationist put more emphasis on, the content based teaching of problem solving and understanding.(J. K. Aina, 2013) found that Science is very important to national development. The term science means in depth knowledge and its implication of generating ideas in making an unfamiliar situation familiar ones. With a scientific approach and analytical thinking, science has the capability to clear all sorts of doubt and create a clear vision about content. Here teacher works as a facilitator to direct learners towards the right path and encourage discussions in order to develop the confidence level of doing right things in investigating path.(Butler, Leahy, Shiel, & Cosgrove, 2013), also discussed that digitalization can make things possible, but only teachers can make things happen in reality. It is very necessary to draw a clear road map for accomplishing the objectives of science in teaching and learning process.(Ali, Haolader, & Muhammad, 2013), also found that teachers and administrators have a strong desire to integrate ICT into the teaching learning process.(Meenakshi, 2013), also put emphasis on teachers must have technical support for pedagogies, redesigning curriculum and assessment tool for the optimal use of ICTs in today's classrooms. It seems like the fountainhead of clarifications, which enables the students in drafting explicit knowledge of science and innovation. Science is becoming more relevant, genuine or worthy when it collaborates with modern technologies like ICT. Undoubtedly we can say that the world is in a clutch of information communication technology, which makes learning easier and more effective.

Science and Information Communication Technology (ICT)

The basic aim of science education is to acquaint the students with the merits and worth of science in our daily life. In the era of paradigm shifting where everyone wants to perform higher on the ladder of success, and fly high. ICT is the novel and creative approach, to reinforce them in a positive manner, and explore the new horizon of success all possible equipments, which can help them to reach the zenith.(Ochieng, 2013), clearly state that ICT influenced schools had well established infrastructure and majority of lessons has been delivered with ICT. It will happen only when the learner bridges its new knowledge with pre existing knowledge because learning develops when learners create and connect the

link between new ideas and day to day life experiences.(Demkanin, Kibble, Lavonen, Guitart Mas, & Turlo, 2008), use of ICT in science education can enhance practice and quality of learning of science. Molecular basis of inheritance is one of the fundamental topics in genetics, which is closely related to our lives, but the level of difficulty is very high because it reveals the "story of life". It answers all the questions which come in learner's mind, like how generations are formed, why we are not clones of our parents, how variation are originates, how we resemble our parents, how evolution occurs, etc. It also throws light, on the future possibilities for the betterment of human life, like in curing dreadful diseases, generating new possibilities for better tomorrow and diseases free world for upcoming generations. It also discusses about how Bacteria and viruses can help mankind, better use of genetics in human welfare, and new proximities for (HGP) Human Genome Project. Concept development of genetics is very important because it gives understanding for human life.(Adeyemo, 2010) also find that ICT has great impact on teaching and learning of Science.

Creativity and Information Communication Technology (ICT)

In the present scenario, ICT is a buzz word and integration of ICT in education within a short period of time became the baseline for all stakeholders. Everyone knows its pros and cons. It started playing a vital role in every walk of life. After NCF 2005 it became the trendsetter in the educational world. Everyone is embracing this technology with an open heart and mind and started preparing learners more precisely and creatively. Many studies show clearly creativity is not inherited, it can be developed among learners with better learning strategies.(Prentice, 2000), highlights, the danger of a complex and slippery concept leading to confusions and contradictions which do not help educators to focus on the purpose and possibilities of creative processes. Scientific theories cannot exist without the person who is responsible for the generation of hypotheses and ideas. As a result, creativity can be described as a personal ability to synthesize already available and seemingly unconnected information into something unique and productive.

Hypotheses Used

- H_0 1: There is no significant difference between the mean scores of boys in the pretest and post test marks of science learning and the use of ICT of senior secondary school students of Bhopal city.
- H1: There is a significant difference between the mean scores of boys in pretest and post test marks of science learning and the use of ICT of senior secondary school students of Bhopal city.
- H_0 2: There is no significant difference between the mean scores girls of pretest and post test marks of science learning and the use of ICT of senior secondary school students of Bhopal city.
- H1: There is a significant difference between the mean scores of girls pretest and post test marks of science learning and the use of ICT of senior secondary school students of Bhopal city.
- H_0 3: There is no significant difference between the mean scores of the pretest and post-test marks of science learning and the use of ICT of senior secondary school students of Bhopal city.
- H1: There is a significant difference between the mean scores of the pretest and post test marks of science learning and the use of ICT of senior secondary school students of Bhopal city.
- H_0 4: There are no significant relationships between the mean scores of boys and girls in the pretest and post test marks of science learning and the use of ICT of senior secondary school students of Bhopal city.
- H1: There is a significant relationship between the mean scores of boys and girls in pretest and post test marks of science learning and the use of ICT of senior secondary school students of Bhopal city.

Objectives

- To Study the differences between the use of ICT and science learning of senior secondary school students of Bhopal city.
- To study the relationship between the use of ICT and science learning of senior secondary school students of Bhopal city.

Methodology/Experimental Set Up

The pretest and post test Experimental method is used in this research. Child centered approach" Constructivism "is opted as the medium of instructions. Learners can participate actively and use their innovative ideas, for learning purposes. By this method of learning they come up with better

solutions and teacher is able to facilitate them in the best way. During field work (August to December 2015) researcher at KNHSS, Kamla Nagar, Kotra, Bhopal. The researcher made efforts to develop a positive attitude for a better understanding of Biology. With the use of information communication technology in Biology at secondary school level in class XII Science and try out the validity the same. The whole research is carried out in three Phases.

For teaching learning process one unit of the Biology Molecular basis of inheritance topic was chosen by the researcher for XII standard students KNHSS, Kamla Nagar Bhopal. The test was made by the researcher to check their knowledge of content. For the assessment of the students 30 marks paper was made, in which 10 marks for pen, paper test, 5 marks for story telling (weightage has been given on three point rating scale confidence, content, and novel approach) and 5 marks for an assignment has been given on three point rating scale points. 5 marks for extempore and 5 marks for Power Point presentation (weightage has been given on three point rating scale Promptness, Originality of ideas and confidence).

All the test items are related to the textbook of XII Biology only and the test items are made only for XII science students'. Planning for the administration of test items on genetics in class XII science at KNHSS Kamla Nagar Kotra Bhopal. Pretest of 30 marks was administered for which 45 minutes were allotted for the pen, paper test and 5minutes for presentation, 5 minutes for Power point and 10 minutes for multiple choice questions are allotted it means the total time for the administration of the test is approximately one hour and five minutes.

After the administration of pretest, students are taught by the use of White board technology (Teach Next Technology). After the completion of the chapter, students are evaluated with post test. Drastic change has been found in student's attitude with improved results.

The pretest and post test were compared as shown in table no.1. The fabulous result shows, a positive change in the learning aspects as well as in their attitudes also. The obtained result was compiled and evaluation on the topic was done as per the suggestions and feedback received from the students and teachers.

Preparation of Worksheet

Since the students were analyzed at their secondary level of education. The aim was to develop (HOT) high order thinking skill in science among the students.

- Define the research problem
- Objective of the study
- Data collection (a) teaching (b) Computation

Evaluation

- Data Interpretation
- Result and discussion

After the rigorous sessions researcher wants to know up to what mark students will enhance their various domains, for that purpose worksheet is prepared, administered, and computed. Finally, scientific creative skill is boosted and students are able to comprehend their knowledge in day to day life.

Data analysis

For the computation of data, statistical techniques Mean, Standard Deviation, paired sample t test, correlation" r" is employed by SPSS 23 version Statistical Program.

Result and Discussions

After the analysis of data tremendous changes have been observed in the results of students. Null-hypothesis are rejected as shown in table 1,2 and 3.It means the use of ICT plays very important role in learning of Science. Smart teaching is the need of the hour. Students can use their full potential to gain knowledge and they can swift high turnout. As shown in table 4, a significant relationship has been found in information communication technology and the learning of science. Boys show more interest in comparison to girls in collaborating ICT(Information Communication Technology) in Science learning. The result also depicts that with ICT learners become more original. ICT collaboration will reflect on their learning and look forward to accomplishing the task by the amalgamating ICT (Information Communication Technology) to build up better approach with worth learning and create more opportunities for upcoming students.

From Table 1, since the calculated value of 't' (15.7) is greater than the tabulated value of 't' at 0.05 level of significance. It means a null-hypothesis is rejected and significant difference has been found in the use of ICT and science learning.

Table 1: Observation table for the mean score of pre-test and post-test for Boys of class XII at KNHSS Kamla Nagar Bhopal (Subject Biology Class XII)

	Number(N)	Mean Value	Standard Deviation	t	d.f	P value
Pretest and Post test	20	9.0	2.5	15.7	19	0.00
P<0.05						

Table 2: Observation table for the mean score of pre-test and post-test for Girls of class XII at KNHSS Kamla Nagar Bhopal (Subject Biology Class XII)

	Number(N)	Mean Value	Standard Deviation	t	d.f	P value
Pretest and Post test	20	15.4	9.65	16.0	19	0.00
P<0.05						

Table 3: Observation table for the mean score pre-test and post-test for Boys and Girls of class XII at KNHSS Kamla Nagar Bhopal

	Number(N)	Mean Value	Standard deviation	t	d.f	P value
Pretest and Post test	40	9.32	2.60	22.6	39	0.00
P<0.05						

Table 4: Observation table for the relationship of science in pre-test and post-test for Boys and Girls of class XII at NHSS Kamla Nagar Bhopal city

Gender of the correspondent	Boys R= 0.931	Girls R= 0.625

As shown in the table 2, since the calculated value of 't' (16.0) is greater than the tabulated value of 't' at 0.05 level of significance. It means a null hypothesis is rejected and there is a significant difference which has been found in the use of ICT and science learning.

Table 3 shows that, since the calculated value of 't' (22.6) is greater than the tabulated value of 't' at 0.05 level of significance. It means a null hypotheses is rejected and there a significant difference found in the use of ICT and science learning.

Since the correlation between ICT and Science learning for boys is (0.931), i.e. higher than the correlation value of girls (0.625) at the 0.05 level of significance as shown in Table 4. This clearly indicates that Boys show great interest in science learning with the use of ICT, which in turns enhances the learning of science. It clearly depicts that, If we intensify our teaching strategies with ICT, learning will be effective

Graphical Representation of Various Activities

In figure 1 blue line represents the marks obtained in the pretest. It means before introducing ICT. Red line indicates the marks of post test after the teaching sessions with ICT. The result clearly shows that if we are imparting the knowledge with ICT it gives excellent and positive impact on their learning process. The students who were not able to achieve good marks in pretest after getting the treatment they also achieve a good score. The study clearly depicts that strategies or techniques of teaching play very important role in teaching and learning process. It provides wider space to enhance their knowledge with best possibilities for making good progress overall. Slow learners show great interest and remarkable changes which can be witnessed in their results.

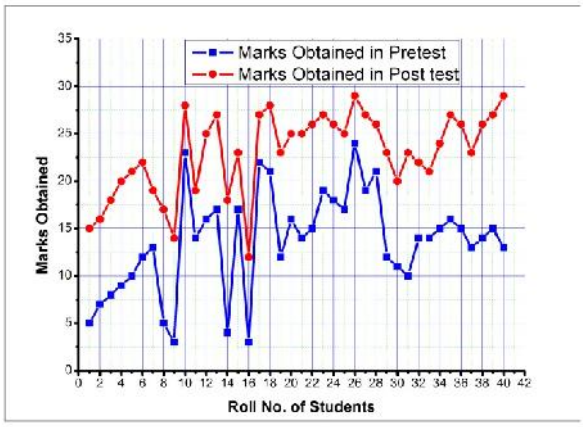

Figure 1: Graphical representation of pretest and post test marks.

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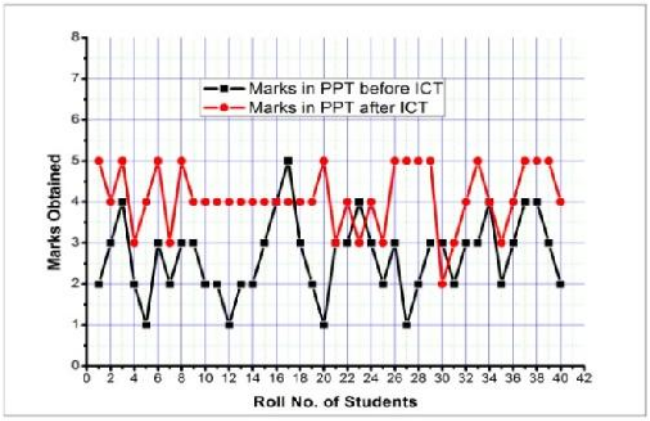

Figure 2: Graphical representation of improvement in marks of power point presentation of students after the use of ICT.

Figure 2 Marks of power point presentation before and after use of information communication technology. The Blue line show marks with traditional teaching, and the red line shows marks after treatment with ICT, the marks of the power point presentation clearly shows that choosing of correct strategy for teaching will enhance the learning of science. Information communication technology is very useful in clearing concept, with the help of ICT Students shows drastic changes in their marks. It means ICT is very useful in teaching and learning process.

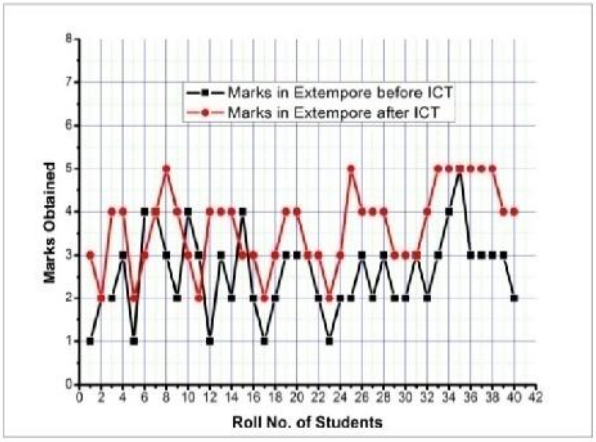

Figure 3: Graphical representation of Extempore activity with the help of ICT.

Figure 3 reveals with red line marks obtained by the students with traditional teaching and with blue line marks of Extempore with the use of ICT. It clearly indicates that information communication technology is very helpful in teaching and learning process. Student's performance shows remarkable changes in their result with the use of ICT.

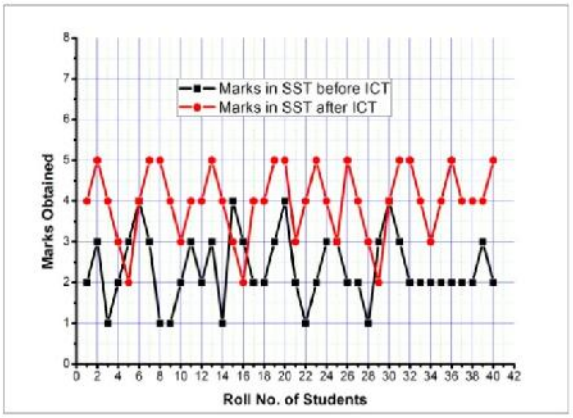

Figure 4: Graphical representation of marks of storytelling with or without use of ICT.

Figure 4 depicts the Changes in story telling, the blue line indicates pre marks which means only traditional teaching is done in the class, the red line indicates that modern technology (ICT) is being used in the class with ICT students shows great interest in learning and desire behavioural changes has been noticed.

Conclusion

After the completion of the study, the effects of Information communication technology on Science learning among students were investigated. The results obtained for problems are as follows:

The result clearly states that ICT enhances the learning capacity of boys and girls. Similarly, the result shows that there was a hike in science learning(Aktamis & Ergin, 2008).It means that if we are using modern technologies like White board, PowerPoint presentation in our class rooms, this way student's grasping power will increase and it will reflect in their understanding concepts rather than any other teaching techniques. Only ICT has the capability of understanding the needs of today's learners in order to serve them in a better manner.

Result also indicates that ICT has a positive relationship with Science learning. If teaching techniques are equipped with various technologies drastic changes will be observed and assertive

attitude will be developed .Result also indicates that boys have better science learning with ICT. Among the students, it is very necessary to create optimistic approach towards the subject, which is possible only by the development of cognitive domain .In this process modern technologies can set a benchmark because with the help of these technologies we can create a better learning atmosphere, it directly hits the psychomotor domain of the learners. (Sarkar, 2012), says that ICT has led to the emergence of OERs (Open Educational Resources) it enables the storage and reuse of information. By this students can learn at their own pace, which positively affects their affective domain and students are able to share their ideas, analyze things according to their capabilities and generate better results, which bring meaningful learning. It can be said that ICT improves Science learning drastically.(Giovannini et al., 2012), observed that individualization and personalization approach gives better opportunity for learning on their personal interest. Anyone can access and become a master in this field. ICT enables the students to learn well and bloom well. (Bingimlas, 2009), discussed that in the presence of all necessary components likings for ICT will flourish and it will create excellent opportunities in teaching and learning process.

Future Suggestions

The following suggestions can be correlated with the outcomes of the results:

- If we really want to prepare our students to compete with challenges, Scientific attitude with Problem solving approach should be developed.
- With the help of real situations teachers can make them understand about handling the problems in real life, for the enhancement in cop up the situations inquiry approach is very supportive and helpful in developing apositive attitude for science.
- To improve their high order thinking and learning skill pragmatic approach with hands on experience has done great a job with the addition of more experiments.
- For the enhancement in their learning capacity deductive and inductive method of teaching should be used in Science teaching in the classrooms which may stimulate their 3H factor for learning.
- The effect of using ICT and Science learning on the students ideas related to the nature of science ontological ideas can be computed.
- This study is confined only to Bhopal city, Future work can be done on broader geographical areas.
- The effect of learners Social adjustment characteristics on their science learning and use of ICT can be investigated.
- The level of stress among Science learner can be computed.

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