

## The Effectiveness of Learning Chemistry Based on WebQuest Model on Students Achievement

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### Abstract

Website learning, an inquiry-based approach is one of the important teaching methods that needs to be implemented by teachers in teaching science. The purpose of this research was to prepare a WebQuest learning material for the topic of Matter and to evaluate the effectiveness of a website by testing the achievements of form four science stream students from Cluster School located in Pontian district, Johor. To achieve these objectives, an experimental study on 74 respondents was conducted quantitatively. The instruments used were sets of pre-test and post-test and questionnaires. The data from this research were analyzed using SPSS software to obtain the mean, frequencies and standard deviation. The finding of ANOVA analysis found that the WebQuest learning can improve the level of students' knowledge and achievement. However, no significant difference was observed when learning through traditional method or WebQuest in students achievement. The finding of this research also showed that there was no significant difference between genders towards WebQuest learning. Nevertheless, the results have shown that the students who learned through WebQuest had positive perception in the presentation of WebQuest, content and learning methods used, communication skills and time duration set in the learning of WebQuest. Finally, this research is expected to improve the process of learning chemistry, as well as promote lifelong learning.

**Keywords:** WebQuest, website learning, inquiry approach, chemistry learning process, teaching science

### Introduction

Continuous and voluntary learning may be defined as a type of learning done by motivating oneself to involve in a form of lifelong learning that can improve social inclusion, active citizenship and personal development and self-preservation of a student. As each student has a different level of intelligence and ways of learning, learning approaches taken by the teachers should be tailored according to the student's skills. One good approach to learning that should be encouraged is active learning by working in groups. It is proposed that applying WebQuest in learning science can overcome the difficulties and monotony experienced by students in understanding science. WebQuest can even make the learning process more understandable and enjoyable through group activities designed by the teacher. Perez (2005) supports the WebQuest

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as an online learning activity that makes full use of resources and findings from websites, which are then presented by the students through assignments. In addition to this, according to a study conducted by Ahmad Fauzi (2011), there are significant differences by gender that male students are more positive towards computers compared to female students. In a related development, through her research, Morahan-Martin (1998) also found that the use of the internet has been dominated by men since it was introduced. Besides that, competencies, skills, perceptions, interests and attitudes towards the use of computers and the internet during lessons also can affect students academic performance.

## **Procedure and Method**

This quasi-experimental study used pre- and post- sets of questions as a tool to measure the level of students achievement in the treatment group and the control group. Sets of test questions were distributed to the samples in the treatment group and the control group before and after they undergone the learning process using WebQuest. The result of the test is to determine whether there is a significant difference between students who learn using traditional way compared to students who learn using WebQuest. The sets of questionnaires were distributed to the WebQuest students group to see the students' perceptions about WebQuest presentations, WebQuest learning methods, communication skills contained in the WebQuest and the time appointed for them to learn through the website. The study recruited a convenience sample of 74 science stream form 4 students from SMK Cluster of Excellence in Pontian who scored 8A and 9A in the PMR examination and took chemistry subject. The samples were selected from the same school on the basis of the homogeneity of the facilities and infrastructure for both study groups.

## **Results and Discussion**

### **The difference in the level of students achievement between WebQuest learning method and traditional learning method**

In order to achieve the main purpose of the study which is to determine whether there is a significant difference in students achievement between the treatment group and the control group, ANOVA was used to analyze the findings of the pre- and post- tests.

Table 1: The ANOVA results for the Posttest – Pretest scores on the difference between the treatment group and the control group

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Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Post-test Control Group	74.842	10	7.484	.509	.849
Pre-test Experimental Group	49.223	9	5.469	.372	.924
Post-test Control Group*	111.833	7	15.976	1.086	.438
Pre-test Experimental Group					
Error	147.167	10	14.717		
Sum	29803.000	37			

The ANOVA table above which shows the results for the Posttest – Pretest scores clearly indicates no significant difference on the students levels of achievement between the treatment group and the control group. According to Dodge (1995), WebQuest was not built to demonstrate the weaknesses of traditional teaching methods, but it was built to help students in building a solid foundation to prepare them for the future. Thus, even if there is no significant difference in the students levels of achievement, the students academic performance could be enhanced through learning using WebQuest. The results obtained show that both methods of learning can increase the level of knowledge and at the same time enhance the level of student achievement. However, the aims and objectives of both methods of learning are probably different.

The differences in students level of achievement by WebQuest learning based on gender.  
Table 2 : One-way ANOVA in comparing the Pre-Test results for male and female students.

Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Gender	11.358	1	11.358	1.018	.320
Error	390.318	35	11.152		
Sum	29803.000	37			

Table 3: One-way ANOVA in comparing the Post-Test results for male and female students.

Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Gender	13.493	1	13.493	2.521	.121
Error	187.318	35	5.352		
Sum	15363.000	37			

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The study also examined whether gender affects students learning through WebQuest. ANOVA tables 2 and 3 above show that the results of pre-test and post-test are not influenced by gender during learning using WebQuest. Therefore, the null hypothesis is accepted. It was hypothesized earlier that male students should have mastered the WebQuest learning as they are more interested in solutions-based learning and learning abstractly, as Gurian et al., (2001) suggest that male students are more likely to use instructional design principles and abstract arguments in line with the fact that abstract exploration of the world is mostly done by men than by women.

In fact, a study conducted by Ahmad Fauzi Mohammed (2011) stated that the attitude of male students is more positive on the computer; therefore, the positive features should contribute to better results. However, the findings proved no significant difference in student achievement between the sexes when they learn through WebQuest. A possible explanation for this might be explained by referring to Wadsworth (1978) who confirmed Piaget's theory which states that different levels of knowledge, skills and understanding is actually influenced by experience and varied environment and not only through learning.

## **Students perceptions on learning through WebQuest**

The findings for part B of the questionnaire is about respondents' perceptions on learning through WebQuest.

Table 4 : Student Perception based on four Aspects towards lessons in WebQuest

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No	Statement	N	Mean	Standard Deviation	Variance
	<b>(A)</b> <b>Overall Web Performance</b>				
1.	I like the presentation of color in this site	37	4.2973	.57081	.326
2.	I like the size of the letters used in this web presentation.	37	4.0000	.57735	.333
3.	I like the layout of text in the web-based learning site	37	3.8919	1.04838	1.099
4.	In my opinion this web-based learning site contains elements of graphic presentation which are appropriate with the topic discussed.	37	4.4595	.83648	.700
5.	In my opinion the presentation in this website is interesting.	37	4.0000	.81650	.667
6.	In my opinion this website is user friendly.	37	4.1351	1.05836	1.120
7.	In my opinion, this web site is a fun teaching tool.	37	4.2703	.87078	.758
	<b>(B)</b> <b>Learning Methods and Contents</b>				
8.	In my opinion, the contents presented are relevant with the selected title.	37	4.3243	.81833	.670
9.	I like the way information is presented in this learning website.	37	4.0000	.81650	.667
10.	I easily understand the information obtained through this website compared to textbooks and reference books.	37	3.8919	.87508	.766
11.	I followed the instructions in this web site with ease.	37	4.2162	.53412	.285
12.	I can repeatedly participate in learning.	37	4.1892	.51843	.269
13.	In my opinion, learning methods for gathering information is more effective compared to passively listening to teachers instructions.	37	4.2973	.93882	.881
	<b>(C)</b> <b>Communication Skills</b>				
14.	I like to learn in groups because it can help me to obtain information faster.	37	4.2162	.71240	.508
15.	In my opinion, discussions with members of the group helps me think more critically and creatively.	37	4.3243	.66892	.447
16.	Members of my group always try to get information to solve a given task.	37	4.3784	.49167	.242
17.	My group members always share information to complete tasks assigned by teachers.	37	4.3243	.57995	.336

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	(D) Learning Time				
18.	I make the most of the two sessions learning to obtain as much information as possible.	37	3.9189	.59528	.354
19.	I need more time to meet and talk with members of the group outside the classroom.	37	4.2432	.64141	.411
20.	In my opinion, learning time during the two sessions is enough for me to get the information and process the information obtained.	37	3.7568	1.06472	1.134

Aspects assessed in sections (A) is WebQuest presentation aspects. The results show the mean value is on the scale 3 and scale 4 which showed that almost all of the students who use the site agree and likes WebQuest presentation patterns. Next, the aspects evaluated in part (B) are the contents and methods applied in the WebQuest. The findings show a mean value is on the scale 3 and scale 4. This shows that almost all of the students who use the site agreed with the contents and instructions that are loaded into this site.

Part (C) is the communication skills applied to the WebQuest. The results show the mean value is on the scale 3 and scale 4, which also indicate that almost all the students who use the site to give a positive perception of communication skills within the group.

Finally in part (D), the aspect of learning time is applied to the WebQuest. The findings also show a mean value is on the scale 3 and scale 4 and showed that almost all of the students who use the site agreed with the time to study this web site. The above findings show that most of the respondents who use WebQuest agreed with the four essential aspects assessed while learning using the site.

## **Students perception towards WebQuest presentation aspect.**

Perceptions of students by gender and pre-test and post-test on the aspects of WebQuest presentation can be seen clearly in Table 5 below.

Table 5 : Perception of Students towards WebQuest Presentation Aspects.

Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Gender	.124	1	.124	.249	.644
Pre-test experimental	3.847	9	.427	.855	.614
Post-test experimental	2.432	10	.243	.486	.838
Gender * Pre-test	.000	1	.000	.000	1.000

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experimental					
Gender * Post-test	.250	2	.125	.250	.790
experimental					
Pre-test experimental* Post-	.762	4	.190	.381	.814
test experimental					
Gender * Pre-test	.000	0	.	.	.
experimental* Post-test					
experimental					
Error	2.000	4	.500		
Sum	625.000	37			

According to Table 5 above, based on the findings of the analysis ( $F(1,4) = 0,249$ ,  $p = 0.644$ ),  $p > 0.05$ ; presentation aspect does not affect the students perception based on gender while the students learn using WebQuest.

## Students perception towards learning approach aspect.

Aspects of content and teaching approach is also an important element while designing teaching materials based on WebQuest model. Perceptions of students by gender and pre-test and post-test can be clearly seen in Table 6 below.

Table 6: Students perception towards aspects of learning approaches using WebQuest.

Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Gender	.000	1	.000	.000	1.000
Pre-test experimental	.452	9	.050	.402	.882
Post-test experimental	1.264	10	.126	1.011	.543
Gender* Pre-test experimental	.000	1	.000	.000	1.000
Gender* Post-test experimental	.000	2	.000	.000	1.000
Pre-test experimental* Post-	.357	4	.089	.714	.624
test experimental					
Gender* Pre-test	.000	0	.	.	.
experimental* Post-test					
experimental					
Error	.500	4	.125		
Sum	571.000	37			

According to Table 6, the contents and learning approaches in WebQuest do not affect the students perception based on gender based on the findings of the analysis ( $F(1,4) = 0.000$ ,  $p = 1.000$ ),  $p > 0.05$ .

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## Students perception towards communications aspect.

Communication skills aspect is considered an important element because WebQuest is a way of learning that fosters skills for studying in groups. Perceptions of students by gender and pre-test and post-test can be clearly seen in Table 7 below.

Table 7 : Students perception towards communications aspect.

Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Gender	.345	1	.345	.460	.535
Pre-test experimental	1.555	9	.173	.230	.969
Post-test experimental	5.732	10	.573	.764	.669
Gender* Pre-test experimental	.071	1	.071	.095	.773
Gender* Post-test experimental	1.083	2	.542	.722	.540
Pre-test experimental* Post-test experimental	1.464	4	.366	.488	.748
Gender* Pre-test experimental* Post-test experimental	.000	0	.	.	.
Error	3.000	4	.750		
Sum	674.000	37			

According to Table 7 which shows the ratio of students' on the communication skills through WebQuest based on gender, it was found that communication skills does not affect the students perception based on gender based on the findings of the analysis ( $F(1,4) = 0.460$ ,  $p = 0.535$ ),  $p > 0.05$ .

## Students perception towards time aspect

Time aspect is important because learning through WebQuest is a way of learning which should save time in the classroom. Perceptions of students by gender and pre-test and post-test can be clearly seen in Table 3.8 below.

Table 8 : Students Perception Towards Aspect of Time for Learning

Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Gender	.677	1	.677	.903	.396
Pre-test experimental	.889	9	.099	.132	.994
Post-test experimental	3.984	10	.398	.531	.810
Gender* Pre-test experimental	.071	1	.071	.095	.773
Gender* Post-test experimental	1.083	2	.542	.722	.540



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experimental					
Pre-test experimental* Post-test experimental	1.107	4	.277	.369	.821
Gender* Pre-test experimental* Post-test experimental	.000	0	.	.	.
Error	3.000	4	.750		
Sum	611.000	37			

Table 8 shows a comparison of students' perceptions of learning time for WebQuest based on gender. It was found that the aspect of learning time does not affect students perception based on gender while studying using WebQuest ( $F(1,4) = 0.903$ ,  $p = 0.396$ ),  $p > 0.05$ .

The findings of the four aspects of the WebQuest presentation have shown that almost all respondents give a very good and positive perception and do not affect students perception based on gender, or students achievement in pre-test and post-test. This shows WebQuest could be well received by students as one meaningful learning medium.

## Conclusion

Summary of the findings obtained by the research questions suggests that teaching materials which was produced based on the WebQuest for the subject chemistry for form four students have already successfully been produced. However, the test to determine the effectiveness of the material showed no significant difference in the levels of student achievement between the treatment group compared to the control group. Therefore  $H_01$  hypothesis is acceptable because the results of students achievement are the same. Besides, the results showed no significant difference between genders in WebQuest learning towards the experimental sample. Results showed that gender did not affect WebQuest learning. Therefore  $H_02$  hypothesis is accepted. There are four main aspects related to the perception of students assessed in the study.

The results showed that all perception assessed, namely in terms of presentation, contents, communication and time were well received by the participants in the study.

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