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Effectiveness Of Online Teaching On Achievement In Chemistry – A Solomon Four Group Study

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Abstract
The system of education has widely changed after the Covid – 19 pandemic. Traditional classrooms have been replaced with e-classrooms where the students are taught with a variety of technological tool to achieve utmost convenience and achievement. Not only does the system of education has changed, but most of all professions in the world are ruled by technology as it has spread its wings across the world. The interest of students has also changed dramatically. There is a like for technology assisted teaching. The students have learnt to learn according to their convenience and the inclusion of animations and graphics have also increased their interest towards learning. This study explores the effectiveness of online teaching over traditional teaching on the achievement of B.Ed. students in pedagogy of physical science. The researcher has selected the Solomon Four Group design for this experimental study and the selected sample size is 100 B.Ed. students. The tool used for the present study was constructed and validated by the researcher. A criterion test tool with 55 items was the tool used for the study. Findings of the study revealed that online teaching has had a significant impact on the achievement of B.Ed. students in pedagogy of physical science when compared to traditional teaching method.

Key Words: Effectiveness, Online teaching, B.Ed. students, Pedagogy of Physical Science, Solomon Four Group

Introduction

B.Ed. students are the future teachers who play a very vital role in building the nation. As far as the B.Ed. course is considered, it is another professional course like engineering and medicine. The curriculum of B.Ed. includes core papers, elective papers, enhancing professional capabilities along with the intensive teaching practice for a period of 4 months. Pedagogy of physical science is a paper that teaches the methods and approaches in teaching of physical science. This paper equips the students to become effective teachers by teaching various techniques of teaching physical science. Online teaching as a new trend in education is highly welcomed by the students over traditional teaching methods. The use of technological aids has gained attention towards online teaching. The students can learn at his/her own convenience and video lessons also help the learner for better understanding. With better understanding, the student will be able to show more achievement. Online teaching relies on various tools such as learning management systems like moodle, Google classrooms, kahoot etc. It is the duty of the teacher to select the best and appropriate teaching mode for online teaching. With the right of the technological tool, online teaching will bring tremendous change in the achievement of the learner.

Need and significance of the study

As a known fact, the expansion of online teaching has profoundly increased across the globe due to the integration of new technological advancements in the field of education. There are a number of tools available for online teaching as well as learning. The interest for online teaching is increasing over the monotonous set up of traditional teaching which is generally a chalk and talk practice. To race with the

present scenario of education, most of the institutions have adopted technology assisted instructions to manage the teaching and learning process. The learners too are more attracted and enthusiastically participate in the technology assisted classrooms say online teaching. The attention and the retention of the students is found be more effective with the use of various online teaching tools. When it is left as a choice to the students, they prefer online teaching over traditional teaching methods. Keeping in mind the need of online teaching in such demanding situation, the researcher has decided to study the effectiveness of online teaching over traditional teaching. It is vital to find out the effectiveness of B.Ed. students in pedagogy of physical science taught using online teaching and traditional teaching. The findings of the study might bring significant changes in the future teaching methodologies. Hence, there is a need for the present study in this present day.

Objectives of the study

1. To measure the effectiveness of online teaching over traditional teaching on achievement in pedagogy of physical science.
2. To find out the significant difference in the achievement of B.Ed. students using Solomon four group study
3. To prove that online teaching has effective impact on B.Ed. students achievement in pedagogy of physical science.

Hypothesis of the study

1. There is no significant difference in the achievement of B.Ed. students from the experimental group I (PPT design) and control group I (PPT design) whose family income is below 5 lakh.
2. There is no significant difference in the achievement of B.Ed. students from the experimental group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh.
3. There is no significant difference in the achievement of B.Ed. students from the experimental group I (PPT design) and control group II (PT design) whose family income is below 5 lakh.
4. There is no significant difference in the achievement of B.Ed. students from the control group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh.
5. There is no significant difference in the achievement of B.Ed. students from the control group I (PPT design) and control group II (PT design) whose family income is below 5 lakh.
6. There is no significant difference in the achievement of B.Ed. students from the experimental group II (PT design) and control group II (PT design) whose family income is below 5 lakh.

Methodology and Research Design

The researcher has selected experimental method of research for the present study. Solomon four group experimental design was used to find the achievement of the B.Ed. students in pedagogy of physical science. 100 B.Ed. students were selected as sample using purposive sampling from two B.Ed. Colleges from Kanchipuram district and they were split equally (25 students in each group) into 4 groups.

Table 1 – Table showing the Solomon Four Group Design of the study

Experimental Groups	Control Groups
Experimental Group I 25 B.Ed. Students Pre-test Post-test design (PPT design)	Control Group I 25 B.Ed. Students Pre-test Post-test design (PPT design)
Experimental Group II 25 B.Ed. Students Post-test only design (PT design)	Control Group II 25 B.Ed. Students Post-test only design (PT design)

Tool used for the Study

The researcher has prepared a criterion test tool to measure the achievement of B.Ed. students in physical science. The tool was validated and reliability was also measured before administering. The tool consisted of 55 items. For every correct response 1 mark was awarded, and for every wrong response 0 mark was awarded. There was no negative marking carried out.

Data Analysis and Interpretation

$H_0$1 - There is no significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and control group I (PPT design) whose family income is below 5 lakh.

Table 2 – table showing the significant in the post test scores of B.Ed. students from the experimental group I (PPT design) and control group I (PPT design) whose family income is below 5 lakh.

Variable	Group	N	Mean	SD	't' Value	Level of Significance
Family Income Below 5 Lakh	Experimental group I (PPT design)	12	43.75	4.56	3.83	Significant at 0.05 level
	Control group I (PPT design)	11	36.27	4.78		

From the above table, it is inferred that the mean value of the post-test of B.Ed. students from Experimental group I (PPT design) whose family income is below 5 lakh is 43.75 with standard deviation 4.56. The mean value of the post-test of B.Ed. students from control group I (PPT design) whose family income is below 5 lakh is 36.27 with standard deviation 4.78.

The calculated t value is 3.83. It is greater than the table 't' value 1.96 at 0.05 level of significance. It is significant. It can be stated that there is significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and control group I (PPT design) whose family income is below 5 lakh. Hence the null hypothesis there is no significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and control group I (PPT design) whose family income is below 5 lakh is rejected.

$H_0$2 - There is no significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh.

Table 3 – table showing the significant in the post test scores of B.Ed. students from the experimental group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh.

Variable	Group	N	Mean	SD	't' Value	Level of Significance
Family Income Below 5 Lakh	Experimental group I (PPT design)	12	43.75	4.56	4.125	Significant at 0.05 level
	Experimental group II (PT design)	12	35.67	5.03		

From the above table, it is inferred that the mean value of the post-test of B.Ed. students from Experimental group I (PPT design) whose family income is below 5 lakh is 43.75 with standard deviation 4.56. The mean value of the post-test of B.Ed. students from experimental group II (PT design) whose family income is below 5 lakh is 35.67 with standard deviation 5.03. The calculated t value is 4.125. It is greater than the table 't' value 1.96 at 0.05 level of significance. It is significant. It can be stated that there is significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh. Hence the null hypothesis there is no significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh is rejected.

$H_0$3 - There is no significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and control group II (PT design) whose family income is below 5 lakh.

Table 4 – table showing the significant in the post test scores of B.Ed. students from the experimental group I (PPT design) and control group II (PT design) whose family income is below 5 lakh.

Variable	Group	N	Mean	SD	't' Value	Level of Significance
Family Income Below 5 Lakh	Experimental group I (PPT design)	12	43.75	4.56	7.498	Significant at 0.05 level
	Control group II (PT design)	12	29.58	4.70		

From the above table, it is inferred that the mean value of the post-test of B.Ed. students from Experimental group I (PPT design) whose family income is below 5 lakh is 43.75 with standard deviation 4.56. The mean value of the post-test of B.Ed. students from control group II (PT design) whose family income is below 5 lakh is 29.58 with standard deviation 4.70. The calculated t value is 7.498. It is greater than the table 't' value 1.96 at 0.05 level of significance. It is significant. It can be stated that there is significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and control group II (PT design) whose family income is below 5 lakh. Hence the null hypothesis there is no significant difference in the post test scores of B.Ed. students from the experimental group I (PPT design) and control group II (PT design) whose family income is below 5 lakh is rejected.

$H_0$4 - There is no significant difference in the post test scores of B.Ed. students from the control group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh.

Table 5 – table showing the significant in the post test scores of B.Ed. students from the control group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh.

Variable	Group	N	Mean	SD	't' Value	Level of Significance
Family Income Below 5 Lakh	Control group I (PPT design)	11	36.27	4.78	0.296	Not Significant at 0.05 level
	Experimental group II (PT design)	12	35.67	5.03		

From the above table, it is inferred that the mean value of the post-test of B.Ed. students from control group I (PPT design) whose family income is below 5 lakh is 36.27 with standard deviation 4.78. The mean value of the post-test of B.Ed. students from experimental group II (PT design) whose family income is below 5 lakh is 35.67 with standard deviation 5.03. The calculated t value is 0.296. It is lesser than the table 't' value 1.96 at 0.05 level of significance. It is not significant. It can be stated that there is no significant difference in the post test scores of B.Ed. students from the control group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh. Hence the null hypothesis There is no significant difference in the post test scores of B.Ed. students from the control group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh is accepted.

$H_0$5 - There is no significant difference in the post test scores of B.Ed. students from the control group I (PPT design) and control group II (PT design) whose family income is below 5 lakh.

Table 6 – table showing the significant in the post test scores of B.Ed. students from the control group I (PPT design) and control group II (PT design) whose family income is below 5 lakh.

Variable	Group	N	Mean	SD	't' Value	Level of Significance
Family Income Below 5 Lakh	Control group I (PPT design)	11	36.27	4.78	3.381	Significant at 0.05 level
	Control group II (PT design)	12	29.58	4.70		

From the above table, it is inferred that the mean value of the post-test of B.Ed. students from control group I (PPT design) whose family income is below 5 lakh is 36.27 with standard deviation 4.78. The mean value of the post-test of B.Ed. students from control group II (PT design) whose family income is below 5 lakh is 29.58 with standard deviation 4.70. The calculated t value is 3.381. It is greater than the table 't' value 1.96 at 0.05 level of significance. It is significant. It can be stated that there is significant difference in the post test scores of B.Ed. students from the control group I (PPT design) and control group II (PT design) whose family income is below 5 lakh. Hence the null hypothesis There is no significant difference in the post test scores of B.Ed. students from the control group I (PPT design) and control group II (PT design) whose family income is below 5 lakh is rejected.

$H_0$6 - There is no significant difference in the post test scoresof B.Ed. students from the experimental group II (PT design) and control group II (PT design) whose family income is below 5 lakh.

Table 7 – table showing the significant in the post test scores of B.Ed. students from the experimental group II (PT design) and control group II (PT design) whose family income is below 5 lakh.

Variable	Group	N	Mean	SD	't' Value	Level of Significance
Family Income Below 5 Lakh	Experimental group II (PT design)	12	35.67	5.03	3.060	Significant at 0.05 level
	Control group II (PT design)	12	29.58	4.70		

From the above table, it is inferred that the mean value of the post-test of B.Ed. students from experimental group II (PT design) whose family income is below 5 lakh is 35.67 with standard deviation

5.03. The mean value of the post-test of B.Ed. students from control group II (PT design) whose family income is below 5 lakh is 29.58 with standard deviation 4.70. The calculated t value is 3.060. It is greater than the table 't' value 1.96 at 0.05 level of significance. It is significant. It can be stated that there is significant difference in the post test scores of B.Ed. students from the experimental group II (PT design) and control group II (PT design) whose family income is below 5 lakh. Hence the null hypothesis There is no significant difference in the post test scores of B.Ed. students from the experimental group II (PT design) and control group II (PT design) whose family income is below 5 lakh is rejected.

Findings of the Study

Following are the findings of the present study

1. There is significant difference in the achievement of B.Ed. students from the experimental group I (PPT design) and control group I (PPT design) whose family income is below 5 lakh.
2. There is significant difference in the achievement of B.Ed. students from the experimental group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh.
3. There is significant difference in the achievement of B.Ed. students from the experimental group I (PPT design) and control group II (PT design) whose family income is below 5 lakh.
4. There is no significant difference in the achievement of B.Ed. students from the control group I (PPT design) and experimental group II (PT design) whose family income is below 5 lakh.
5. There is significant difference in the achievement of B.Ed. students from the control group I (PPT design) and control group II (PT design) whose family income is below 5 lakh.
6. There is significant difference in the achievement of B.Ed. students from the experimental group II (PT design) and control group II (PT design) whose family income is below 5 lakh.

Conclusion

The findings of the present study has revealed that online teaching has had significant impact on the achievement of B.Ed. students in pedagogy of physical science. Online teaching has proved to be better over the traditional teaching method through the use of online teaching tools such as LMS, Interactive videos, and E-content. The interest of the students has increased profoundly and it has been clearly seen in the achievement of the B.Ed. students. Since there is already a technological revolution in the system of education, the teachers can very well make use of technology and integrate various technological tools available in the present day to enhance their teaching. This will definitely help the learners to develop interest in the subject and achieve more. As technology has a vital role in the process of education, every teacher should must become multifaceted with the use of it. This will definitely bring a progressive change in the achievement of the students in the subject they are taught with.

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