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Effect Of Web Quest Integration With Inquiry Training Model On Academic Achievement In Physics

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ABSTRACT

The present investigation was intended to discern the effectiveness of WebQuest (WQ) Integration with Inquiry Training Model (ITM) on achievement in physics at IX grade level. The current research is of experimental type and the study sample comprised of 459 students. Three modes of instruction were applied- Traditional Teaching Method (TTM), Inquiry Training Model (ITM) and WebQuest Integration with ITM (WQ & ITM). Achievement test for physics employed as pre-test before teaching and as post-test after teaching in all the three groups for accumulating data. Results signified that students taught through ITM and WebQuest Integration with ITM exhibit higher academic achievement as compared to the students of Traditional Teaching Method group. It is also found that the students taught with WebQuest Integration with ITM gain better academic achievement as compared to the students of ITM group. No significant difference has been observed in the gain scores of Academic Achievement between male and female learners. Also, no significant difference has been found in the interaction effect of modes of instruction and gender on the gain scores of Academic Achievement in Physics.

Keywords: WebQuest, Inquiry Training Model, Academic Achievement, and Physics.

INTRODUCTION

Information and Communication Technology (ICT) has undergone various advances that influenced the individual's thinking and living style a lot (Grabe, 2007). Due to its enormous benefits, schools and other institutions that focus on preparing their pupils for "an information society" must deliberate regarding ICT integration in their instructive proposal (Ghavifekr, Afshari & Amla Salleh, 2012). There is no denying the fact that technology in the present scenario is utilized progressively particularly for teaching-learning process. This is on the grounds that latest technology equips the classrooms with numerous instruments that can be utilized in enhancing the quality of education process (Bruniges, 2003; Lefebvre, Deaudelin, and Loiselle, 2006; Bingimlas, 2009; Hamidi et al., 2011; Hussain et al., 2011). Rosnaini Mahmud and Mohd Arif (2008) describe ICT integration as the mode for determining where and in what way technology mounts in the teaching-learning state. Researches have proved that ICT can prompt learning along with superior pedagogical practices. As it is believed that all human minds are not the same, then educators must vary teaching practices in appropriate ways by utilizing most recent technology. In this regard, WebQuest (WQ) is becoming popular as arising learning technology and has been a splendid illustration of how to efficiently integrate technology in education.

Webquest

In 1995, Bernie Dodge originally presented WebQuests at San Diego University. Dodge (1997) stated WebQuest as "an inquiry oriented activity in which some or all of the information that learners interact with, comes from resources on the Internet." WebQuest is an emerging web 2.0 tool and its original model incorporates these six segments – "Introduction, Task, Resources, Process, Evaluation and Conclusion".

Teaching physics through inquiry necessitates that students should pose inquiries identified with the subject and sort things out for themselves. It includes the attempt to answer questions and look for data. Inquiry can be directed in an assortment of modes. Out of Information Processing Models, Inquiry Training Model (ITM) has extraordinary importance in such manner.

Education assumes a critical part in modifying the learner's learning pattern. Indeed, even the best-planned educational program stay dead except if make alive by incorporating the suitable techniques of teaching. For the accomplishment of framed educational objectives, reasonable instructional methodologies or strategies are required. Therefore, teachers should instill inquiry-training skills in their students with their teaching. Inquiry Training Model of teaching is one such methodology especially implied for boosting inquiry skills among students.

To adjust with the rapid explosion of knowledge of physics, the learners should be set up to handle data of various ideas reasonably and seriously so the data can be held for a more extended time frame and can be utilized in different circumstances of life. Teaching physics through inquiry necessitates that students should pose inquiries identified with the subject and sort things out for themselves. It includes the attempt to answer questions and look for data. Inquiry can be directed in an assortment of modes. It may involve discussion, reading, laboratory investigations and conducting field surveys. Out of Information Processing Models, Inquiry Training Model (ITM) has extraordinary importance in such manner.

During the most recent couple of many years numerous new strategies for teaching and training have been created, tried, altered and embraced to various types of teaching learning situation. Infact, every great instructor in classroom consistently attempts to set up a model of teaching what he or she needs to follow it for all instances. He additionally continues altering it with the progression of time when he acquires more experience of teaching. A couple of teaching models has been done looked out and is being spread in various nations to infer greatest advantages. In this manner models recommend something actually quite useful for changing the conduct of the students. Model of teaching is an advanced teaching method. All teaching models determine the learning results exhaustively on recognizable student's performance. Models of teaching were recognized and explained for the first time by Bruce Joyce and Marsha Weil (1972). As per Joyce and Weil, "Teaching models are just instructional designs. They describe the process of specifying and producing particular environmental situations which cause the student to interact in such a way that specific change occurs in his behavior". They arranged Models of Teaching into four families such as Information-Processing,Social, Personal and Behavioral Systems Family.

Education assumes a critical part in modifying the learner's learning pattern. Indeed, even the best-planned educational program stay dead except if make alive by incorporating the suitable techniques of teaching. For the accomplishment of framed educational objectives, reasonable instructional methodologies or strategies are required. In this manner investigators continue to investigate new models and methodologies of teaching. As per NCERT (2006), "for any qualitative change from the present situation, science education in India must undergo a paradigm shift. Rote learning should be discouraged and inquiry skills should be strengthened and supported". Therefore, teachers should instill inquiry-training skills in their students with their teaching. Inquiry Training Model of teaching is one such methodology especially implied for boosting inquiry skills among students.

Inquiry Training Model (ITM)

In 1962, J. Richard Suchman proposed Inquiry Training Model with the objective to teach students a process for examining and describing extraordinary phenomena. Inquiry Training Model has a place with Information Processing Family of Models. Suchman accepts that people faced with a bewildering circumstance are propelled to seek meaning in it. They normally look to comprehend what they experience. To comprehend confounding circumstance they should expand the intricacy of their reasoning and see better how to interface information, structure ideas and apply those ideas towards the identification of the standards of causation. The principle objective of this model is to give training of inquiry skills. ITM are designated as fundamental components i.e. " Syntax, Social System, Principles of Reaction,Support System, Instructional and Nurturant Effects".

Keeping in mind the above parameter, the investigator decided to see the effect of three modes of instruction viz-a-viz Traditional Teaching Method (TTM), Inquiry Training Model (ITM) and WebQuest Integration with ITM (WQ & ITM) on the Academic Achievement of IX class students in Physics.

Related Studies

Students found webquest as an effective tool in terms of their achievement (Hassanien, 2006). Pandey, Nanda and Ranjan (2011) lead an examination that explored the efficiency of ITM on achievement of students of secondary stage in science. The consequences of the investigation showed that students' achievement taught through ITM is better in contrast with the students learnt through conventional teaching method. Alias, DeWitt and Siraj (2013) directed a study on the construction of Webquest Module for Physics subject and recommended that the achievement mean scores of posttest is significantly greater regarding the WebQuest module in comparison to that of pretest. It was also discovered that this type of model is applicable in designing webquest based physics module in the context of Malaysian secondary education. Auditor (2014) led a study to see the effectiveness of WebQuest on Content Knowledge Attainment and Motivation of students in Physics subject. The results revealed that webquest method might foster academic achievement of learners in the subject of physics. Hadriana (2015) directed a quasi-experimental study to see the effect of M-WebQuest on the academic achievement of students. Significant difference was observed in achievement of reading comprehension and self-learning as per the WebQuest approach. The Pearson Correlation was applied that emphasized a significant relation between achievement and self-learning in reading comprehension. Chaudhari (2015) directed an inquiry to understand the adequacy of Inquiry Training Model in science to eighth class learners. Findings showed that the given model is efficient as far as the academic achievement of students is concerned. Mohanty (2016) led an investigation to check the efficacy of inquiry training model on enhancing the motivation and achievement in geography at secondary level. The research results depicted that the prescribed model is efficient in boosting the motivation and academic performance of students in geography. S¸ahin and Baturay (2016) conducted a research to see the impact of 5E-learning model upheld with WebQuest approach on learners' academic achievement and contentment. The aftereffects of the investigation demonstrated that there exists significant difference in the achievement post-test scores of the learners who were given WebQuest treatment. It was likewise tracked down that the specified model coordinated with WebQuest satisfies learners and encourages better learning particularly among female students. Harahap, Sirait and Bukit (2017) guided an exploration to look at the impacts of ITM upheld Mind Map for conceptual knowledge and science process skills of tenth class learners. The findings of the study showed that the conceptual knowledge and science process skills of physics students taught through ITM upheld Mind map is better as compared to the physics students learnt with conventional teaching strategy. Patel (2019) conducted a study to look for the adequacy of Inquiry Training Model in the eleventh class biology subject. It was tracked down that the students learnt with the model of Inquiry Training performed better in comparison to those who were taught with conventional method. The findings also revealed that the girls given treatment of ITM succeeded more academically in contrast with those of boys. Wulandari et al (2019) found that the methodology of inquiry training model incorporated with google classroom could upgrade the mathematical representation ability of students of XI class in the medium group. Badmus, Hamzat and Sulaiman (2019) directed an investigation to examine the effectiveness of WebQuest on secondary school students in biology subject. The results depicted that students' achievement improved significantly though no significant difference was seen among the achievement scores of boys and girls. It was also found that there exists no significant interaction effect among gender, WebQuest and achievement scores of students. Bhatt and Sevak (2019) observed that ITM is more powerful on the achievement of ninth standard students in mathematics subject. The analysis of the study likewise showed that ITM is more influential on the achievement of male students when contrasted with female students in resolving mathematical problems. Salako (2020) led an investigation to explore the effect of WebQuest on students of secondary stage in the subject of computer science. The outcomes of the research showed that there exists significant difference in the mean performance score of students by making use of orthodox and WebQuest approach. It was moreover seen that the female students displayed a better mean gain score as compared to male students. Rahayu (2020) guided an examination to look at the advancement in learning exercises and achievement of learners with the utilization of Inquiry Training Model. The findings proposed that the ascent in learning activities influence the achievement of student learning outcomes in the subject of physics. Hs and Simatupang (2020) directed a study to administer the effect of inquiry training model supported macromedia streak on the learning outcomes on the topics of impulse and momentum of class tenth students. The results of the study indicated that there is an impact of the execution of given model upheld macromedia streak on the performance of students in specific topics of physics. Therefore, many investigations have been carried out in prescribed modes of instruction but not a single study was found in which experiment conducted by taking all these modes of instruction together. Thus, the investigator decided to take up this topic for research.

Objectives

- To study the effect of different Modes of instruction viz-a-viz Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM on the gain scores of Academic Achievement in physics.
- To study the interaction effect of modes of instruction and gender on the gain scores of Academic Achievement in Physics.

Hypotheses

1. There is no significant difference in different modes of instruction viz-a-viz Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM on the gain scores of Academic Achievement in Physics.
2. There is no significant difference in Academic Achievement gain scores in Physics between male and female students.
3. There is no interaction between modes of instruction and gender on the gain scores of Academic Achievement in Physics.

Delimitations of the Study

The existing study was confined to CBSE school students of Amritsar city. Data was collected from students of class IX for teaching the concepts of physics only.

METHODOLOGY

Sample

The study was intended to find out the effectiveness of WebQuest Integration with ITM on achievement in physics at IX grade level. Data was collected from IX class of four CBSE schools of Amritsar city of Punjab State. The sample of the study comprised of 459 students. Three modes of instruction were employed- Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM, and thus designed three groups. Achievement test for physics employed as pre-test before teaching and as post-test after teaching in all the three groups for collecting the data. Experimental research method was employed in the present study. A total of 459 students constituted the sample of the study with 153 for each group.

Tools used

The experts of science education validated all the following tools:

- The investigator prepared achievement Test in Physics and it was used as pre-test and post-test. Revised Blooms Taxonomy was followed during the preparation of the test. This test covered two physics chapters 'Work, Power and Energy, Sound' of IX class CBSE syllabus. The test comprised of 50 questions of sixty marks including Multiple Choice Questions, Fill Ups, Match the Columns and Short Answer Type Questions
- Lesson plans based on Traditional Teaching Method and Inquiry Training Model prepared by the investigator
- WebQuest based modules (including the ITM principles) prepared by the investigator.

Procedure

For collecting the data, firstly achievement pre-test was administered on all the three groups. Students of Group-I taught with Traditional Teaching Method, students of Group-II taught with Inquiry Training Model whereas students of Group-III taught with the WebQuest based modules incorporating ITM principles. At the end, achievement post-test was employed on all the groups. After administration, scoring was carried out as per the proposed marking criteria. Thus, the pre-test and post-test scores of achievement test comprised the data for the current study.

Data Analysis

Analysis was done by applying statistical techniques such as Mean, Standard Deviation (S.D.) and ANOVA. The data obtained have been analyzed as 3x2 Analysis of Variance on the gain scores of Academic Achievement in relation to Modes of Instruction and Gender.

RESULTS AND DISCUSSION

The means and standard deviations of sub groups for 3x2 factorial design of ANOVA on the gain scores of 'Academic Achievement' in relation to modes of instruction and gender have been calculated and presented below in the Table 1:

TABLE 1

MEANS OF SUB-GROUPS OF ANOVA FOR 3X2 FACTORIAL DESIGN ON THE GAIN SCORES OF ACADEMIC ACHIEVEMENT IN RELATION TO MODES OF INSTRUCTION AND GENDER

GENDER	MODES OF INSTRUCTION			TOTAL
	TTM	ITM	WQ & ITM	
Male	N= 88 M_1= 14.68 SD= 4.007	N= 78 M_3= 21.46 SD= 4.535	N= 87 M_5= 36.33 SD= 3.926	N= 253 M_{10}= 24.22 SD= 10.093
Female	N= 65 M_2= 13.82 SD= 4.548	N= 75 M_4= 21.99 SD= 3.975	N= 66 M_6= 35.85 SD= 4.372	N= 206 M_{11}= 23.85 SD= 9.888
Total	N= 153 M_7= 14.31 SD= 4.253	N= 153 M_8= 21.72 SD= 4.263	N= 153 M_9= 36.12 SD= 4.117	N= 459 M_{12}= 24.05 SD= 9.992

For the analysis of variance in Academic Achievement, the acquired scores have been subjected to ANOVA and the results have been mentioned below in the Table 2:

TABLE 2

SUMMARY OF ANOVA FOR 3x2 FACTORIAL DESIGN IN RESPECT OF ACADEMIC ACHIEVEMENT GAIN SCORES IN RELATION TO MODES OF INSTRUCTION AND GENDER

Source of Variance	Sum of Squares (SS)	df	Mean Sum of Squares (MSS)	F-ratio	P-value
MAIN EFFECTS					
Modes of Instruction (A)	36957.695	2	18478.847	1041.021	**.000****
Gender (B)	8.580	1	8.580	.483	.487
INTERACTION EFFECT					
Modes of Instruction x Gender (AxB)	39.205	2	19.603	1.104	.332
Error	8041.065	453	17.751		
Total	311266.000	459			
Corrected Total	45728.745	458			

* Significant at the 0.05 level of confidence

** Significant at the 0.01 level of confidence

Main Effects

Modes of Instruction (A)

It may be noted from the table 2 that F-ratio for the difference between means of different modes of instruction viz-a-viz Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM on the gain scores of Academic Achievement in Physics, has been found to be significant at the 0.01 level of confidence. Thus, the data provide sufficient evidence to reject the Hypothesis (1), "There is no significant difference in different modes of instruction viz-a-viz Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM on the gain scores of Academic Achievement in Physics". It indicates that there is significant difference in different modes of instruction viz-a-viz Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM on the gain scores of Academic Achievement in Physics. Further the analysis suggests that there is need to go ahead with 't' analysis.

TABLE 3

T-RATIOS BETWEEN THE DIFFERENCE IN MEANS OF VARIOUS CELLS OF 3X2 FACTORIAL DESIGN OF ANOVA IN CASE OF MODES OF INSTRUCTION

CELLS	D	SE_D	t-RATIO
M_7-M_8	7.405	.487	**15.211****
M_7-M_9	21.810	.479	**45.577****
M_8-M_9	14.405	.479	**30.063****

* Significant at the 0.05 level of confidence

** Significant at the 0.01 level of confidence

The above Table 3 revealed that the attained value of t-ratios for the difference between means **M_7-M_8**, **M_7-M_9** and **M_8-M_9** have been found to be significant at the 0.01 level of confidence. Further the analysis of mean Table 1 suggests that the students taught through modes of instruction i.e. Inquiry Training Model and WebQuest Integration with ITM exhibit higher academic achievement as compared to the students of Traditional Teaching Method group. Therefore, the students who were given the treatment of both ITM and WebQuest performed better academically. The present finding is in tune with the findings of Patel, Nanda and Ranjan (2011); Harahap, Sirait and Bukit (2017); Patel (2019); Wulandari et al (2019); and Hs & Simatupang (2020).

Gender (B)

It is clear from the Table 2 that F-ratio for the difference between means of male and female students has not been found significant at the 0.01 level of confidence. Thus, the data did not provide sufficient evidence to reject the Hypothesis (2), "There is no significant difference in Academic Achievement gain scores in Physics between male and female students". It indicates that there is no significant difference in Academic Achievement gain scores in Physics between male and female students. The present result is in resonance with the findings of Badmus, Hamzat and Sulaiman (2019) and in contrary with the findings of Bhatt & Sevak (2019) and Salako (2020).

Two Order Interaction (AxB)

Modes of Instruction x Gender (AxB)

The results of Table 2 showed that the F-ratio for the interaction between Modes of Instruction and gender on the gain scores of Academic Achievement has not been found significant at the 0.01 level of confidence. Thus, the data did not provide sufficient evidence to reject the Hypothesis (3),

"There is no interaction between modes of instruction and gender on the gain scores of Academic Achievement in Physics". It indicates that there exists no significant difference in the interaction effect of modes of instruction and gender on the gain scores of Academic Achievement in Physics. The present result is in parallel with the findings of Badmus, Hamzat and Sulaiman (2019).

Findings

- There is significant difference in different modes of instruction viz-a-viz Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM on the gain scores of Academic Achievement in Physics.
- Students taught through modes of instruction i.e. Inquiry Training Model and WebQuest Integration with ITM exhibit higher academic achievement as compared to the students of Traditional Teaching Method group. It is also found that the students taught through WebQuest Integration with ITM gain better academic achievement as compared to the students of ITM group.
- There is no significant difference in Academic Achievement gain scores in Physics between male and female students. Thus, gender is not contributing in the Academic Achievement gain scores in Physics.
- There exists no significant difference in the interaction effect of modes of instruction and gender on the gain scores of Academic Achievement in Physics. It suggests that the effect of instruction through prescribed modes on the achievement scores gain scores in physics is independent of gender.

Conclusion

The present investigation is showing some trend concerning modes of instruction viz-a-viz Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM. Findings of the current study indicated that there is significant difference in different modes of instruction viz-a-viz Traditional Teaching Method, Inquiry Training Model and WebQuest Integration with ITM on the gain scores of Academic Achievement in Physics. It was observed that there is no significant difference in Academic Achievement gain scores in Physics between male and female students. Also, there exists no significant difference in the interaction effect of modes of instruction and gender on the gain scores of Academic Achievement in Physics. It could be inferred that WebQuest integration with ITM works better as compared to other two modes of instruction. This framework can be replicated on different samples, circumstances, variables, and practices for better results.

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