RESEARCH PAPER
EFFECT OF WEB BASED INSTRUCTION ON ACHIEVEMENT IN PHYSICS OF ELEVENTH GRADE STUDENTS IN RELATION TO LEARNING STYLES

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INTRODUCTION

The most important difference that has taken place in the world in the last few years is the rapid development and spreading of information technology in every field. It is accepted by all environmentalists that information technology provides value in materialistic and moral aspects, and that is widely used in fields of education, economy, health, agriculture, social life, and entertainment.

The Internet and its applications like e-mail and the WWW, provides for an effective means of transferring information between individuals and organizations alike, and it has spawned a revolution in how business, education, and personal communications are transacted (Chalmers, 2000; Comer, 2000).

Since the invention of the World Wide Web (WWW) by Tim Berners-Lee in 1989, and the subsequent creation of the Web browser in 1993, by Marc Andreeson, the Web has transformed the ways in which we communicate, transact business, and access information (Chalmers, 2000; Comer, 2000). This is especially true in education, where the Web’s ubiquity and ability to deliver media-rich instruction regardless of geography and time, has sparked a revolution in the ways that instructors teach and students learn (Brathler, Peterson, & Johnson, 1999).

Advances in learning environment have provided students with a wide variety of teaching/learning alternatives that have expanded the educational process beyond the traditional classroom. As the instructor’s time is “liberated” through computer-delivered instruction, the instructor is given the opportunity to develop more learner-centered activities by creating multiple opportunities for the students to interact with one another and the instructor, and participate in group activities that take place in the online environment. These collaborative opportunities are supported by various modes for communication and interaction provided by the Internet, including e-mail, chat rooms, and discussion groups.

Meaning of Web-Based Instruction (WBI)

Simply stated, Web-based instruction refers to providing a learning environment that is

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mediated and supported via the Internet/Intranet and connected to a computer with hyperlinks to resources outside the instructional domain. The instruction is designed so that the computer displays lessons in response to learner/user interactions.

Web based Instruction is an innovative approach to instruction in which computer based instruction (CBT) is transformed by the technologies and methodologies of the World Wide Web, the Internet, and Intranets. Web based Instruction presents live content, as fresh as the moment and modified at will, in a structure allowing self-directed, self-paced instruction in any topic. WBI is media-rich instruction fully capable of evaluation, adaptation, and remediation, all independent of computer platform.

Khan (1997) defines Web-Based Instruction as “...a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported”.

One aspect of web-based instruction is the incidental learning that frequently occurs. In a traditional “face-to-face” instructional environment, learning is considered to be intentional—there is usually very little incidental learning. Computers and the web have changed this model of instruction; they allow learners to view, retrieve, and store information at “any place, any time”.

In Web-based instruction, increased student control and responsibility optimizes learning and makes it more effective. In a well designed Web based course students can be more successful than they would be in a classroom setting. Hence, the individual is able to explore the subject matter in the range and depth s/he wishes to learn that is appropriate to her/his learning capacity.

Learning Styles

Students preferentially take in and process information in different ways: by seeing and hearing, reflecting and acting, reasoning logically and intuitively, analyzing and visualizing, steadily and in fits and starts.

A learning style is a student’s consistent way of responding to and using stimuli in the context of learning. Learning styles refer to the variations in the ability to accumulate as well as assimilate information. Basically, learning style is the method that best allows gathering and using knowledge in a specific manner.

The learning styles view has acquired great influence within the education field, and is frequently encountered at levels ranging from kindergarten to graduate school.

Orr & Davidson (1993) studied the effects of group computer-based instruction and learning style on achievement and attitude of 190 elementary school students. Results do not support the hypothesis of interaction between instructional delivery and learning style for both performance and attitude.
Sansanwal and Nawayot (2001) developed WBI for facilitating the Reasoning Ability and thinking skills of people. The WBI was found to be effective in facilitating Reasoning Ability amongst people belonging to different countries and age group.

Shih & Gamon (2002) investigated relationship between learning styles and achievement in web-based courses. They concluded students with different learning styles and backgrounds learned equally well, and did not differ in their use of learning strategies and patterns of learning in Web-based courses.

Derouza and Fleming (2003) compared undergraduates who completed quizzes online with students who took traditional paper-based quizzes and found that marks revealed that students who took the quizzes online significantly outperformed students who took the paper-and-pencil quizzes.

Kim & Moore (2005) investigated how students’ characteristics affect their satisfaction and learning experience within web-based courses. Findings suggest that students’ interaction with classmates and their instructor have an impact on their satisfaction with web-based courses.

OBJECTIVES OF THE STUDY
i. To study the effect of two different instructional strategies (Web Based Instruction, and Conventional Method) on achievement in physics of eleventh grade students.
ii. To study the differences in achievement in physics of eleventh grade students in relation to learning styles.
iii. To study interaction effect of instructional strategies and learning styles on achievement in physics of eleventh grade students.

HYPOTHESES OF THE STUDY
1. There will be no significant difference between mean achievement scores in Physics of students taught through two different instructional strategies i.e. Web Based Instruction and Conventional Method.
2. There will be no significant effect of learning styles on achievement in physics of eleventh grade students.
3. There will be no significant interaction effect of instructional strategies and learning styles on achievement in physics of eleventh grade students.
SAMPLE
For this research investigation, 150 students were drawn through random sampling from CBSE affiliated senior secondary schools located in Ludhiana district, where the students have exposure to computer and Internet. All the 150 students were randomly divided into two groups. To see the learning style of students, the test was administered on both the groups. On the basis of scoring, the students were divided into three subgroups namely, visual, auditory, and kinesthetic learners in each group.

In both the groups, there was unequal number of students in each cell. The minimum number of students in one cell was 21. Then all the cells were reduced to the size of 21 by randomly dropping extra students. So, the final sample consisted of 126 students.

DESIGN OF THE STUDY
The present study was an experimental one. This method was appropriate to study the effect of independent variable on dependent variable. In the present study, 2×3 factorial design was employed. The students were divided into 2 groups. The experimental group was taught through Web-Based Instruction and the Control group was taught through conventional method. Both the groups were further subdivided into 3 subgroups namely visual, auditory, and kinesthetic learners.

PROCEDURE
The present study was conducted in four steps:
Phase I: In this phase Web based Instruction, Learning Styles Test, and Achievement Test on selected units of Physics of eleventh grade were developed.

Phase II: Achievement test on selected topics of Physics was given and learning styles test was administered.

Phase III: Students were divided randomly into 2 groups. The allocation of instructional strategies was done at random. Experimental group was taught by Web Based Instruction and the control group was taught by conventional method.

Phase IV: Same Achievement test was administered to students of the 2 groups as post test.

TOOLS USED
The following tools were used for collecting the data:
(i) Web based Instruction on selected units of Physics of eleventh grade developed by the
investigator.

(ii) Achievement test on selected units of Physics developed to measure the performance of students before and after the treatment.

(iii) Learning styles test developed by the investigator to identify preferred learning style of students.

RESULTS AND DISCUSSION

Table 1: Summary of 2×3 Analysis of Variance on Gain Scores on Achievement in Physics in relation to Instructional Strategy and Learning Styles

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MSS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A: Instructional Strategy</td>
<td>32.58</td>
<td>1</td>
<td>32.58</td>
<td>3.99*</td>
</tr>
<tr>
<td>B: Learning Styles</td>
<td>15.93</td>
<td>2</td>
<td>7.96</td>
<td>0.98</td>
</tr>
<tr>
<td>First Order Interaction</td>
<td>50.72</td>
<td>2</td>
<td>25.36</td>
<td>3.10*</td>
</tr>
<tr>
<td>(Instructional Strategy x Learning Styles)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Group (Error)</td>
<td>979.20</td>
<td>120</td>
<td>8.16</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1078.43</td>
<td>125</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*significant at 0.05 level of significance

Interpretation of Results

The interpretation of results on the basis of table 1 is as given below:

1) Main Effect of WBI and Conventional Method of Instruction on Achievement in Physics:

Table 1 reveals that the F ratio for the difference between mean gain scores on the achievement of the groups taught through WBI and conventional method came out to be 3.99, which is
significant at 0.05 level of significance. Hence, the hypothesis stating:

“There will be no significant difference between mean achievement scores of students taught through two different instructional strategies i.e. Web Based Instruction and conventional method” is rejected.

2) Main Effect of Learning Styles on Achievement in Physics:

Table 1 shows that the F ratio for the difference between mean gain scores in the groups having visual, auditory, and kinesthetic learning styles came out to be 0.03, which is insignificant at both the levels of significance. Hence, the hypothesis stating:

“There will be no significant effect of learning styles on achievement in physics of eleventh grade students” is accepted.

3) Interaction Effect of Instructional Strategies and Learning Styles on Achievement in Physics:

Table 1 reveals that the F ratio for the difference in mean gain scores on the achievement of students due to interaction between instructional strategies and learning styles came out to be 3.10, which is significant at 0.05 level of significance. Hence, the hypothesis stating:

“There will be no significant interaction effect of instructional strategies and learning styles on achievement in physics of eleventh grade students” is rejected.

CONCLUSIONS

On the basis of above discussion, the following conclusions were drawn:

1. There was significant difference between mean achievement scores in Physics of students taught through two different instructional strategies i.e. Web Based Instruction and conventional method.

2. There was no significant effect of learning styles on achievement in physics of eleventh grade students.

3. There was significant interaction effect of instructional strategies and learning styles on achievement in Physics.
achievement in physics of eleventh grade students.

Educational Implications

The findings of the present study reveal that there is significant difference in achievement of students taught through web based instruction and conventional method of instruction. Students showed more interest while studying on website prepared by the investigator. We can say that in today's world, internet has become a part of our life. Students like to spend their time studying through websites on internet. Also, it engages them in many activities which help to reduce problems like that of indiscipline in class, boredom and lack of motivation etc.

Further, the present study concluded that the interaction between instructional strategies and learning styles contribute towards achievement in physics. Therefore, while designing any instructional strategy, the learning styles of the students should be taken into consideration.

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