

Blended Learning Package: It's Effectiveness On Students' Performance And Retention In Higher Secondary Physics Course

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Abstract: Blended Learning popularly known as B-learning is an effective integration of face-to-face and online learning/E-learning to enhance the experience and through the utilization of ICT. Blended learning combines online delivery of educational content with the best features of classroom interaction. Based on the interactions with the experienced teachers in Physics, it has been noted that the performance of the higher secondary learners in physics course is not satisfactory and needs immediate attention. To overcome this problem, an experimental study has been carried out to study the effect of blended learning package on higher secondary learners' performance and retention in physics. This study examined: post-test performance and retention performance of students in Physics when learned through blended learning and traditional lecture method. The study adopted a Quasi-experimental design. The sample was drawn from higher secondary school in Karaikudi, Sivagangai District, Tamil Nadu, India. Respondents were 40 students (21 male and 19 female). The findings revealed that: (i) there was a significant difference in the post-test scores of experimental and control groups and (ii) there was a significant difference in the retention test scores of experimental and control groups. The study concluded that blended learning significantly improves students' achievement and retention capacity. Therefore, the study recommended that this advent of learning which combines both face to face and online delivery can effectively be utilized in learning Physics to enhance the performance and retention among higher secondary learners.

Keywords: Blended Learning, Traditional lecture method, Learning achievement, Retention

1. INTRODUCTION

Technology-enabled learning is emerging as a significant component of instructional materials in the present educational context. The rapid changes in technology have divulged the deficiencies in traditional education system; therefore, this has manipulated the educators to discover new ways to meet new necessities that have emerged in education. In the last two decades, pedagogy has undergone unprecedented change with an innovative focus on interactive, more student-centred learning. This has been driven to a significant extent by technological innovation. A key part of this evolution is e-learning or online learning, and has become a key element of present education as students become more computer literate, computers become more readily available and the demand for technology-based learning at a time expedient to the learner increases. In traditional pedagogies context, lecture method is one of the primary methods used to large size classroom teaching. Teachers were positioned at a dominant role in the teaching-learning process, whereas the students were restricted to performing as mere disciples. In this teacher-centred process, students were passive listeners and the teacher had all authority to resolve what do teach, whom to teach and vitally when to teach. But it has been noted that the face to face mode also has some advantages which should be retained. The research studies about the perception of students in traditional classes indicate that the students were more satisfied with the clarity of instruction [1].

Akkoyunlu and Soyly [2] mentioned that the highest grade of students' perceptions is given to a face-to-face environment that learning is best linked with classroom teaching. Thus, the studies carried out by Akkoyunlu & Soyly and Chen and Jones supported face-to-face learning. Whereas, some of the studies support e-learning and online learning environment for effective learning. Hence, it is essential to integrate both online and face to face approaches for effective teaching and learning process. This integration triggered an approach known as Blended Learning.

Blended Learning

Blended learning is one of the e-learning models integrating an online course and face-to-face classroom by optimizing the use of ICT as instructional media in order to enhance the teaching and learning experience for the students and teachers. Selvakumar & Sivakumar [3] suggested that the blended learning is the one of e-learning modalities incorporating an online course and real face-to-face classroom by augmenting the utilization of ICTs as instructional media to enrich the teaching-learning experiences for the teachers and students. The term blended learning is usually understood as denoting to formal and classroom approaches. Blended learning environment contain not only the physical presence of instructors and learners but also the learners' ownership and control of the time, place, path, setting, and pace at which learning takes place [4]. There are a wide variety of definitions of blended learning which are given below; "A course that blends online and face-to-face delivery. A substantial proportion of the content is delivered online, typically uses online discussions, and typically has some face-to-face meetings." The Sloan Consortium defines blended courses as having between 30 percent and 79 percent of their content delivered online, with the remaining portion of the course content delivered by face-to-face instruction or other non web-based methods, such as paper textbooks [5]. The combination of multiple approaches to

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learning. Blended learning can be accomplished through the use of 'blended' virtual and physical resources [6]. According to Elliot Masie [7], blended learning include combinations such as: blending classroom instruction with online instruction, blending online instruction with access to a coach or faculty member, blending simulations with structured courses, blending on-the-job training with brown bag informal sessions, blending managerial coaching with e-learning activities. Thus, Blended learning combines classroom learning with online learning, in which students can, in part, control the time, pace, and place of their learning. This term increasingly used to describe the way ICT based learning is being combined with traditional classroom methods to create a new, hybrid teaching-learning process. It represents much more than that of simply adding computers in classrooms. Graham, Allen and Ure [8] initiate that people chose blended learning for three causes: (i) improved pedagogy, (ii) increased cost-effectiveness, and (iii) improved access or flexibility. Some researchers have discussed that blended learning methodologies enrich the level of active learning approaches, peer to peer learning approaches, and learner-centred approaches used [9] [10]. The significant aspect of blended learning method is to cover the various learning needs of the learners who have multi learning styles and preferences [3].

Objectives of the study

The main objective of this study was to study the effectiveness of blended learning on Higher Secondary School Students' performance in Physics. The other objectives of this study were:

- To determine the significance of difference(s) in the post-test performance of students learned physics through Blended Learning Package (BLP) and those learned using the Traditional Learning method (TLM).
- To examine the significance of differences(s) between the retention of students learned physics through the BLP and those learned using the TLM.

Research Questions

The following research questions were raised in the study:

- Is there any difference in the post-test performance of students learned physics course using the BLP and those learned using the TLM?
- Is there a difference between the retention performance of students learned physics using the BLP and those learned using the TLM?
- Is there a difference exists between genders in terms of academic achievement in physics after experimental treatments?

Research Hypotheses

Based on the above research questions, the following null hypotheses were formulated for this study:

H₀₁: There is no significant difference in the post-test performance of students learned physics through the BLP and those learned with TLM.

H₀₂: There is no significant difference in the retention performance of students learned physics through the BLP and those using the TLM.

H₀₃: There is no significance of difference exists between genders in terms of post-test scores in physics after experimental treatments.

Significance of the Study

The outcome of the study may assist as a useful roadmap for curricular planning to incorporate Blended Learning in Physics at the higher secondary level. The outcome of this study would also assist learners enhance their preparation for exam, positively change their perception about physics, through blended learning. This may also develop learners' computer knowledge which may aid to comfort their fear and lack of preparedness. More over, the outcome of this study would help the educational administrators to plan, execute and assess a strategy for blended learning and to promote the quality of teaching-learning process.

RESEARCH METHODOLOGY

To answer the research question a pre-test and post-test Quasi-experimental were adopted for the present investigation.

Sample

The investigators has chosen sample for the present study by using purposive sampling technique from the Alagappa Model Higher Secondary School, in Karaikudi. A total sample of 40 students (21 male and 19 female) from Computer Science and Biology groups were selected based on their percentage of marks secured in their previous examination and formed a homogenous group. Further, these 40 students were divided equally using simple random sampling technique into two groups namely the control group (10 male and 10 female) and experimental group (11 male and 9 female) and both groups consisted 20 students each. For the control group, the traditional method namely lecture method was followed, whereas for experimental group blended learning method was adopted.

Study tools and Procedure for Implementation

To respond the study questions and main objectives, the investigator selected the unit entitled 'Gravitation', in the Physics Textbook volume II for 11th standard new syllabus. Further, the unit content was analysed and numerous learning objectives were recognized. After the identification of unit, the investigator developed the Blended Learning Package (BLP) comprised of a content-based unit, various activities, numerous selected videos and other relevant E-resources. The developed packages were handed over to the subject experts, technical experts and experienced school teachers to give expert opinion. Based on their suggestions, some modifications were carried out in the package. Then, the investigator developed a Physics Achievement Test (PAT) to measure the academic achievement level among 11th standard students, which consisted of 20 questions of multiple-choice questions and dichotomous questions. The reliability of Physics Achievement Test (PAT) using Cronbach Alpha was 0.88. The pre-test was administered at the beginning of the experimentation to both control and experimental groups. The investigator administered the BLP on experimental

group and TLM on control group for four weeks. At the end of the treatment, control and experimental groups responded to the post-test. After a month of the experimentation period, a retention test was conducted to determine the retention level of the students.

Statistical Treatments

Data obtained from the research is analyzed with the Statistical Package for Social Sciences (SPSS), and all objectives are tested at the 0.99 confidence interval. Parametric tests are used in the analyses with the assumption of typically distributed data. The researcher used the descriptive analysis (Mean & SD) and Differential analysis ('t'-test) to find out the effectiveness of the BLP on students' performance and retention. An independent sample t-test is used for comparison of independent variables, paired-samples t-test is used for comparison of dependent variables.

Results

To establish the homogeneity of control and experimental groups, the significance of differences between the mean values of pre-test scores of the groups are calculated by using 't' test. The results are shown in table (1)

Table 1: Significance of differences between pre-test mean value scores of control and experimental groups

Group	N	Mean	SD	df	t	Standard Error
Control	20	4.65	1.040	38	0.7995	0.375
Experimental	20	4.95	1.317			

Table 1 shows at a glimpse that the difference between the control and experimental groups was insignificant as the mean score and standard deviation for the control group are 4.65 and 1.040 respectively while for the experimental group 4.95 and 1.317 respectively. The calculated value of t-test is 0.7995 which is not statistically significant at the 0.01 level. The result reveals that there is no statistically significant difference between mean values of students of control and experimental groups in the pre-test. Thus, the homogeneity of the groups is well established before the treatment.

Study Variables

The independent variables in this study are Blended Learning Method and Traditional Learning Method and the dependent variable of the study is academic achievement.

Results on Hypotheses

H₀₁: There is no significant difference in the post-test performance of students learned physics through the BLP and those learned with TLM.

Table no (2) describes the analyses for testing this hypothesis,

Table 2: Significance of Differences between control and experimental groups in their post-test performance

Group	N	Mean	SD	df	t	Standard Error
Control	20	13.85	1.663	38	6.0648	0.488
Experimental	20	17.10	1.410			

Group	N	Mean	SD	df	t	Standard Error
Control	20	10.65	1.268	38	12.57	0.422
Experimental	20	15.95	1.395			

Table 2 shows that the difference between the control and experimental groups was significant as the mean score and standard deviation for the control group are 13.85 and 1.663 respectively while for the experimental group 17.10 and 1.410 respectively. The calculated t-test value is 6.0648 which is statistically significant at the 0.01 level. Here, the null hypothesis is rejected. This result indicates that there was a significant difference in the academic achievement of students learned physics using BLP and those learned using the TLM as reflected in the mean and SD. The use of BLP is more effective than TLM in terms of students' performance in physics academic achievement.

H₀₂: There is no significant difference in the retention performance of students learned physics using the BLP and those using the TLM.

Table no (3) describes the analyses for testing this hypothesis,

Table 3: Significance of Difference between control and experimental groups in their retention-test performance.

Group	N	Mean	SD	df	t	Standard Error
Control	20	10.65	1.268	38	12.57	0.422
Experimental	20	15.95	1.395			

Table 3 shows that the difference between the control and experimental groups was significant as the mean score and standard deviation for the control group are 10.65 and 1.268 respectively while for the experimental group 15.95 and 1.395 respectively. The calculated t-test value is 12.57 which is statistically significant at the 0.05 level. Hence the null hypothesis is rejected. This result indicates that there was a significant difference in the retention scores of students learned physics using BLP and those learned using the TLM as reflected in the mean and SD. The use of BLP is more effective than TLM in terms of retention level of the students.

H₀₃: There is no significant difference exists between genders in terms of post-test scores in physics after experimental treatments.

Table no (4) describes the analyses for testing this hypothesis.

Table 4: Results of t-test at academic achievement level between male and female students of posttest scores attributed to gender variable (Experimental group).

Gender	N	Mean	SD	df	t	Standard Error
	11				2.046	0.586

Male		17.64	1.12	18		
Female	09	16.44	1.504			

It is evident from the table (4), that the post-test mean value of male students of experimental group is 17.64 with standard deviation 1.12 and the post-test mean value of female students is 16.44 with standard deviation 1.504. The calculated t-value 2.046 is no statistically significant at (0.01) significance level. Hence the null hypothesis is accepted. This result can be interpreted that students whether males or females are similar in using modern technological methods because of the availability of modern technological gadgets as a result of the huge scientific and technological development and easiness to access.

Summary of Findings

Table 1 revealed that the pretest mean values of control and experimental groups is not differ significantly. Hence, the homogeneity of the group was established. A similar finding was also made Kazu and Demirkol [11], Yildiz, & Ocak[12] and Sivakumar [13] which reveals that there was no significant difference found between control and experimental groups at the pre-test level. It is evident from table 2, the post-test mean value of experimental group was higher than the mean values of control group. This finding indicated that the Blended learning is effective than the Traditional Learning method in terms of the performance in physics at higher secondary level. This finding also agreed with the earlier findings of Lin, Tseng & Chiang [14], Ceylan & Kesici [15] and Kaur & Singh [16], Sivakumar [13] which concluded that the experimental group was academically more successful than the control group. Sitzmann, Kraiger, Stewart, & Wisner [17] led a meta-analysis of 96 experimental studies on online and lecture-based classroom between the year of 1996 and 2005. Their findings designate that blended learning method is more effective than face-to-face classroom only method instruction for teaching and learning. It is concluded from Table 3 that the experimental group shows high retention score than that of control group. Hence, Blended learning package has high retention than the Traditional Learning Method. This finding is consistent with research finding made by Makinde and Yusuf [18] who expressed that the retention performance of students taught using flipped classroom was higher than the students taught using traditional method. Ibrahim & Haruna [19] found that results of their study demonstrate enhancement in the performance and retention ability of students when flipped teaching method was implemented. Vimalkumar and Sivakumar [20] found that the blog based learning is effective in learning physics in terms of retention performance. Table 4 indicates, the academic achievement level of male and female students exhibited same level in learning physics at higher secondary level. This finding is supported by the study made by Elian and Hamaidi [21] who explored that no statistically significant differences in the means on the academic achievement attributed to gender variable. Daphine and Sivakumar [22] emphasized that the Technology can effectively be utilized to eliminate gender disparity.

RECOMMENDATIONS

Based on the findings and conclusions of this study, the following recommendations were prescribed:

- Effectiveness of Blended learning in physics has been established beyond the shadow of a doubt. Hence, the newer instructional technology using Blended learning can be introduced for the school students.
- Blended learning is an effective tool for teaching-learning process to enhance achievement in physics. The school educational administration may insist on the teachers in developing and implementing the blended learning strategies on their own to educate their students.
- The department of school education may conduct an in-service training programme and workshops on developing blended learning environments for school teachers.
- The Tamil Nadu Teacher Education University (TNTEU) and National Council of Teacher Education (NCTE) should include Blended Learning as a compulsory component under theoretical and practical stream. Hence the pre-service teachers can be well trained for Blended learning based instructional strategies.
- The educational administration may insist the administrator monitor the usage of blended learning strategies and provide proper feedback for students and teachers.
- More researches should be done to analyze availability and utilization of resources and as well as supplementary technical supports to make sure smooth and effective implementation of blended learning.
- If the blended learning method of teaching is adopted at school levels, it can assist to develop students' involvement in instructional activities through enriched confidence. Hence, in order to trigger the students' involvement in instructional activities the blended learning can effectively be utilized.

CONCLUSION

The technological revolution has transformed many aspects of our present educational scenarios. M-learning, Blended Learning, Virtual learning, Gamification, and Artificial Intelligence in Education has made a tremendous changes in pedagogy. Before the implementation of these innovative strategies, it is indispensable to test the ground reality at gross root level. Hence, this research intended at exploring the effectiveness of blended learning package on the academic achievement in physics at higher secondary level. The results revealed that students who learned through the blended learning strategy got higher scores in the academic performance than students who learned through the traditional learning method. It also evidenced that the retention performance of students in physics was high in Blended learning. In addition, there were no statistically significant differences between male and female students of experimental group in terms of academic achievement. The findings encourage teachers of physics to utilize Blended Learning methods as it enhanced the academic achievement and retention of students.

ACKNOWLEDGEMENT

This article has been written with the financial support of RUSA-Phase 2.0 grant sanctioned vide Letter No. F.24-5112014-U, Policy (TN Multi-Gen), Dept. of Edn, Govt. of India, Dt.09.10.2018.

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