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Effect of Web Based Instructions on Achievement in Mathematics of Secondary School Students

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Abstract
In recent years, information and communication technology has paved the way for accelerating the paradigm shift through providing more flexible ways of learning. The rapid growth in the use of learning technologies, particularly the use of the internet and web-based communication, has provided teachers many opportunities to explore the most suitable teaching and learning styles for a given task. The rapid and constant pace of change in technology has profound and far reaching implications on the teaching learning process. At this changing time, there is dire need of innovative ways of teaching and learning. Web Based Instructions promotes the adoption of progressive educational practices, a more holistic approach which focuses on individual student's needs. The web allows students to assemble a set of rich resources easily. An important principle of teaching on web is to see whether a student has learnt the material and is successfully able to communicate to others.
Key Words:1 Web-Based Instructions, 2 Learning technologies, 3Web-based communication, 4 Mathematics, 5information & communication technology.

Introduction

In the twenty-first century, teaching is not confined to simply imparting the predefined knowledge to students, but it is to help them to learn and explore new information and ideas. Due to rapid advancement in the field of science and technology, visible changes have occurred in almost every sphere of life including education. Education in general is undergoing rapid transition from the traditional teacher dominated teaching to the more self-motivated, self-directed and constructive learning. In recent years, information and communication technology has paved the way for accelerating the paradigm shift through providing more flexible ways of learning. The rapid growth in the use of learning technologies, particularly the use of the internet and web-based communication, has provided teachers many opportunities to explore the most suitable teaching and learning styles for a given task. The rapid and constant pace of change in technology has profound and far reaching implications on the teaching learning process. At this changing time, there is dire need of innovative ways of teaching and learning. The NPE (1986) has laid special emphasis on the special use of computer for improving quality of education. Also the use of technology in education is rewarding for both students and the educators (Williams, 2002).

Recent innovations in the application of technology in education have enabled learning to take place beyond the four walls of a classroom. With the advancement in communication and network technologies, more innovative instructional delivery and learning solutions have emerged in order to provide meaningful learning experiences for learners in academic settings. New information and communication technologies (ICTs) provide educators and learners with an innovative learning environment to stimulate and enhance the teaching and learning process. Today's students are undoubtedly net-savvy as they are living in the world where the information is just a screen touch away. All this credit

goes to the advent and exponential growth of the internet that has touched every sphere of life.

Science and technology have made it possible for us to carry out all our tasks efficiently and effectively. The facilities of broadband access to high speed internet and wide availability of personal computers, laptops, smart-phones, tablets etc., have opened new ways for creating innovative instructional delivery methods and learning solutions in order to provide meaningful learning experiences to students in academic settings (Lim & Morris, 2009). One such innovative educational solution is blended learning which has emerged with the advent of internet in the late 1990s (Ermakova, Demyanenko, Kurovskii, Tysepilova, & Kadochnikova, 2016).

Web Based Instructions promotes the adoption of progressive educational practices, a more holistic approach which focuses on individual student's needs. The web allows students to assemble a set of rich resources easily. An important principle of teaching on web is to see whether a student has learnt the material and is successfully able to communicate to others. The effective participation in learning itself is a positive learning experience.

Review of related literature

Meyer (2003) studied the impact of the Web based instruction on student learning and compared Web based instruction based with the traditional courses and focused on individual difference including gender difference and found that skills are enhanced by online environments including critical thinking and writing skills.

Liao (2004) investigated the effect of Web based instructions on the students' achievement and showed positive correlation between Web based instructions and academic achievement of students.

Yavuj, servet and Levent (2008) studied various factors that influence academic achievement and attitudes in Web based education. Results revealed that Web based instruction had positive effect on improvement of academic achievement.

Lai, Y. (2014) performed the study to synthesize existing research comparing the effect of Computer assisted Instruction (CAI) versus Traditional Instruction (TI) on students' achievement in Taiwan. The results indicated that the effect of CAI in instruction is positive over traditional teaching Students' learning achievement in language subject area was significantly different from mathematics subject area, but learning achievement in sociology, science, and computer subject area were insignificantly different from mathematics subject area.

Menon (2015) analyzed the effectiveness of smart classroom teaching on the achievement of chemistry of secondary school students. Experimental group was taught in smart classroom and control group was taught by conventional mode of teaching. The results revealed that students achieved higher when taught in smart classroom as compared to conventional mode of instruction.

Thus on the basis of review of related studies it is found that there are some studies that investigated the effect of Web based instruction on the achievement of students in subjects like chemistry, science, physics etc., much work is needed to be donein the field especially in the subject of mathematics.

Objectives

1. To study the effect of web based instruction on the achievement in Mathematics of secondary school students.
2. To compare the achievement in Mathematics based on web based instructions and conventional method.
3. To study the gender difference with respect to achievement in Mathematics based on web based instructions.

Hypotheses

1. There exists significant difference in achievement in mathematics based on web based instruction and conventional method.
2. There exists significant gender difference in achievement in mathematics when taught through web based instruction and control group through conventional teaching.

Method

Design

The present study was experimental in nature. The experimental group was taught through web based instructions and control group through conventional teaching.

Sample

The sample of the present study consisted of 200 students of class IX from representative secondary schools. The students were divided randomly in two groups. The experimental and control group consisted of 100 students each. Further the students were divided in two groups on the basis of gender.

Tools used

1. Achievement Test in Mathematics (self Prepared)
2. Web based Instructional Package (Self-prepared)

Delimitations

1. The study was delimited to the secondary school students of CBSE affiliated schools in Jalandhar City.
2. The study was delimited to the selected topics of mathematics.

Procedure

The students were divided in two groups: control group (treated conventional teaching) and experimental group (subjected to Web based instructions).

Phase I- (Pre-test) –In this phase the achievement test in mathematics was administered as pre-test on both the groups.

Phase II-In this phase, the students of control group were taught by using the conventional method of teaching whereas the experimental group was taught by web based instructions.

Phase III- In this phase, both control and experimental groups were administered the same achievement test in mathematics as post-test.

Data analysis

The pre-test and post-test scores of both the groups were listed. Then the mean, standard deviation and difference of the mean scores were computed. Significance of difference between the mean scores on post-test and pre-test of the experimental and control groups were tested both at 0.05 and 0.01 level by applying t-test.

Performance of students in mathematics after pre-test and post-test-

Achievement test in mathematics was administered to all the students in the form of Pre-test and Post-test. Pre-test was administered in the form of entry behaviour test to all the students and then the group was divided into two groups: experimental and control group. Experimental group was taught by web based instructions and control group by conventional method of teaching. Then the achievement test in mathematics was administered to see the difference in achievement. The results are represented in the following table:

Table: I

Difference in Mean scores of Students in Mathematics after Pre-test and Post-test-

Category	N	Mean	S.D	't'-value	Inference
Pre-Test	200	9.37	4.91	3.23	Significant at 0.05 and 0.01 levels.
Post-Test	200	10.96	5.02		

It is revealed from the result given in the Table-I that mean scores of Pre-test is 9.37 and S.D is 4.91 and mean score of post-test is 10.96 and S.D is 5.02 and the calculated 't' value is 3.23. Since the obtained value of't' is more than the table value, it is significant at both the 0.05 and 0.01 levels. It is indicated that there is significant difference in achievement in pre-test and post-test.

Performance of students in amthematics of control group and effect of web based instructions on the performance of students of experimental group:

Hypothesis I: There exists significant difference in achievement in Mathematics based on Web based Instructions and Conventional Method.

The students of control group and experimental group were administered achievement test in mathematics. By applying appropriate statistics, the raw scores obtained of students of both the groups were compared. The results are given in table 2 given below-

Table 2

Difference in the Mean Score of Achievement in Mathematics of Control and Experimental group-

Category	N	Mean	S.D	't' value	Inference
Control Group	100	9.29	3.91	3.78	Significant at both 0.05 and 0.01 level
Experimental Group	100	11.58	4.47		

It is revealed from the result given in Table 2 that mean score of control group is 9.29 and S.D is 3.91 and mean score of experimental group is 11.58 and S.D is 4.47 and the obtained't' value is 3.78 which is more than the table value i.e. 1.96 at 0.05 level and 2.58 at 0.01 level, is significant at both the levels. It indicates that there is significant difference in achievement in mathematics based on Web based Instructions and conventional method of teaching. Hence, hypothesis I which states that, "There is significant difference in achievement in mathematics based on Web based Instructions and conventional method" is accepted.

Performance of the students showing gender difference in achievement in mathematics with web based instructions

Hypothesis 2: "There exists significant gender difference in achievement in mathematics when taught through web based instruction and control group through conventional teaching."

By applying appropriate statistics, the raw scores obtained by both the genders are compared. The results are shown in the table 3 given below-

Table 3

Difference in the Mean Score of Achievement in Mathematics among Boys and Girls with Web based Instructions

Category	N	Mean	S.D	't' value	Inference
Boys	50	13.03	4.31	3.21	Significant at both 0.05 and 0.01 levels
Girls	50	10.21	4.11		

It is shown in table 3 that the mean score of boys for achievement in mathematics is 13.03 and S.D is 4.31 whereas the mean scores of girls for achievement in mathematics is 10.21 and S.D is 4.11 which is more than the table value i.e. 2.01 at 0.05 level and 2.68 at 0.01 level which is significant at both the levels. It indicated that there is significant difference in achievement in mathematics with web based Instructions.

Hence hypothesis 2 which states "There exists significant gender difference in achievement in mathematics when taught through web based instruction and control group through conventional teaching" is accepted.

Conclusions

On the basis of analysis and interpretation of results following conclusions can be drawn-

1. There is significant difference between Web based Instructional group (WBI) and conventional method group on achievement in mathematics. Students who were taught by using Web based Instructions scores better in comparison to the students taught by conventional method of teaching. So, Web based Instructions (WBI) provided the students a variety of teaching learning experience. Thus, WBI found to be more innovative, interactive and promotes active engagement of students. It provides more effective interaction between the teacher and the students and also enables the learners to participate actively in the teaching learning process.
2. There was a significant gender difference found in the achievement, when Web based instructions were imparted. As compared to girls, boys showed better scores in terms of achievement. This could be further inferred from the fact that boys are more interested in computers. Anything taught using computers is able to attract their attraction for a longer period of time.

Educational implications

- Web based instructions can enhance the learning environment in terms of place, pace and time.
- The students become aware of the different learning websites and take benefit from them.
- It provides learning activities engaging the online communication tools to make them more attractive.
- Possibility of developing positive ideas and attitude about computer mediated communication.
- Improvement of teaching learning environment and process.

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