

# Effect of Web Based Instruction on Achievement in Mathematics in Relation To Learning Styles

## Harleen Kaur

Research Scholar,  
Deptt. of Education,  
Guru Nanak Dev University,  
Amritsar, Punjab, India

## Navdeep Kaur

Assistant Professor,  
Deptt. of Education,  
Guru Nanak Dev University,  
Amritsar, Punjab, India

### Abstract

The purpose of this study was to investigate the effect of web-based instruction on mathematics in relation to learning styles of 9<sup>th</sup> grade students. This study is based on the pretest-posttest control group design. The experimental groups were chosen from among students who had access to computers. This study employed two different treatments. The treatment for the students in the experimental group were taught by the Web based Instruction while the students in the control group were received the 9th grade mathematics content through conventional mode of instruction as suggested in the curriculum. The Kolb learning style tool was used to see the effect on method of instruction. The difference between the two groups were tested by f-test. The results of the study revealed that there is a statistically significant difference between the groups. Therefore it can be concluded that learning styles are affected by the method of instruction.

**Keywords:** Web Based Instruction, Conventional mode of Instruction, Achievement on Mathematics, Learning styles.

### Introduction

With the development of communication technologies and the changing of learning and teaching paradigms, distance learning has also entered a new era. New Internet learning environments have been developed mainly for asynchronous learning while video conferencing and satellite systems have been used for synchronous activities. All these offer means to overcome some of the shortcomings of the traditional distance-learning environment (Beyth-Marom, Chajut, Roccas&Sagiv, 2003).

The World Wide Web can be used to provide instruction and instructional support. Web-based instruction offers learners unparalleled access to instructional resources, far surpassing the reach of the traditional classroom. It also makes possible learning experiences that are open, flexible, and distributed, providing opportunities for engaging, interactive, and efficient instruction (Kahn, 2001). Phrases such as "flexible navigation," "richer context," "learner centered," and "social context of learning," are used in the literature to describe Web-based instruction. Furthermore, cognitive-based theories of learning have extended the design and delivery of Web-based instruction, applying the technical nomenclature to instructional practices (Bonk and Dennen, 1999).

In recent years, researchers have shown an increased interest in learner styles as one of the key factors influencing learning generally. During the last decade we have also noticed rapid advances in the field of technology enhanced learning and growing trend towards its application in formal education. Introduction of different forms of e-learning (e.g. computer assisted learning, blended learning, massive online open courses (MOOCs), etc.) has become reality at most universities. The research used a convenience sample of 81 fifth year university students (pre-service English language teachers) split into control (n=55) and experimental (n=27) groups. The results of a two-way analysis of variance (ANOVA) showed no significant findings. The results indicate that the learning styles and form of teaching have no effect on academic achievement. (Cimermanova,2018)

To respond to the diverse distance and time needs of today's learners, many institutions offer online courses to expand their teaching

## Shrinkhla Ek Shodhparak Vaicharik Patrika

methods with distance learning courses. They work on specializing or adapting the courses according to learners' needs (Hamilton-Pennell, 2002). Learners' needs include different learning styles which can influence learning performance (Mitchell, 2000; Chen & Lin, 2002; Morris, Finnegan, & Sz-Shyan, 2005; Hummel, 2006).

Definitions of learning style generally focus on ways of learning. According to Fleming (2001) learning style is an individual's preferred way of gathering, organizing, and thinking about information. It is considered as the behaviors related to the psychological, cognitive, and affective domains of interaction with learning environments. Learning style involves learners' preferred ways to receive, process, and recall information during instruction which is related to learners' motivation and information-processing habits (Aragon, Johnson, & Shaik, 2002).

Thus the study was being done as the investigator feels that schools should develop a vision of how technology can improve teaching-learning process and make the pupils more informative and develop the various skills and abilities. The investigator tried to develop web-based instruction package for teaching of mathematics to adolescents and also taken into the consideration of different problem solving abilities and learning styles. Technology nowadays is used with wide variety of formats that makes teaching-learning process more desirable and leads to have different learning styles. To make more balanced learners it is necessary to integrate the technology in the teaching learning so that preferred styles of learning can be taken into account. The review of studies related to web-based instruction on achievement in mathematics reveals that negligible work has been done on the effect of web-based instruction on achievement in mathematics in relation to learning style as variable. The investigator in the present research studied the effect of web-based instruction on achievement in Mathematics in relation their learning style and developed web based instructional package supported by visualization and animations which can facilitate effective learning of mathematical concepts.

### Research Questions

Q1. What is the interaction effect of instructional strategies and learning styles?

Q2. What is difference in the different learning style group from one another in mathematics?

### Statement of the Problem

Effect of web based instruction on achievement of class ix students in mathematics in relation to learning styles.

### Objectives

The purpose of this study was to investigate the effect of web-based instruction on mathematics in relation to learning styles of 9<sup>th</sup> grade students. This study is based on the pretest-posttest control group design. The experimental groups were chosen from among students who had access to computers. This study employed two different treatments. The treatment for the students in the experimental group were taught by the Web based Instruction while the students in the control group were received the

9th grade mathematics content through conventional mode of instruction as suggested in the curriculum. The Kolb learning style tool was used to see the effect on method of instruction. The difference between the two groups were tested by f-test. The results of the study revealed that there is a statistically significant difference between the groups. Therefore it can be concluded that learning styles are affected by the method of instruction.

1. To develop an achievement test in Mathematics for class IX students.
2. To develop WBI package for selected units of Mathematics.
3. To study the difference in achievement of class IX students in Mathematics with different learning styles.
4. To study interactional effect of instructional strategies and learning styles on achievement of class IX students in Mathematics.

### Hypotheses

1. There exists no significant difference in the different learning style group from one another in mathematics.
2. There exists no significant interaction effect of instructional strategies and different learning styles on achievement.

### Delimitations of The Study

The Study was conducted on class IX students from three schools of Amritsar city affiliated to Central board of Secondary Education (CBSE) The study was delimited to the variables in Mathematics, instructional strategy and learning styles.

### Operational Definitions

#### Web Based Instruction

It is a self-learning interactive instructional strategy and to present information in Mathematics and monitor the learning that takes place.

#### Academic Achievement

Achievement means performance in a subject or in a test. The achievement test is an investigator made test. It involves the set of questions from different lessons chosen for study. This helps to measure high and low achievement of students under study.

#### Learning Styles

Learning styles could be used to predict what kind of instructional strategies or methods would be most effective for a given individual and learning task. In the present study four types of learning styles were taken into consideration viz. convergent, divergent, assimilating and accommodating.

#### Methodology

In the present study, in order to satisfy the real effort in experimental research, the logical statistical inference of purposive sampling was initially employed to select those schools which have LAN facility and then random sampling technique was used.

#### Tools used

The following tools were used for collecting the data

1. An achievement in Mathematics for class IX was constructed and standardized by the investigator

## Shrinkhla Ek Shodhparak Vaicharik Patrika

to measure the performance of students before and after the treatment.

2. Kolb learning style inventory was used
3. Web Based Instruction package in Mathematics for class IX was developed and validated (content wise) by the investigator. Lesson plans on the same chapters for delivering lectures by

conventional mode of instruction were also delivered by the investigator.

### Results

The mean of different sub groups, sum of squares, mean sum of squares and F-ratio have been presented in Table 1

**Table 1**  
**Analysis of Variance (Three Way) Factorial Design**

Dependent Variable	Source of Variation	Sum of squares	df	Mean sum of squares	f-ratio
Achievement in mathematics	Instructional Strategy (A)	75.014	1	75.014	5.86**
	Problem Solving Ability (B)	584.056	1	584.056	45.20**
	Learning Style (C)	165.57	3	55.19	4.27
	A*B	42.08	1	42.08	3.26
	A*C	94.65	3	31.55	2.44
	B*C	402.96	3	134.32	10.40**
	A*B*C	323.97	3	107.99	8.36**
	Error Term	5194.232	402	12.921	

\*\* Significant at 0.01 level

Critical value 3.89 at 0.05 and 6.76 at 0.01 level, df 1/418

Critical value 2.65 at 0.05 and 3.38 at 0.01 level, df 3/418

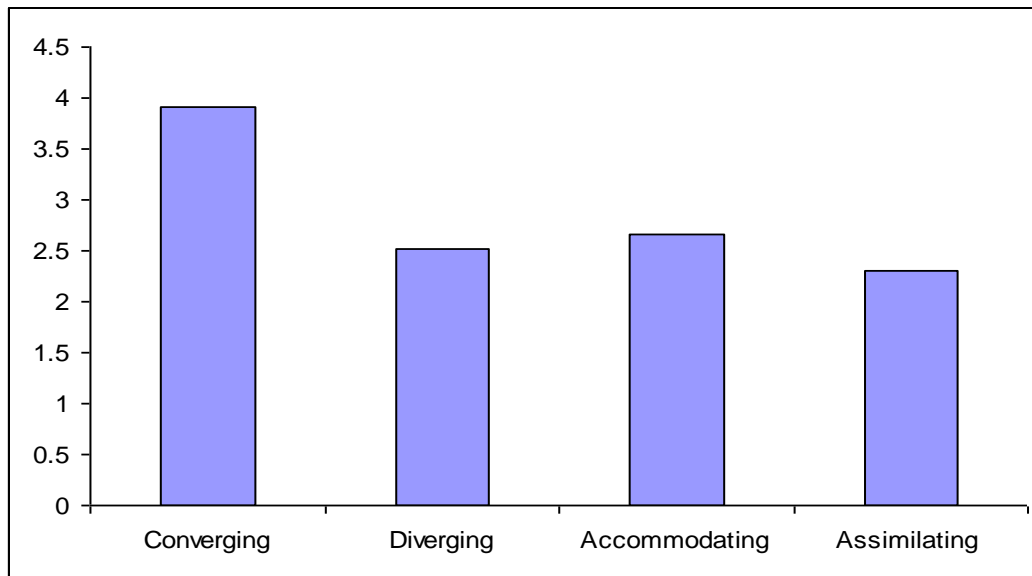
It may be seen from the table 4.4 that the F-ratio for difference between the mean gain scores for students with the different learning styles is 4.27, which in comparison to the table value was found to be significant at 0.01 level of significance. This suggested that different learning styles effect on achievement in mathematics scores was signified at the specified level. Hence, the hypothesis 2: There exists no significant difference in the different learning style group from one another in mathematics, is

accepted at 0.01 level of significance. It may be, therefore, concluded that different learning style groups were different on mean gain scores on achievement in mathematics.

To ascertain significance of difference among means of various combination groups, t-ratios were computed for difference in mean gain scores on achievement in mathematics for diverging, converging, accommodating and assimilating learning style has been placed in table 2

**Table 2**  
**T-ratios for Significance of Difference among Means of Learning Styles**

Variables	Converging Mean SD 3.91 3.79	Diverging Mean SD 2.51 3.76	Accommodating Mean SD 2.66 3.39	Assimilating Mean SD 2.30 5.03
Converging Mean SD 3.91 3.79		1.39	1.25	1.61
Diverging Mean SD 2.51 3.76			0.15	0.21
Accommodating Mean SD 2.66 3.39				0.36
Assimilating Mean SD 2.30 5.03				

**Fig.1: Bar Diagram Showing Comparison of Mean Gain Scores of Different Learning Styles**

\*\* Significant at 0.01 level

Critical value 1.98 at 0.05 and 2.61 at 0.01 level

A bar diagram has been drawn to depict the mean gains scores of students with different learning styles on achievement in mathematics has been presented in fig 1

It may be inferred from the table 2 and fig 1 that the mean gain scores of students with converging learning style is 3.91, which is higher than the corresponding mean gain score of 2.51 of diverging learning style. The t-value testing the significance of the mean difference on achievement in account of comparing and diverging learning style is 1.39, which in comparison to the table value was not found to be significant even at 0 .01 level of significance. Hence, it can be inferred that mean gain achievement scores was not significant for converging and diverging learning style group.

The table 2 and fig 1 reveal that the mean gain score of students with converging learning style is 3.91, which is higher than the corresponding mean gain score of 2.66 of students with accommodating learning style. The t-value testing the significance of the mean difference on achievement in mathematics of converging and accommodating learning style is 1.25, which in comparison to the table value was found to be significant at 0 .01 level of significance. Hence, it can be concluded that mean gain achievement scores is higher for converging and accommodating learning style groups.

The table 2 and fig 1 reveal that the mean gain score of students with converging learning style is 3.91, which is higher than the corresponding mean gain score of 2.30 of students with assimilating learning style. The t-value testing the significance of mean difference on achievement in mathematics of converging and assimilating learning style is 1.61 , which in comparison to the table value was found to be significant at 0 .01 level of significance. Hence, it can be found that mean gain achievement scores was significant for converging and assimilating learning style groups.

The table 2 and fig 1 reveal that the mean gain score of students with diverging learning style is 2.51, which is lesser than the corresponding mean gain score of 2.66 of students with accommodating learning style. The t-value testing the significance of the mean difference on achievement in mathematics of diverging and accommodating learning style is 0.15, which in comparison to the table value was not found to be significant at 0 .01 level of significance. Hence, it can be revealed that mean gain achievement scores is significant for diverging than accommodating learning style groups.

The table 2 and fig 1 reveal that mean gain score of students with diverging learning style is 2.51, which is higher than corresponding mean gain score of 2.30 of students with assimilating learning style. The t-value testing the significance of the mean difference on achievement in mathematics of diverging and assimilating learning style is 0.21, which in comparison to the table was not found to be significant even at 0 .01 level of significance. Hence, it can be inferred that mean gain achievement scores was significant for diverging and assimilating learning style groups.

The table 2 and fig 1 reveal that the mean gain score of students with assimilating learning style is 2.30, which is lesser than the corresponding mean gain score of 2.66 of students with accommodating learning style. The t-value testing the significance of the mean difference achievement in account of assimilating and accommodating learning style is 0.36, which in comparison to the table value was not found to be significant even at 0 .01 level of significance. Hence, it can be inferred that mean gain achievement scores was significant for assimilating and accommodating learning style groups.

#### **Hypothesis II**

There exists no significant interaction effect of instructional strategies and different learning styles on achievement.

**Conclusion**

It may be observed from the table 1 F-ratio for interaction between instructional strategy and learning style group is 2.44, which in comparison to the table value was not found to be significant even at 0.01 level of significance. This suggested that interaction effect on achievement in mathematics was not signified at the specified level. Hence, the null hypothesis II: There exists no significant interaction effect of instructional strategies and different learning styles on achievement, is accepted. It may be concluded that there was no difference in the mean gain achievement scores due to interaction effect of instructional strategy and learning style.

**References**

- Aragon, S. R., Johnson, S. D., & Shaik, N. (2002). *The influence of learning style preferences on student success in online versus face-to-face environments. The American Journal of Distance Education*, 16(4), 227-243.
- Beyth-Marom, R., Chajut, E., Roccas, S., & Sagiv, L. (2003) *Internet -Assisted Versus Traditional Distance Learning Environments: Factors Affecting Students Preferences. Computers & Education*, 41, 65-76
- Bonk, C. J., and Dennen, V. P. (1999). *Teaching on the Web: With a little help from my pedagogical friends. Journal of Computing in Higher Education*, 11, 3 – 28.
- Cimermanova, Ivana. (2018). *The Effect of Learning Styles on Academic Achievement in Different Forms of Teaching. International Journal of Instruction*.11. 10.12973/iji.2018.11316a.
- Chen, N. S., & Lin, K. M. (2002, September). *Factors affecting e-learning for achievement. In IEEE International Conference on Advanced Learning Technologies (9-12).*
- Fleming, N. D. (2001). *Teaching and learning styles: VARK Strategies. Honolulu Community College.*
- Hamilton-Pennell, C. (2002). *Getting ahead by getting online. Library Journal*, 127(19), 32-35.
- Mitchell, J. L. (2000). *The effect of matching teaching style with learning style on achievement and attitudes for women in web-based distance education course. Terre Haute, IN: Indiana State University.*
- Morris, K. V., Finnegan, C., & Sz-Shyan, W. (2005). *Tracking student behavior, persistence, and achievement in online courses. Internet and Higher Education*, 8(3), 221–231.