# Using WebQuest Based Instruction to Enhance Students' Critical Thinking

**Richa Bansal[1] and Sunil Dutt[2]**

[1]Department of Education, Panjab University, Sector-14, Chandigarh-160014, India

[2]Department of Education & Educational Management, National Institute of Technical Teachers Training & Research, Sector-26, Chandigarh-160019, India

[1]richa.1922@gmail.com (Corresponding Author)

## ARTICLE INFORMATION

## ABSTRACT

The study was executed to investigate the effects of teaching via WebQuest Based Instruction on students' critical thinking in comparison to teaching through traditional mode of instruction. Murthy Critical Thinking Scale (2014) was used to assess students' critical thinking. The study was carried out with ninth grade science students who were selected from government schools of Chandigarh and were randomly separated into two groups: the control group who received conventional mode of instruction and experimental group exposed to WebQuest based instruction created by the researcher. Both descriptive as well as inferential statistics (t-test) were employed to analyze the data. The findings of the research illustrated a noteworthy variation in critical thinking between two groups where students of experimental group dominated over control group students, hence demonstrating the substantial positive effect of WebQuest based instruction on student's critical thinking. In view of the acquired results, the researcher recommended the use of WebQuest based instruction during teaching learning process and also proposed to provide proper training to teachers in how to implement the WebQuest in educational practices.

## 1. Introduction

The two most important questions which fabricate the basis of educational system of each and every nation these days are "What to teach and How to teach"? It is the learning content which answers the first question here and selecting the range and boundaries of this content generate a grave concern before the curriculum makers. The question "How to teach?" designates the teaching method or teaching approach. Selecting an appropriate and fine teaching methodology is not an easy job in a country like India where diverse societal values and cultures co-exist on a single soil.

Several methodologies have been recommended for the effective and educationally valid use of internet from time to time. It is indeed a challenge to locate quality information on internet as pupils should be able enough to discover the most pertinent pieces from the multitude of information. In answer to that, Bernie Dodge instigated the WebQuest, a framework for teachers to construct an instructional material using pre-arranged tasks and pre-defined internet resources (Dodge, 1995). WebQuest based instruction is an apt solution for this dilemma in which technology is amalgamated with constructivist approach in order to provide meaningful and effective learning in classroom setting.

## 2. WebQuest Based Instruction

The WebQuest concept was developed by Dr. Bernie Dodge and his student Tom March in 1995 to aid teachers in incorporating technology into their classrooms. Dodge characterized WebQuest as "an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet, optionally supplemented with videoconferencing" (Dodge, 1997). In simple words, a WebQuest is a web based lesson constructed by teacher. The components of the WebQuest as explained by Dodge are:

1. Introduction (this part displays the topic of study and give previous information)

2. Task (presents general overview of the assigned task; may comprise web papers, web links and books etc).
3. Process (explain the task and offers specified web resources for completing the task).
4. Evaluation (a quiz for measuring students' gains).
5. Conclusion.

Along with basic components, WebQuest also possess various other attributes. Solis (2006) classifies these attributes as:

1. WebQuests revolve around a central inquiry that needs to be rectified judiciously.
2. In a WebQuest, learners are offered with actual resources to work on.
3. Students are given specified roles within a collaborative group.
4. WebQuests employ the scaffolding approach hence promoting higher order thinking in learners.
5. Students are presented with appropriate illustrations of the topic, allowing them to build a rational link between their previous knowledge and new learning.

## 3. Critical Thinking

Critical thinking has become an imperative prospect of present-day educational scenario. All teachers are in the search of every possible way to impart critical thinking skills to their students. Teaching instruction is considered significant only when it supplies all crucial parameters of a quality education and critical thinking is most important amongst them. However, reality speaks otherwise. Students receive insignificant experience of critical thinking activities in their academic studies. Teachers seem to gush students with readymade answers sufficient to make them obtain good grades in examinations, resulting in to incapable learners who do not possess the vital thinking abilities. One of the primary aims of instruction is to create self-reliant learners capable of differentiating between right and wrong and education of critical thinking will certainly inculcate such features in them. Good thinking skills can only be developed by teaching, not on their own (Beyer, 1987). Researchers unveil that majority of students possess poor critical thinking skills (Rudd, Baker & Hoover, 2000). Ennis (1990) suggested that teaching of critical thinking skills should be an integral part of classroom learning.

## 4. Significance of the Study

One of the foremost goals of education is to cultivate student's critical thinking through teaching learning process (Yeh et al., 2001). Many investigators established that critical thinking can be inculcated in students by employing computer and web-based technologies in our teaching learning process. Dodge (2001) described WebQuest as a deep learning that results into creating novel knowledge via critical thinking process. WebQuest strategy has been incorporated in the class teaching by some and is believed to be resourceful because it encourages critical thinking and organize learning in a new manner which was almost unachievable earlier (Vidoni & Maddux, 2002). A few studies have evaluated the effects of WebQuest usage by primary and secondary school students on their high order thinking skills and shown encouraging results if regular classroom teaching is supplemented with WebQuest based instruction. Most of the research located by investigator was observed to ascertain the effect of relationship between critical thinking and academic achievement of students when educated with WebQuest based instruction. Hence, not much research has been done so far to assess the effect of WebQuest strategy in enhancing the critical thinking of secondary students. Moreover, the present study was a first attempt in Indian government schools with limited resources and success of this study might prove significant in advancing the teaching learning process not only in government institutions but also in educational set-ups where resources are found in abundance.

## 5. Review of Literature

A review of literature is carried out to identify the gaps and to formulate the hypothesis.

**Kundu & Bain (2006)** reported their practice of integrating WebQuests to one of the undergraduate course of Technology in the Visual Arts. The WebQuests were constructed collaboratively by students in the said course and it was concluded that the students were successful in integrating technology into the classroom in a constructive manner which implies that WebQuest enhanced student's creativeness and critical thinking skills.

**Alhileh & Nofal (2007)** evaluated the effect of the WebQuest strategy on improving achievement and critical thinking of educational sciences faculty (ESF) student in the thinking Course. Results of the study reported statistically significant differences in

favor of first experimental group followed by second experimental group with regard to achievement as well as critical thinking of students.

**Cigrik (2008)** studied the effect of WebQuests on students' achievement, logical thinking skills and attitude towards Science and Technology course was investigated. A sample of 136 sixth grade students from a public elementary school was distributed into two experimental groups consisting of 71 students and two control groups carrying 65 students. The findings demonstrated significant mean differences of students' achievement and logical thinking scores favoring the experimental groups whereas no difference in attitude scores was noted.

**Puthikanon & Nunthika (2009)** undertook a study entitled "Examining critical thinking and language use through the use of WebQuests in an EFL reading class." Researchers made use of case study approach with mixed research design method to collect the data from two intermediate English reading course classrooms at a university in Thailand. Two WebQuests were executed to supplement reading lessons which resulted into enhanced use of critical thinking by students during the use of WebQuest.

**Cigrik & Ergul (2010)** investigated the effect of using WebQuest on logical thinking ability in science education. Pre-test and post-test trying model was used in this study. As a result of research, the learning with WebQuest was reported to be effective on students' logical thinking ability.

**Alfar (2011)** studied the "Effectiveness of using knowledge trips via WebQuests in teaching Geography at reflective thinking and understanding of intermediate school children" with the objective of monitoring efficiency of using cognitive trips via WebQuests in teaching Geography at students' Reflective thinking and academic achievement. A statistically significant difference between the experimental group scores on the pre and post-tests of the meditative thinking test was noted.

**Zhou et al. (2012)** integrated WebQuest into chemistry classroom teaching to see whether using WebQuest promotes Students' Critical Thinking". Researchers used a pre and post-test design where they instructed 50 high school students. Data was collected using California Critical Thinking Skills Test (CCTST) and California Critical Thinking Disposition Inventory (CCTDI). Participants displayed significant difference in scores on both CCTDI and CCTST scales between pre and post WebQuest learning. Further, the subscale scores of CCTDI test also revealed significant differences in almost all dimensions of critical thinking. These outcomes advocate the effectiveness of integrating WebQuest into science teaching to promote students' critical thinking.

**Auditor & Roleda (2014)** studied the effects of WebQuest on students' critical thinking, task performance, content acquisition, and outlook towards Physics. Descriptive and inferential data analysis methods were employed in the study. The results of this study suggested that students had attained significant growth in critical thinking as well as content-knowledge acquisition.

**Averkieva et al. (2015)** experimented with the use of WebQuest to increase students' critical thinking and motivation. In particular, student's involvement in learning professional foreign language was illustrated and the role of a WebQuest in mounting students' motivation & stimulating cognitive skills was observed.

**Ahmed (2016)** conducted a research study, 'The Effect of Using Web Quest Strategy to Improve the Critical Thinking Skills in Science Course among Male Students of Six Grade' aiming to discover the effect of WebQuest in mounting critical thinking skills in science students. Semi-experimental research design was employed on the sample of 20 students from sixth grade where results demonstrated a statistically significant difference in the scores of critical thinking skills test before and after the application.

**Bansal & Dutt (2017)** conducted a review study on the topic 'Effect of WebQuest based instruction on achievement in science in relation to critical thinking and attitude towards learning science: A review' and found mixed results in regard to WebQuests as a decent approach for the valuable incorporation of this technology into teaching and learning process. Though, it has been established that students occupied in a WebQuest based learning do exhibit high cognitive skills still the question remains unanswered as to which aspect of the WebQuest is important for that.

**Calgin & Koc (2017)** examined the effect of WebQuest Supported Mathematics Instruction on critical thinking skills of sixth grade students. The critical thinking scale was employed to collect the data and it

was observed that students in the experimental group achieved higher scores in analysis, interpretation, and self-regulation skills in comparison to control group; however this difference in their scores was not found statistically significant in MANCOVA test.

**Ebadi & Rahimi (2018)** employed a descriptive mixed method to explore the influence of WebQuest based teaching on writing skills and critical thinking of EFL learners. California Critical Thinking Skills Test was applied to assess students 'critical thinking skills. Data analyzed by one-way MANCOVA and one-way MANOVA revealed that both WebQuest and conventional classrooms improved participants' critical thinking and writing skills, however, the former outdid the latter.

## 6. Hypothesis

For the present study, null hypothesis was formulated as:
There will be no significant difference between critical thinking of students taught through WebQuest based instruction and conventional instructional strategy.

## 7. Method and Procedure

Details regarding research design, sample, tool used, procedure and statistical techniques used in the study are as given below:

### 7.1. Research Design

Pre-test and Post-test experimental research design was employed in the present study.

### 7.2. Sample

The present study was carried out on a sample of 179 students of 9th class studying in English medium schools of Chandigarh affiliated to Central Board of Secondary Education, New Delhi. Students were in the age range of 13-15 years. 16 students formed the experimental mortality, as the data was not complete for such students. Hence, the results interpreted in the study are based on a sample of 163 students with 81 students in experimental group and 82 students in control group who were exposed to two different instructional strategies.

### 7.3. Tool Used

To measure the critical thinking, the investigator selected Murthy Critical thinking Scale for the present study. This scale was developed by Prof. C.G, Venkatesha Murthy in 2014 to assess the critical thinking ability of children of age group 14-18 years. In this scale, four contradictory situations are presented and a respondent is asked to imagine herself/ himself in that situation. She/he has to analyze each situation and write its different merits and demerits. The number of merits and demerits one can mark is an indication of one's ability to think in different ways. Therefore, more points one writes more thinking ability she/he possesses. In addition, if one can conclude on logical grounds, it will earn them more marks. So, final scores will be given by adding the scores of individual situations. The scale was subjected to Content validity where 10 subject experts from Psychology and Educational Psychology validated the items, scoring pattern, Process and Product categories, explanation of process-product categories and the overall scale. Reliability was calculated using both split half reliability as well as Cronbach's alpha.

### 7.4. Procedure

The study was conducted in three phases. During the First phase, students of both the groups were administered with Murthy Critical Thinking Scale as pre-test. In the second phase, i.e. Treatment phase, the experimental group was instructed with the WebQuest based instruction developed in the form of WebQuest program for chosen science topics of 9th class, while the control group was taught through conventional teaching strategy for the same science topics by the investigator for about 30 working days. During the third and final phase, same critical thinking scale was given as a post-test to both the groups after the completion of course.
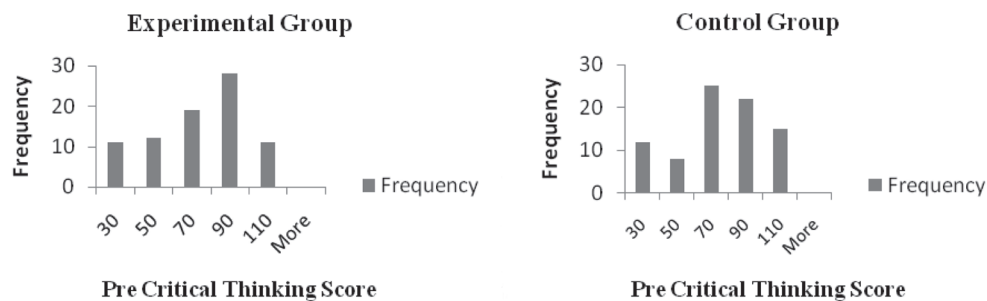
### 7.5. Statistical Techniques Employed

Descriptive statistical techniques such as measures of central tendency and dispersion were computed to study the nature of distribution of data. The data was analyzed using t-test. Graphic presentations were used wherever required.

## 8. Results & Discussion

**Table 1:** Descriptive statistical analysis of Pre Critical thinking Score of Experimental and Control group.

|  | Pre Critical thinking Score (Experimental Group) | Pre Critical thinking Score (Control Group) |
|---|---|---|
| N | 81 | 82 |
| Mean | 65.11 | 66 |
| Median | 68 | 67.5 |
| Standard Deviation | 23.94 | 23.02 |
| Skewness | −0.39 | −0.29 |
| Kurtosis | −1.18 | −0.93 |

Table 1 illustrates that the mean and median values are almost same; hence data closely resembled normal distribution. The value of skewness for both the groups advocated for the negatively skewed distribution and negative value of Kurtosis interpreted the data to be platykurtic. All the values were fairly close to the value of normal curve. The corresponding Histogram drawn (Figure 1), also confirmed the distribution of scores near to normal.

Table 1 shows the mean values for both the groups to be different. 't' test was applied to check whether this difference was statistically significant or not (Table 2).



**Figure 1:** Histogram for scores of Pre Critical thinking for Experimental and Control group.

**Table 2:** t-test analysis for Pre Critical thinking scores of Experimental and Control Group.

| Group |  | N | Mean | Std. Deviation | Std. Error Mean | t-value | p-value |
|---|---|---|---|---|---|---|---|
| Pre Critical thinking Score | Experimental | 81 | 65.11 | 23.94 | 2.66 | .185 | .426 |
|  | Control | 82 | 66 | 23.02 | 2.54 |  |  |

t value (df = 161) at 0.05 level of significance is 1.97.

Mean scores of pre critical thinking of the groups taught through WebQuest based instruction and conventional mode of instruction were 65.11 and 66 and standard deviations were calculated as 23.94 and 23.02 respectively. The calculated value of t-ratio (.185) was found to be insignificant confirming that there is no significant difference in critical thinking of both the groups. Hence both the groups can be treated as equivalent groups at the commencement of experiment.

**Table 3:** Descriptive statistical analysis of Post Critical thinking of Experimental and Control group.

|  | Post Critical thinking Score (Experimental Group) | Post Critical thinking Score (Control Group) |
|---|---|---|
| N | 81 | 82 |
| Mean | 75.57 | 67 |
| Standard Deviation | 24.77 | 22.65 |
| Median | 85 | 66.5 |
| Kurtosis | −0.97 | −0.95 |
| Skewness | −0.62 | −0.22 |

Table 3 represents the data to be negatively skewed and the negative value of kurtosis -0.974 for experimental group and -0.95 for control group indicates the distribution to be platykyrtic. There was observed a substantial increase in mean values of scores for both the groups after treatment and to ensure the significance of this increase, t-test was applied on the data as shown in Table 4.
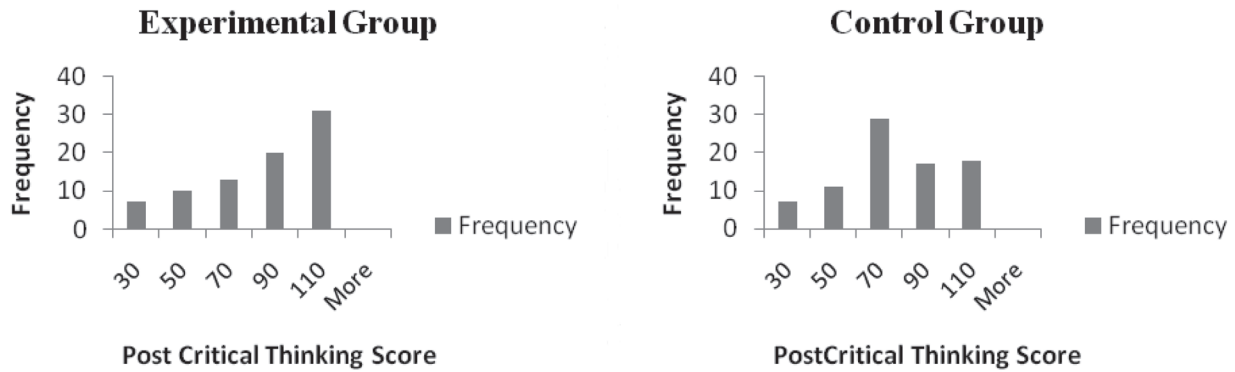


**Figure 2:** Histogram for scores of Post Critical thinking for Experimental and Control group.

**Table 4:** t-test analysis for Post Critical thinking Score of Experimental and Control Group.

|  | Group | N | Mean | Std. Deviation | Std. Error Mean | t-value | p-value |
|---|---|---|---|---|---|---|---|
| Post Critical thinking Score | Experimental | 81 | 75.57 | 24.77 | 2.75 | 2.36 | 0.01 |
|  | Control | 82 | 67 | 22.64 | 2.50 |  |  |

t value (df = 161) at 0.05 level of significance is 1.97.

It is apparent from Table 4 that students of experimental group who were taught with WebQuest based instruction achieved higher critical thinking (M=75.57) in comparison to the control group (M=67) instructed with conventional mode of teaching. Moreover, the t value of 2.36 proves the difference to be highly significant, hence confirms the effectiveness of WBI in improving students' critical thinking.

## Conclusion

To conclude, it was established that there is a significant difference in students' critical thinking taught with WebQuest based instruction and conventional mode of teaching favoring the former. The results obtained were in correspondence with the studies done by Cigrik (2010), Zhou et al. (2012), Auditor & Roleda (2014), Ahmed (2016) and Ebadi & Rahimi (2018). The null hypothesis that there will be no significant difference between critical thinking of students taught through WebQuest based instruction and conventional teaching strategy is therefore rejected. However, not many studies could be sited in this particular area of research which further necessitates the implementation of WebQuest approach in education to investigate its effects on diverse variables. Hence, the present study is an attempt to discern the positive effects of WebQuest approach in the education field.

## Recommendations

Since WebQuest is an advanced form of technology, educationalists need to recognize its efficacy as well as ineptness. Hence, more research studies need to be performed to substantiate the effectiveness of WebQuests in enhancing other educational skills.

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## Issues and Ideas in Education