



Impact of ICT on Teaching Learning of Biological Science at The Secondary Level

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ABSTRACT: Science and ICT are two important aspects of School education. Science deals with creative thoughts, ideas, problem-solving, critical analysis, and experimental practices. Whereas ICT in education refers to the use of information and communication technologies to improve teaching and learning processes. This includes a broad range of digital tools, platforms, and resources that can maintain various aspects of education. It supports experiential learning where students discover their interests, and abilities and learn through their own experiences. Biology as a branch of Science is generally taught with a concrete commitment to its disciplinary strength having its core elements and definite perimeter. The present article was an attempt to discuss the impact of ICT (Information and Communication Technology) on teaching learning of Biological science and its importance in better-understanding concepts of Biological Science at the secondary level. The audio-video content and virtual lab activities were used in teaching-learning strategies. The study was experimental and primary data were used for analysis of the study.

KEYWORDS: Biological, creative, critical, ICT, experiential, secondary level.

INTRODUCTION

School education should be reached to the children in the best possible way. For this, different pedagogy has been given in the subject areas. Science is a subject that talks about facts, questioning, critical thinking, analysis observations, etc. To make these things easily accessible to children, many teaching pedagogies have been given. Such as Toy-based pedagogy, Sports-based pedagogy, art-integrated pedagogy, and ICT. In this paper, a detailed study has been described of how Information and communication technology as pedagogy is effective in teaching Biology science at the secondary level.

Teaching Biology Science through ICT and teaching-learning practices become, interesting, joyful, stress-free, and experiential. Children understand the concept easily and actively participate in classroom activities. Many research scholars have already explained teaching through ICT.

According to Daniels (2002), ICTs have grown to be within a very short time, one of the basic structural blocks of modern society. Many countries now regard accepting ICT and mastering the necessary skills and concepts of ICT as part of the core of education, alongside reading, writing, and numeracy. However, there appears to be a misunderstanding that ICTs generally refer to 'computers and computing-related activities'. This is fortunately not the case, although computers and their application play a significant role in modern information management, other technologies and/or systems also comprise the phenomenon that is commonly regarded as ICTs. Pelgrum and Law (2003) state that near the end of the 1980s, the term 'computers' was replaced by 'IT' (information technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term 'ICT' (information and communication technology) around 1992 when e-mail started to become available to the general public (Pelgrum, W.J., Law, N., 2003). According to UNESCO (2002), information and communication technology (ICT) may be regarded as the arrangement of 'Informatics technology' with other related technology, specifically communication technology. The various kinds of ICT products accessible and have significance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counseling, interactive voice response systems, audiocassettes, and CD ROMs, etc have been used in education for different purposes (Sharma, 2003; Sanyal, 2001; Bhattacharya and Sharma, 2007)

The change in classroom pedagogy and teaching approaches of this study are compared below against four stages of technology use in the classroom (as described by Engida 2011).

The integration of audiovisual content in the classroom played a positive role in creating learner-oriented classrooms. Through technology, it was possible to examine students' actions and thinking processes. While observing the classes, it was noticed that the



questioning skills of students increased. Thus the tool supported students' learning by directing them to useful resources, rephrasing important questions, and providing additional information and answers to their questions.

1.1 Statement of the problem

A study to assess the effect of ICT-integrated learning material on achievement in Biology at secondary level.

1.2 Objective

1. To study the Impact of ICT on achievement gain in Biology at the secondary level.

1.3 Research Hypothesis

The following null hypothesis is formulated.

- There is no significant difference between the mean achievement scores of students taught introductory technology with ICT presentation and those taught without the ICT (Verbal presentation)

METHODOLOGY

The researcher used an experiment following a non-equivalent control design to verify the impact of the ICT-integrated teaching-learning materials. It involved the comparison of students taught through ICT-integrated teaching learning materials to those who were taught through traditional methods. The student's achievement scores were collected and measured before and after being taught by ICT-integrated teaching-learning materials.

2.1 Sample for the study

The research was conducted at a Demonstration multipurpose school, in Bhopal. The respondents of the study were the two sections of class ninth students where the researcher conducted the impact of ICT integrated learning material. In total 35 students were selected for the study. A total of 35 students were selected for the study out of which 14 Girls and 21 boys.

2.2 Tools

The research made use of the following

1. The Pre and Post-Achievement Test
2. The traditional approach
3. The ICT-integrated Learning material (constructivist approach)

The pre-achievement test was administered to the two groups. The experimental group was taught with the help of ICT integrated Teaching learning material and the control group was with the traditional method for some time.

At the end of the study, a post-achievement test was again administered to measure the achievement level of students.

The t-test was used to determine if there was difference between the experimental and control groups in their:

- Pre-achievement scores in Biology
- Post- achievement scores in Biology
- Pre-achievement scores of male students in Biology

RESULT AND DISCUSSION

The chapter deals with data analysis of pre-achievement scores in biology for both the control and experiment groups and post-achievement scores in Biology for both the control and experiment groups. The difference between the pre-achievement scores of experimental and control groups. The pre-achievement test was conducted to find out if the respondents of both groups possessed the same cognitive level before the conduct of the study. The null hypothesis states that there is no significant difference between the pre-achievement scores of experimental and control groups. Table 1 shows the difference between the pre-achievement scores of both the experimental and control groups.



Table 1: The difference between the pre-achievement scores in Biology of both the experimental and control groups

Group		Mean	SD	df	t
Biology	Control	3.14	1.49	68	0.947
	Experimental	3.51	1.77		

Table 1 clearly shows that the Biology for the control group has a mean score of 3.14 and a standard deviation of 1.49 and the experimental group has a mean score of 3.51 and a standard deviation of 1.77. To find out whether there is a significant difference between the two means t-test was performed. It has been assumed that the distribution of the achievement scores for the pre-achievement test for the groups was normal. The assumption of homogeneity of variances was tested and satisfied via Levene’s test $F(68) = 2.28$ $p = 0.05$. The t ratio of 0.947 has an associated probability of 0.005.

The obtained t value is less than the table t value at 0.05 level of significance. Hence, the null hypothesis is not rejected. This shows that the significant difference between the pre-test mean scores of the two groups had the same cognitive level before the study was conducted.

II. The difference between the post-achievement scores in Biology of experimental and control groups.

The effect of ICT-based teaching and non-ICT-based teaching approach in Biology was determined. The actual scores of the two groups were treated. The null hypothesis is that there is no difference in the post-achievement scores of experimental and control groups.

Table 2: The difference between the post-achievement scores in Biology of both the experimental and control groups

Group		Mean	SD	df	T
Biology	Control	3.51	1.77	68	1.97
	Experimental	4.37	1.86		

Table 2 shows the students taught with the ICT-integrated material in Biology had a post-test mean score of 4.37 and a standard deviation of 1.86 while the group which was not taught with the ICT-integrated material had a post-test mean score of 3.51 and a standard deviation of 1.77. The t ratio of 1.85 has an associated probability of 0.05. The t-value obtained is greater than the table t-value at 0.01 level of significance hence the null hypothesis is rejected. Therefore, there is a significant difference between the achievement scores of the two groups after intervention. The assumption of homogeneity variances was tested and satisfied via Levene’s F test, $F(68) = 0.009$, $p = .053$

After the intervention, the respondents of the two groups varied statistically in terms of biology achievement. It also signifies that the ICT integrated approach as a tool in teaching Biology did enhance better achievement of students than the traditional method i.e., the non-ICT integrated approach.

III. The difference between the pre and post-achievement scores of the students taught with the help of ICT ICT-integrated approach

The pre and post-achievement tests were administered to find out whether there was a significant change in the achievement of the students taught with the help of ICT integrated approach in biology. Table 3 shows the difference between the pre and post-achievement scores of the students taught with the help of ICT integrated approach.



Table 3: The difference between the pre and post-achievement scores of the students taught with the help of ICT integrated approach (experimental group)

Group		Mean	SD	df	t
Biology	Pre-test	3.51	1.77	34	1.94
	Post-test	4.37	1.86		

Table 3 shows a remarkable difference in the mean scores of the students before and after the intervention. Before intervention, the mean score of the students in Biology was 3.51 with a standard deviation of 1.77 which was increased significantly to 4.37 with a standard deviation of 1.86 after intervention. The table also shows that the t -ratio is 1.94 which has a probability of 0.060 which shows that the null hypothesis is rejected. The obtained t value is greater than the table t value at 0.01 level of significance. Hence, there is a significant difference between the pre and post-achievement scores of the students taught with the help of the ICT-integrated approach (EXPERIMENTAL GROUP). Thus, the null hypothesis is rejected. The students showed keen interest and performed better with ICT-integrated teaching approach.

CONCLUSION

The use of ICT in the classroom is a powerful tool for raising student achievement and encouraging them to create engaging modules that help them grasp the material. Both the pre-control and post-control groups' achievement results were satisfactory. It was reassuring to see that the pre and post-experimental groups' achievement scores were greater than those of the control group. Before the investigation, the pre-test results showed that the respondents in the two groups were at the same cognitive level. Following the intervention, there was a statistical difference between the two groups' biology achievement levels.

The improvement in success scores following the intervention shows that ICT-integrated teaching and learning resources can be used as a tool in science education. The experimental group's higher post-achievement scores are explained by the student's willingness to accept a shift in the teaching-learning process's methodology from the conventional approach to the ICT-integrated approach (smart courses). By allowing them to actively participate in their education, the children were greatly inspired to do so, which improved their performance following the intervention.

Implication of the study

It is advised that teachers create different modules and use the technology to help students better understand science (physics, chemistry, and biology) in both two and three dimensions. This is because the use of ICT-integrated teaching and learning materials helped the students become more aware of, interpret, apply, and evaluate the subject with greater precision. With the use of ICT, educators can create and invent a variety of concepts. They should be encouraged to create modules and take part in workshops and seminars. More research should be done to determine the efficacy of ICT-integrated teaching and learning materials in all disciplines for every class. Schools should supply the facilities needed to run these smart courses.

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