



EFFECT OF BLENDED LEARNING APPROACH ON ACHIEVEMENT IN MATHEMATICS

Navdeep Sanwal

*Assistant Professor, Rayat College of Education, Railmajra, SBS Nagar

Abstract: *The present study investigates the effect of blended learning approach on achievement in mathematics. The sample of sixty students of 9th class was taken from DAV Public Sr. Sec. School Roopnagar, affiliated to PSEB, SAS, Nagar (Mohali). The major objective of this study was to distinguish blended learning approach from the traditional classroom teaching. Blended learning, a modern approach is the integration of face to face classroom interaction and e-learning environment. Instructional material based on blended learning approach were prepared and implemented to the experimental group after pre-testing. The gain scores were computed after post-test for all the students. The data was analyzed statistically with the help of Mean, SD, and t-ratio was used to arrive at the following conclusions: (i) The Post-test performance in mathematics of students taught through blended learning approach was significantly higher than that of pre-test performance. (ii) The Post-test performance in mathematics of students taught through conventional teaching approach was significantly higher than that of pre-test performance. (iii) The performance of students in mathematics taught through blended learning approach was significantly higher than that of conventional teaching approach and (iv) There is no significant difference found in the performance of male and female students.*

Key Words: Blended Learning, Achievement, Mathematics

Introduction: It is very well said that mathematics is mother of all the mothers, science of all the sciences and art of all the arts. It is the only subject which starts with mind and ends with a beautiful smile on the face of the learners after the successful completion of the problem. Every human being should have the basic knowledge about mathematics for various jobs in every discipline and mainly in the routine life activities they do. Knowledge of mathematics provides opportunities for learners to have meaningful and efficient learning experiences in their life. So it is the responsibility of the school mathematics teachers that they should encourage their students not only to score good grades in mathematics but to acquire quality mathematics knowledge and mathematical competencies needed in daily life and work place (Czemaik, Weber, Sandmann, & Ahern, 1999). It had been noticed everywhere in the world that there is high mathematics failure rate and big shortage of efficient and skilled workers with high quality mathematical competencies. Many educationists and mathematicians advised that the only way to successful and meaningful mathematics learning are logics, manipulative skills and very important is the instructional strategies in the teaching learning process. If we think to solve the above said problem, one thing comes in our mind that we should change mathematics entirely, but it is not possible. The only way is we can improve our methods of

instructions, designing of instructional activities and approaches to construct mathematics curriculum at school level (Stodolsky, Salk, & Glaessner, 1991).

Today in the age of information and technology, 21st century learners can learn at different locations at any time and they can continue learning unless and until they master a skill. It is the only approach which create flexible educational environment to fulfil variant learning needs of the learners and to help the teachers to make teaching learning and evaluation process more easy and effective. Thus, we can expect that quality in mathematics teaching, learning and evaluation can be enhanced by introducing e-learning approach in the class room along with the other teaching strategies which are already in use (Garrison & Vaughan, 2008).

Till date traditional teaching approach is only common approach used for large class teaching but the biggest challenge is that it does not allow the teacher a close tutorial supervision and individual interaction with the learners (Zou, 2005). It also creates barriers in individual interaction among learners. To solve this problem an advanced and innovative approach named 'Blended Learning Approach' can be used in the 21st century smart classrooms. The term blended learning completely came into existence with the publication of first handbook of blended learning by Bonk and Graham (2006). Through this approach teachers tries to combine traditional classroom teaching with e-learning in which a teacher can teach initial few lessons in class room and after the students have established a general idea of the subject, learner can proceed to e-learning and e-interaction with the teacher and other classmates. Blended learning is the approach of teaching and learning that integrate technology such as e-mails, streaming media, on line videos, power point presentations and internet surfing along with the traditional classroom teaching. So this approach has the advantages of both teacher dominated classroom environment and student oriented active e-learning environment.

Thus from the perspective of e-learning based mathematics instructions, the present study examines the effect of blended learning approach on the achievement in mathematics of 9th class learners. The study attempted to determine how to apply information technology within traditional classroom by using e-learning as a learning tool, a new approach for teachers and learners.

Need and Significance

Mathematics has been a complicated and boring subject for learners of all ages till date. A single negative experience like impartial behaviour of the teacher, wrong method of instruction, unsatisfactory interpretations of the problem, defective curriculum, over burden in the classroom etc., in mathematics class at school level is enough to create a negative attitude to learn mathematics in the higher class. The question is whether learner's failure to learn mathematics can be attributed to the factors like defective curriculum; defective methods of teaching used by teachers or may be the sum of all these factors. Hence most of reasons behind student's failure in learning mathematics are mainly due to defective curriculum, teaching methodology and strategies, as we know that the educational field is being developed and transformed very quickly now days but still today our teaching methods to teach and learn mathematics remains same. In view of the above said evidences, now the question arises whether the blended learning approach has any impact on student's

achievement in mathematics and hence, here lies the rationale of this present study. Blended learning is the blending of routine classroom learning with the active learning strategies and e-learning approach. Therefore the investigator made an attempt to determine the effect of blended learning approach on achievement in mathematics.

Objectives

1. To compare the pre-test and post-test performance of blended learning approach group.
2. To compare the pre-test and post-test performance of conventional teaching approach group.
3. To compare the performance of groups taught through blended learning approach and conventional teaching approach.
4. To compare the performance of male and female learners in mathematics.

Hypotheses

H₁: There will be no significant difference in pre-test and post-test performance of blended learning approach group.

H₂: There will be no significant difference in pre-test and post-test performance of conventional teaching group.

H₃: There will be no significant difference in the performance of group taught through blended learning approach and group taught through conventional teaching approach.

H₄: There will be no significant difference in the performance of male and female students of experimental and control group.

Methodology of the Study

It is necessary to adopt a systematic procedure to collect the necessary data which helps to test the hypotheses of the study under investigation. Various steps of research methodology followed in present study are as follows:

Sample

The study was conducted on a sample of sixty students of 9th class of DAV Public Sr. Sec. School, both male and female of Roopnagar, affiliated to PSEB, SAS Nagar (Mohali). The two intact sections of thirty students were formed. The two intact sections were named as experimental and control group. It was purposive sample.

Design

The study was experimental in nature. A pre-test and post test factorial design was employed. The experimental group was taught through blended learning approach and control group was taught through conventional teaching approach. The variable learning approach was independent variable and gain performance score was the dependent variable which was calculated as the difference in post- test and pre – test scores.

Tools Used

1. Achievement test in Mathematics prepared by the investigator.
2. Five Mathematics Lesson Plans (Geometry and Menurations) based on Blended Learning approach and conventional teaching approach prepared by the investigator.

Procedure

After the selection of sample and allocation of students to the two instructional strategies, the experiment was conducted in three parts i.e. firstly; a pre-test was administered to the students of both the treatment and control group. The answer sheets were scored to obtained information regarding the previous level of achievement. Secondly, the experimental group was taught through blended learning approach and control group was taught through conventional teaching approach by the investigator. Thirdly after the completion of the course, the post test was administered to the students of both the groups. The answer sheets were scored with the help of scoring key. Time limit for the test was 45 minutes. The scores of experimental and control group was compared according to their pre test and post-test scores. The difference was the gain achievement scores.

Analysis and Interpretations of the Results

Analysis of Achievement Scores

The analysis of the obtained data was done by statistics such as mean, SD and t-ratio techniques were used. The results are presented in table 1, 2, 3, and 4.

Table-1: Significance of mean difference of pre and post test mathematics scores of blended learning approach group

Variable	Post-test Scores			Pre-test Scores			SE _D	t-ratio
	N	Mean	SD	N	Mean	SD		
Blended Learning Approach	30	49.14	16.67	30	21.02	6.02	3.23	8.68**

***Significant at 0.01 level of significance
(Critical Value 2.00 at 0.05 and 2.66 at 0.01 level, df 58)*

Table-1 shows that post test performance mean scores of blended learning approach group is 49.14, which is higher than pre-test performance mean scores 21.02, of conventional teaching approach group. The t-value testing mean difference of post and pre test of blended learning approach is 8.68, which in comparison to table value was found significant at 0.01 level. Hence hypothesis H₁: There will be no significant difference in pre-test and post-test performance of blended learning approach group is rejected. Results indicated that blended learning approach group performed better after the treatment given by the investigator.

Table-2: Significance of mean difference of pre and post test mathematics scores of conventional teaching approach group

Variable	Post-test Scores			Pre-test Scores		SE _D	t-ratio
	N	Mean	SD	N	Mean		
Conventional Teaching Approach	30	24.96	7.69	30	19.88	1.49	3.41**

***Significant at 0.01 level of significance
(Critical Value 2.00 at 0.05 and 2.66 at 0.01 level, df 58)*

Table-2 shows that post test performance mean scores of conventional teaching approach group is 24.96, which is higher than pre-test performance mean scores of 19.88 of conventional teaching approach group. The t-value testing mean difference of post and pre test of conventional teaching approach is 3.41, which in comparison to table value was found significant at 0.01 level. Hence hypothesis H₂: There will be no significant difference in pre-test and post-test performance of conventional teaching group is rejected.

Table-3: Significance of mean difference of performance gain scores in mathematics of blended learning approach and conventional teaching approach groups

Variable	Blended Learning Approach			Conventional Teaching Approach			SE _D	t-ratio
	N	Mean	SD	N	Mean	SD		
Gain Scores	30	28.12	10.91	30	5.08	5.03	2.19	10.52**

***Significant at 0.01 level of significance
(Critical Value 2.00 at 0.05 and 2.66 at 0.01 level, df 58)*

Table-3 shows that mean gain scores of blended learning approach is 28.12, which is higher than the mean gain scores of 5.08 of conventional teaching approach. The t-value testing significance of mean difference of blended learning approach and conventional teaching approach is 10.52, which in comparison to table value was found significant at 0.01 level. Hence hypothesis H₃: There will be no significant difference in the performance of group taught through blended learning approach and group taught through conventional teaching approach is rejected. The results show that blended learning approach is more effective than conventional teaching approach. The results were supported by the findings of Bawanesh (2011), Kazua and Demirkolb (2014), Abidoeye (2015) and Kintu, Zhu and Kagambe (2017) revealed that blended learning approach was more effective than conventional teaching approach. Kwak, Menezes and Sherwood (2013) found that blended learning approach has no impact on the performance of school students.

Table-4: Significance of mean difference between performance gain scores in mathematics of male and female students

Variable	Male			Female			SE _D	t-ratio
	N	Mean	SD	N	Mean	SD		
Gain Scores	30	15.67	7.93	30	18.26	8.11	2.06	1.25

* Significant at 0.05 level of significance **Significant at 0.01 level of significance
(Critical Value 2.00 at 0.05 and 2.66 at 0.01 level, df 58)

Table-4 shows that mean gain scores of female students is 18.26, which is higher than the mean gain scores of 15.67 of male students. The t-value testing significance of mean difference between male and female students 1.25, which in comparison to table value was found insignificant at 0.05 level. Hence hypothesis H₄: There will be no significant difference in the performance of male and female students of experimental and control group is accepted. Results indicates that there is no major difference in the performance of male and female students in mathematics, which shows that sex of students has no influence on the performance.

Findings

1. Post-test performance in mathematics of students taught through blended learning approach was significantly higher than that of pre-test performance.
2. Post-test performance in mathematics of students taught through conventional teaching approach was significantly higher than that of pre-test performance.
3. The performance of students in mathematics taught through blended learning approach was significantly higher than that of conventional teaching approach.
4. There is no difference found in the performance of male and female students.

Conclusion

The present study reveals that performance in mathematics post-test of blended learning approach and conventional teaching approach group was significantly higher than that of pre-test performance of blended learning approach and conventional teaching approach groups respectively. Performance in mathematics of students taught through blended learning approach was significantly higher than those which were taught through conventional teaching approach. Further, the performance gain means scores has shown insignificant differences between male and female students. So from the above whole discussion it is very much clear that blended learning approach is the modern approach of teaching and learning and it has positive impact on the performance of students in mathematics. It is also observed during this study that blended learning approach is interactive, participatory and information technology oriented approach of teaching, this differentiates it from other teaching approaches.

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