



## **THE IMPACT OF BLENDED LEARNING ENVIRONMENT ON ACADEMIC ACHIEVEMENT OF HIGH SCHOOL STUDENTS**

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### **ABSTRACT**

*Higher education has become an important area of focus in India. With the initiatives of the current government like there is a greater emphasis on the learning outcome in higher education. Technology based education brings engaging experiences to the students. A hybrid approach which is a mix of online, technology based and class room teaching is the best strategy for imparting knowledge. The current study aims at understanding the impact of blended learning environment on student performance along with the mediating role of student engagement. The results from the study reflect that blended learning have a positive impact on student performance. The blended learning enhances the engagement level of the students and thus the performance of the students also increases.*

### **INTRODUCTION**

Environmental education is the most effective method to protect our environment- which aims at finding the best method for presenting information, determining quality of functions and executing a structure which in turn can be a ground for improving Environmental awareness all around the society (Moharral Neghad and Heydari, 2006). Paying attention to the process of teaching Environmental issues and being familiar with the new pedagogical methods on local and national levels as means of improving people's knowledge about their environment is so important (Mahmodi and Veisi, 2005). Environmental education refers to some organized efforts which teach the ways in which our environment works. It especially

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teaches management of human beings behavior and ecosystems, in order to reach constant life.

Shortcomings of traditional and electronic methods necessitate more endeavors to find better methods which can utilize advantages of both methods. Lastly, a new educational model has been made which is called as “blended electronic learning”. During the past decade, technological advances have caused minimization of the differences between traditional education and electronic education; that is because both of them have their own advantages and shortcomings. Numerous studies have conducted on use of data, on line and off line activities and to investigate learning strategies which incorporate educational potential of on line and face to face educational methods. In fact, the term blended electronic learning has been coined from these studies.

Blended learning has been referred to as the third generation of distant educational systems. First generation was correspondence method; in which an educational package was being delivered to a learner via post offices, television or radio stations. The second generation was a unique distant education, such as computer-based or webbased learning. The third generation is blended learning which incorporate the best characteristics of both the previous methods into it (Pheeps and Meriotees,1999; by So and Brush,2008). Blended learning cause significant improvements in levels of active learning strategies, student to student learning strategies and student based learning strategies (Hartman,Duziuban and Moskal,1999; Morgan,2002). At last and based on what was said about advantages and shortcomings of electronic, face to face or traditional, and blended electronic education, the main goal of this study is to compare and determine efficacy of each method in accomplishing the goals of environmental education at high school level.

### **Blended Learning Environment**

The concept of blended learning has been defined by several researchers and scholars. For instance, Singh and Reed (2001) defined blended learning as a learning program where more than one delivery mode is being used to optimize the learning outcome and cost of program delivery. According to Thorne (2003), blended learning is a way of “meeting the challenges of tailoring learning and development to the needs of individuals by integrating the innovative and technological advances offered by online learning with the interaction and participation offered in the best of traditional learning” (p. 2).

The above definitions indicate that blended learning can combine the advantages of both traditional face-to-face learning and e-learning and avoid the drawbacks of the two learning modes. The effectiveness of blended learning has been demonstrated by many studies, for example, the findings of a meta-analysis have shown that blended learning brings more

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positive impact on students learning than online and face-to-face learning (BatdÄ, 2014). Despite the merits of blended learning itself, the effectiveness is determined by the proper design. How to achieve the equilibrium between e-learning and face-to-face modes is crucial to the success of the blended learning environment (Osguthorpe and Graham, 2003).

### **Perceptions of Blended Learning Environment**

It has been acknowledged that students' perceptions and satisfaction are important for determining the quality of blended learning environment (Naaj et al., 2012). Studies have been conducted to examine students' views regarding a blended learning environment and factors influencing it. For example, Bendania (2011) study found that students hold positive attitudes toward the blended learning environment and the influencing factors mainly include experience, confidence, enjoyment, usefulness, intention to use, motivation, and whether students had ICT skills.

The positive view was also reported in the study done by Akkoyunlu and Yilmaz (2006), and it was found to be closely related to students' participation in the online discussion forum. Findings from other studies (e.g., Dziuban et al., 2006; Owston et al., 2006) also revealed students' positive attitudes toward the blended learning environment, and the satisfaction could be attributed to features like flexibility, convenience, reduced travel time, and face-to-face interaction.

Some studies, however, reported some negative perceptions of the blended learning environment. For example, the results of the study of Smyth et al. (2012) showed that the delayed feedback from the teacher and poor connectivity of the internet were perceived as major drawbacks of the environment. In another study conducted by Stracke (2007), lack of reciprocity between traditional and online modes, no use of printed books for reading and writing, and use of the computer as a medium of instruction was considered as major reasons for students withdraw from the blended course. These findings indicate that students' negative attitudes toward the blended learning environment mainly come from the inadequate design (Sagarra and Zapata, 2008).

The review of the above studies indicates that applying ICT tools to cultivate awareness has gained much popularity and produced positive results. Few studies, however, focus on students' perceptions of a learning environment designed to promote awareness despite the fact that many studies have been conducted to explore students' perceptions of a blended learning environment in general. Therefore, the purpose of the current research is to investigate students' perceptions of a blended learning environment with the orientation of creating awareness towards the students.



### **Objectives of the study**

In accordance with this main aim, the objectives presented below are investigated:

1. To find out the significance of the difference in the academic achievement of control group students between pre- and post-tests.
2. To know whether there is any significant difference in the academic achievement of experimental group students between pre and post-tests.
3. To assess the significance of the difference in post-test academic achievement scores of experimental and the control groups students.

### **Purpose**

The aim of this research is to analyze the impact of blended learning environment on high school students' engagement and academic achievement. Under the general purpose of this research, the following sub-objectives are to be investigated:

- Is there a significant difference between post-test achievement scores of students in the experimental group and the control group of students?
- Is there a significant difference between pre-test and post-test student engagement scores of students in the experimental group and the control group of students?
- Is there a significant difference between the developments of experimental and control group student engagement?

### **Hypotheses**

1. There is no significant difference in the academic achievement scores of control group students between pre and post-tests when the subject is learned through Teacher Based Environment (TBE)
2. There exists a significant difference in the academic achievement scores of experimental group students between pre and post-tests when the subject is learned through Blended Learning Environment (BLE).
3. There is a significant difference in the post-test performance between the control and the experimental groups of students.
4. There is no significant difference in the mean gain scores of the experimental group in terms of gender.

### **Methodology**

### **Research Design**

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A quasi-experimental design was adopted to explore the impact of the blended learning environment on students' academic achievement. The selection of the design was based on the recommendation of [17] who stated that quasi-experimental design should be accepted when research includes finding out about the impact of a treatment on a group of people. The independent variables of the study are Blended Learning Environment (BLE) and Teacher Based Environment (TBE) the dependent variable is academic achievement in Physics

**Table 1: Design of the study**

S.No.	Group	Pre-test	Treatment	Post-test
1.	Control	Achievement test	X <sub>LB</sub>	Achievement test
2.	Experimental	Achievement test	X <sub>BL</sub>	Achievement test

### Participants

The participants of the study consisted of 50 students studying Diploma course in Basic Engineering and having the subject Physics in a Government Polytechnic college in the 2018-2019 academic year. A homogenous group of 50 students selected based on age, and academic achievement, of which 25 students were randomly assigned to the experimental group (Male-13 Female-12) and another 25 students were randomly assigned to control group (Male-14 Female-11). Before the treatment, all participants received training for primary computer-oriented skills to avoid probable problems inefficient utilization of computers and internet throughout the experimental process.

### Procedure

For the present investigation, Station Rotation Model described by Heather Staker and Micheal B.Horn [18] has been implemented. According to them, in this particular model students rotate on a fixed schedule or at the teacher's discretion among classroom-based learning methods. This model contains at least one station for online learning mode. Other stations may include activities such as small group or full - class instruction. Some adaptation involves the entire class interchanging among activities together, whereas others divided the class into a small group or one by one rotation [5]. In the present study, the teacher-led instruction method was given to the entire class, whereas for collaborative activities the class was divided into four groups. Each group had four members. On line learning was offered separately to the students. Based on the expert's opinion, the investigator selected the unit entitled „Heat“ and „Thermodynamics“, in the Engineering Physics volume II for Diploma in Basic Engineering syllabus for the development of Blended Learning Environment (BLE) and Teacher Based Environment (TBE). Besides, the learning content was analyzed and various learning objectives were recognized. After the identification of the unit, the investigator developed the Blended Learning Environment (BLE) comprised of a content-

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based unit, various selected videos and other relevant E-resources. The developed package was handed over to the technical experts, subject experts, and senior lecturers to give experts' opinion. The comments and notes of the experts were considered and some alterations were carried out in the development of the package. Then, for the development of Lecture Based Environment the investigator constructed conventional lesson plans based on Bloom's taxonomy. An achievement test was also constructed to measure the academic achievement level among students, which involved 25 questions of dichotomous questions and multiple-choice questions. The calculated reliability value of Achievement Test using Cronbach Alpha was 0.79 and this value is accepted for the purposes of this study.

### **Data Collection**

The study included two groups of participants. The experimental group was learned through using BLE and the control group was through TBE. The above methods were adopted in six weeks to both groups. The pre-test was conducted at the commencing of the treatment to both control and experimental groups. The investigator administered the BLE on experimental group and TBE on control group for six weeks. At the end of the treatment session, control and experimental groups responded to the post-test.

### **Data Analysis**

The researchers utilized the following statistical analyses: i) Means and Standard Deviations to compute academic achievement with respect to group variable, ii) T-test to check the equalization of study groups and to calculate the significance of the difference in the effect of group on academic achievement. Data attained from the study is analyzed with SPSS, and hypotheses of the study are tested at the 0.95 ( $p=0.95$ ) confidence level.

## **FINDINGS**

### **Results**

In this section, the results and discussion about the data analysis related to the objectives are given hereunder. The results of the independent samples t-test with respect to academic achievement pre-test scores of the control and experimental group students before adopting the treatment are given in table-2.

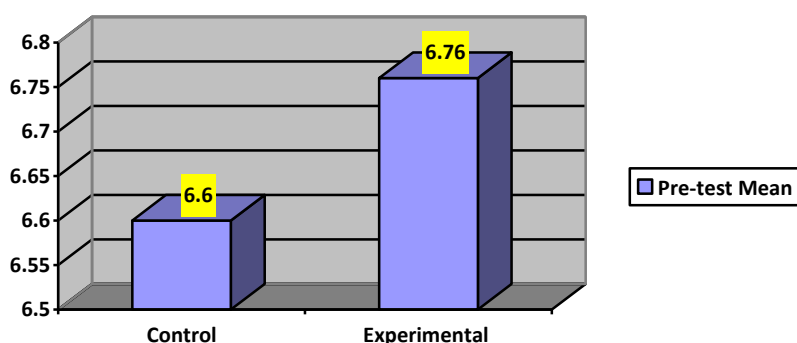
**Table 2: The results of the t-test according to the Pre-test scores of the control and experimental groups**

S.No.	Group	N	Mean	SD	df	t	P
1.	Control	25	6.6	1.258	48	0.4878	0.6279
2.	Experimental	25	6.76	1.052			

As table 2 shows, the average pre-test scores of the students in the control group is 6.6 with standard deviation 1.258, whereas the average pre-test scores of the students in the experimental group is 6.76 with standard deviation 1.052. It is seen that the average scores of the two groups are very close to one another. The difference between the average pre-test scores of the students which based on two different groups is statistically not significant [ $P=0.6279 > 0.05$ ]. According to this result, it can be inferred that the academic achievement of both groups are similar that no statistical difference has been found. Thus, the homogeneity of the groups is well established before the treatment

**Figure 1: Graphical representation of pre-test mean values of the control and experimental groups.**

**B. Results on Hypotheses**



H01: 1. There is no significant difference in the academic achievement scores of control group students between pre and post-tests when the subject is learned through Teacher Based Environment (TBE) Table no (3) refers to the analyses for testing the above hypothesis,

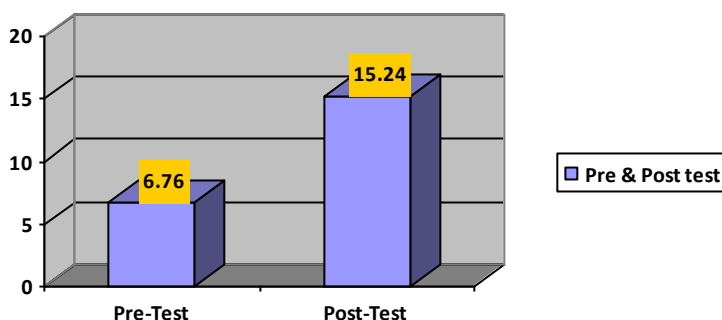
**Table 3: The results of the t-test according to the pre and post-tests scores of the control group.**

S.No.	Test	N	Mean	SD	df	t	P
1.	Pre-test	25	6.6	1.258	48	11.099	0.00
2.	Post-test	25	11.64	1.890			

As table 3 shows, the average pre-test score is 6.6 with a standard deviation of 1.258, whereas the average post-test score is 11.64 standard deviation 1.890 of the control group students

who were learned by the LBE. It is seen that the average scores of the two groups are not close to another. The difference between the average pre-test and post-test scores of control group students is statistically significant [ $p=0.00<0.05$ ] Hence, the null hypothesis is rejected. Based on this result, their academic achievement was better in post-test performances.

**Figure 2: Graphical representation of Pre and Post-test mean scores of the control group analysis.**



H02: 2. There exists a significant difference in the academic achievement scores of experimental group students between pre and post-tests when the subject is learned through Blended Learning Environment (BLE) Table no (4) refers to the analyses for testing the above hypothesis,

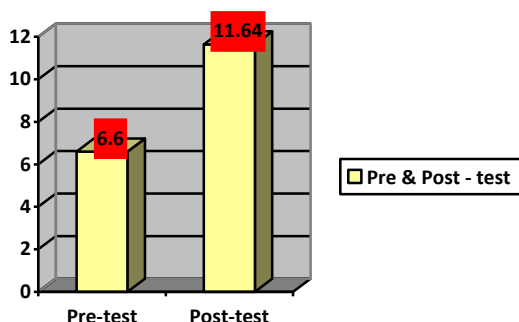
**Table 4: The results of the t-test according to the pre and post-test scores of the experimental group.**

S.No.	Test	N	Mean	SD	df	t	P
1.	Pre-test	25	6.76	1.052	48	18.42	0.00
2.	Post-test	25	15.24	2.047			

As table 3 shows, the average pre-test score is 13.85 with a standard deviation of 1.052, whereas the average post-test score is 15.24 with standard deviation 2.047 of the experimental group students who were learned by the BLE. It is seen that the average scores of the two groups are not close to another. The difference between the average pre-test and post-test scores of experimental group students is statistically significant [ $p=0.00<0.05$ ] Hence, the hypothesis is accepted. Based on this result, it is inferred that students' academic achievement is higher in post-test than pre-test scores.

**Figure 3: Graphical representation of Pre and Post-test mean scores of the experimental group analysis**





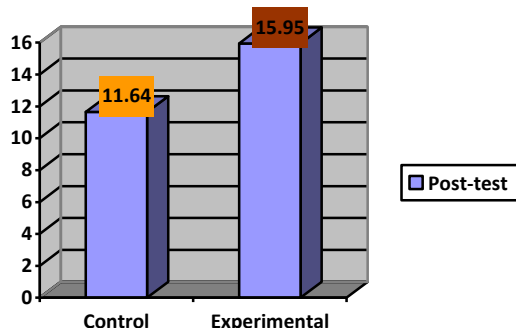
H03: 3. There is a significant difference in the post-test performance between the control and the experimental groups of students. Table no (5) refers to the analyses for testing the above hypothesis.

**Table 5: The results of the t-test according to the post-test performance between the control and experimental groups**

S.No.	Group	N	Mean	SD	df	t	P
1.	Control	25	11.64	1.89	48	6.460	0.00
2.	Experimental	25	15.95	1.395			

It is evident from the table (4), the average post-test score of the control group is 11.64 with a standard deviation of 1.89, whereas the experimental group is 15.95 with standard deviation 1.395. It is seen that the average scores of two groups are not close than another. The difference between the average post-test scores of both control and experimental groups are statistically significant [ $p=0.00 < 0.05$ ]. Hence, the hypothesis is accepted. Moreover, the academic achievement of the experimental group students is higher than the achievement of the control group students.

Figure 4: Graphical representation of post-test mean scores of the control and experimental groups analysis.



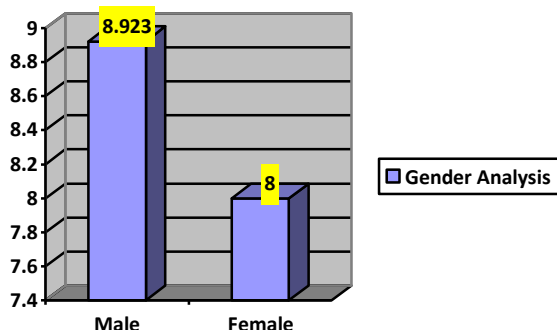
H04: 4. There is no significant difference in the mean gain scores of the experimental group in terms of gender. Table no (6) refers to the analysis for testing the above hypothesis.

**Table 6: The result of the t-test according to the mean gain scores of the experimental group in terms of gender.**

S.No.	Variable	N	Mean Gain	SD	df	t	P
1.	Male	13	8.923	1.498	23	1.773	0.0896
2.	Female	12	8.000	1.044			

As table 5 shows, the mean gain score of male students is 8.923 with standard deviation 1.498, whereas the mean gain of female students score is 8.000 with standard deviation 1.044 of the experimental group students who were learned by the BLE. It is seen that the mean gain scores of the two groups are close to another. The difference between the mean gain scores of experimental group students is statistically not significant [ $p=0.0896>0.05$ ]. Hence, the null hypothesis is accepted. Based on this result, it is inferred that there exists no significant difference between the gain scores of the experimental group in terms of gender.

**Figure 5: Graphical representation of mean gain scores of the experimental group in terms of gender analysis.**



### Gap Closure Analysis

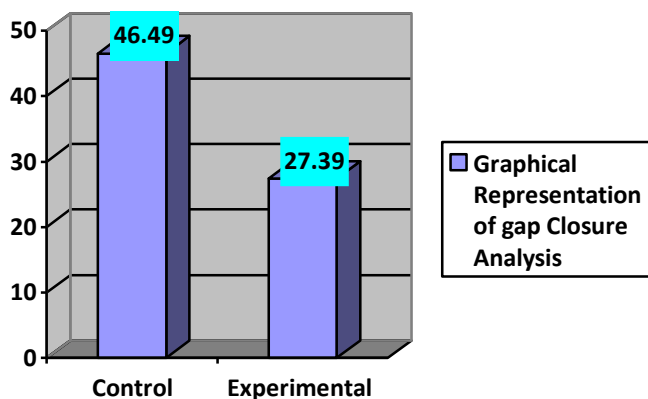
Gap closure denotes that the percentage of the gap covered (after the experimental treatment) as specified by the distance between post-test and pre-test mean scores. The gap closure points out to what extent which treatment has been effective.

**Table 7: Gap closure analysis of BLE and TBE**

S.No.	Group	Teaching Method	Pre-test Mean	Post-test Mean	Gap Closure
1.	Control	LBE	6.6	11.64	27.39
2.	Experimental	BLE	6.76	15.24	46.49

From table 6, reveals that the gap closure percentage of the control group is 27.39 and the experimental group is 46.49. The gap closure percentage of control group shows a low percentage of gain scores, whereas the gap closure percentage of experimental group shows a higher percentage of gain scores. From the analysis, BLE is more effective in enhancing academic achievement than TBE.

Figure 1: Graphical representation of gap closure analysis.



## DISCUSSION

The t-test analysis of the difference in the pre-test means values of control and experimental groups is not significantly differ [ $p=0.6279 > 0.05$ ]. Thus, the homogeneity of the group was established before the treatment. It can be said that the academic level and the readiness toward course are equal for the students both in the control and experimental groups. A few other studies Vimalkumar & Sivakumar, [19], Yildiz, & Ocak [14], Sivakumar [5], and Sivakumar & Selvakumar [11] are supporting this similar finding. From table 3, the difference between the average of pre and post-tests performance scores in terms of academic achievement of the students who learned through the LBE is found statistically significant [ $p=0.00 < 0.005$ ].

It is concluded that the post-test performance scores are statistically higher than the pre-test performance scores in terms of control group academic achievement. It is evident from the table 4, the difference between the average of pre and post-tests performance scores in terms of academic achievement of the students who learned by the TBE is found statistically significant [ $p=0.00 < 0.05$ ].

The findings revealed that the post-test performance score is statistically higher than the pre-test performance scores in terms of control group academic achievement. Based on the above two findings, academic achievement scores of the two groups are not similar between the pre and post-tests that significant difference has been found. These results show that the two different learning strategies (BLE & TBE) are efficient in terms of the academic achievement

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of students. Comparatively, experimental group mean difference (8.48) is greater than the control group mean difference (5.04). Hence, it is concluded that when compared to the TBE, the BLE is more effective in terms of academic achievement. The finding agreed with that of Vimalkumar & Sivakumar, [19], Sivakumar, [5] and Sivakumar & Selvakumar [11] studies. The study further revealed that the difference between the average post-test academic achievement of the students who learned based on two different learning methods is found statistically significant [ $p=0.00<0.05$ ]. The academic achievement of the students in the BLE is statistically higher than the ones in the TBE. The finding of the study was found to be the similar result with that of research by Acelajado [12], Saritepeci [13], Yildiz & Ocak [14], Sivakumar [5], and Sivakumar & Selvakumar [11] which were conducted by utilizing blended learning environments. Hence, it is vital to utilize BLE which increase the academic achievement of students. The analysis of null hypothesis four showed that the difference between the mean gain scores of the experimental group in terms of gender who learned BLE is found statistically not significant [ $p=0.0896>0.05$ ]. Hence, it is concluded that the academic achievement level of male and female students exhibited same level in learning physics at Diploma basic Engineering level and there is no gender influence. This finding is consistent with the studies Elian and Hamaidi [20], Selvakumar & Sivakumar [11] who explored that no statistically significant differences in the means on the academic achievement attributed to gender variable.

### **Research Implications**

**The research implications of this study as follows:**

- The results of the study found that the BLE is more effective than the LBE in enhancing academic achievement in physics at Diploma in Basic Engineering level. Hence, it is recommended to adopt Blended Learning Strategies in teaching-learning.
- Blended learning is an effective tool for teaching-learning process to enhance achievement in physics. The AICTE and DoTE may insist on the lecturers in developing and implementing the blended learning strategies in their classrooms.
- The government and AICTE should prepare the scheme to promote blended learning methodologies in technical education level. For example, providing training and workshops to educators and administrators. They should afford enough funding for implementing innovative blended learning environments.
- Educators, policymakers and government authorities can seek for the network with international organizations for the opportunity of exchanging knowledge and the best practices form other countries that have successfully implement this approach.
- More researches should be done to consider application and accessibility of resources and as well as add-on technical supports to make ensure effective and successful implementation of blended learning.

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## CONCLUSION

The main purpose of this study is to investigate the impact of the blended learning environment on students' academic achievement in high school students. The study results revealed that students who were learned through BLE got higher scores in the academic achievement test than students who were learned through TBE. The study findings encourage lecturers of Diploma in Engineering to teach students through Blended Learning Strategies as it improved the students' academic achievement. Further, the findings insist on preparing pre-service teachers to have suitable training to use novel teaching strategies raised from both recent technological development and techno - pedagogical development to cater the needs of the new generation learners.

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