Learning from WebQuests

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INTRODUCTION

Science teachers are constantly seeking new and innovative ways to engage their students in inquiry activities. One novel approach is to have students seek out information about a topic using Web-based resources. Thus, teachers send learners on a quest for information using the Word Wide Web. March and Dodge define WebQuests as an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet (Dodge, 1998). A short term WebQuest engages learners on tasks that require one to three class periods allowing learners to interact with a number of sources of new information and make sense of it. A long-term WebQuest requires additional time, usually more than three class periods depending on the amount of work required by the teacher. Learners analyze a body of knowledge, transform it in some way and demonstrate in-depth understanding of the material by creating a final product that others can react or respond to.

According to March (1999), the scaffolding structure of WebQuests allows students to transform new information and understand it better. He further notes the possibility for collaborative work that helps learners in the development of social abilities, which is an important skill for achieving goals both inside and outside of classrooms. Some have embraced the WebQuest strategy and believe that it is effective because it inspires critical thinking and contextualizes learning in a way that was not previously possible (Vidoni & Maddux, 2002).

Burke et al. (2003) compared the WebQuest method against classroom demonstrations for an introductory Biology course with 365 students in 19

laboratories sections. Eight groups were randomly assigned to biology laboratory sections using WebQuest modules on Mac wireless computers; eleven sections participated in traditional demonstration laboratories. Final exam score differences were not significant. Students had a positive attitude toward the WebQuest lab sections.

METHODS

Two WebQuest experiments were conducted in a rural high school that occupies a rather new building and is very well supported with technology. The authors (ML, AM) developed the WebQuests for the teachers and designed the details of the WebQuest activity. The class scheduling strategy for this school made it possible for students to be randomly assigned to treatments. The number of spaces available in the computer room led to small differences in the number of students placed in each group. The nature of the curriculum was such that students could be engaged in WebQuests in two areas: social science (history) and science (earth science).

EXPERIMENT 1

In the first experiment, the study topic was "Assassinations of Four American Presidents and Their Impact on the History of the United States". The participants were 72 high school students in a freshman history class. The teacher had more than 20 years of teaching experience in social studies. The class was randomly divided into computer lab (N =31) and regular classroom (N = 41).

Each student was issued a number from 1 to 72. A 15-item pre-test was administered to each student on the first day of the experiment. The teacher scored each test during the next four days, the students in the regular classroom listened to the teacher, took notes, watched a movie, and participated in discussions on the given topic. The teacher, an effective storyteller, kept students on task almost all the class time. Each of the four class times during four days of the study was devoted to one of the stories about each of the assassinated American Presidents.

During the same four days, students in the computer lab worked through the WebQuest individually. The WebQuest contained a scoring rubric with detailed information on the teachers' requirements and expectations for their final product, a *PowerPoint* presentation. The teacher was also in the laboratory assuring that students stayed on task. He answered students' questions regarding the topic. The students' computer proficiency was very high, and they experienced very few problems related to working with *PowerPoint* software to create their final products.

At the end of four days, both groups of students were given a post-test that was identical to the pre-test. The post-test was scored by the teacher.
On the same fourth day, the researchers conducted unstructured interviews with the teacher (20 minutes) and twelve WebQuest students (10 minutes each) (Creswell, 2002, p.206). The researchers transcribed audiotapes of the interviews.

EXPERIMENT 2

In the second experiment, the study topic was geology (rocks and minerals). The participants included 72 freshman science students who were computer proficient and able to use *PowerPoint* software. The class was randomly divided into 31 students in a WebQuest group and 41 students in a traditional group. A 22-item pre-test was administered and scored by the teacher. During the next four days, the teacher lectured to the control group using *PowerPoint* presentations and shared samples of rocks and minerals with students. Students worked alone, listened to the lectures, took notes, and occasionally asked questions.

The WebQuest unit consisted of a Web site containing a collection of Web-based resources for exploration, project-based tasks, and instructions on organizing *PowerPoint* materials for in-class presentations. WebQuest students received technical instructions on navigating the WebQuest. The participants worked in groups of two (one group had three members). The groups were allowed to browse the resources provided in the WebQuest, print materials from the web and collaborate with each other at their convenience within the four class periods. The teacher was in the classroom at all times, occasionally interacting with students and answering questions related to the WebQuest activities. The teacher helped students with technical problems and answered computer related questions. WebQuest students made oral presentations using their *PowerPoint* programs. On the fourth day, a post-test identical to the pre-test was administered and scored by the teacher. On the same day, the researchers conducted

unstructured interviews with the teacher (20 minutes) and eight WebQuest students (10 minutes each) (Creswell, 2002, p.206). The researchers transcribed audiotapes of the interviews.

RESULTS

Experiment 1 (History).

Figure 1. History Pre-test/Post-test

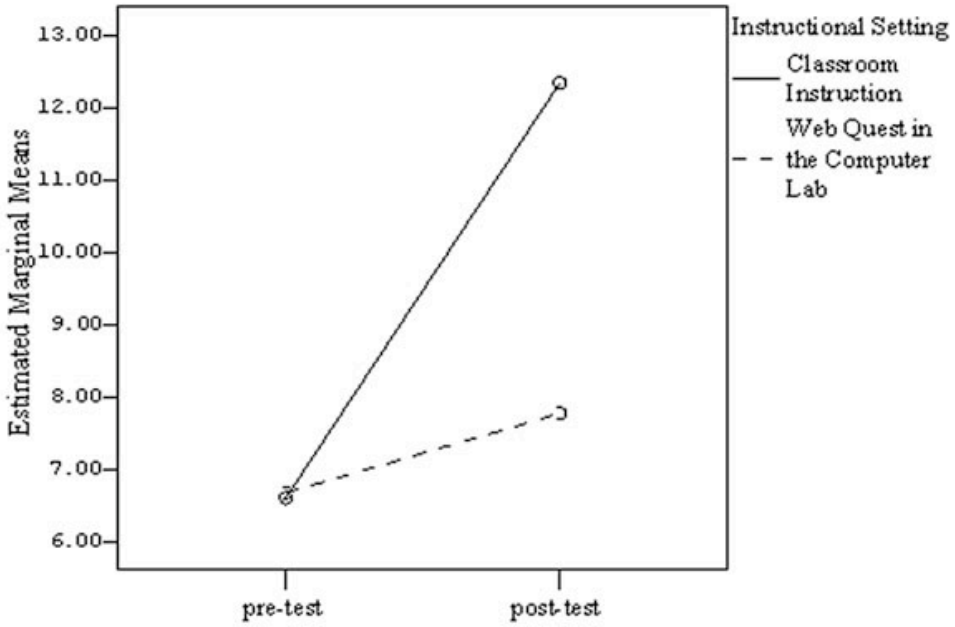

Table 1. History Descriptive Statistics

	Instructional Setting	Mean	Std. Dev.	N
Pretest	Classroom	6.61	2.08	41
	Web Quest	6.68	2.57	31
Posttest	Classroom	12.3	2.2	41
	Web Quest	7.77	2.11	31

Table 2. History ANOVA

Source	SS	df	MS	F	Sig.
time	411.558	1	411.558	131.321	.000
time * group	189.614	1	189.614	60.502	.000
Error(time)	219.379	70	3.134		
group	178.703	1	178.703	26.072	.000
Error	479.790	70	6.854		

Pre-test scores were not significantly different. The improved performance of the control group relative to the WebQuest group on the post-test was significant.

Experitment 2 (Geology).

Figure 2. Geology Pre-test/Post-test

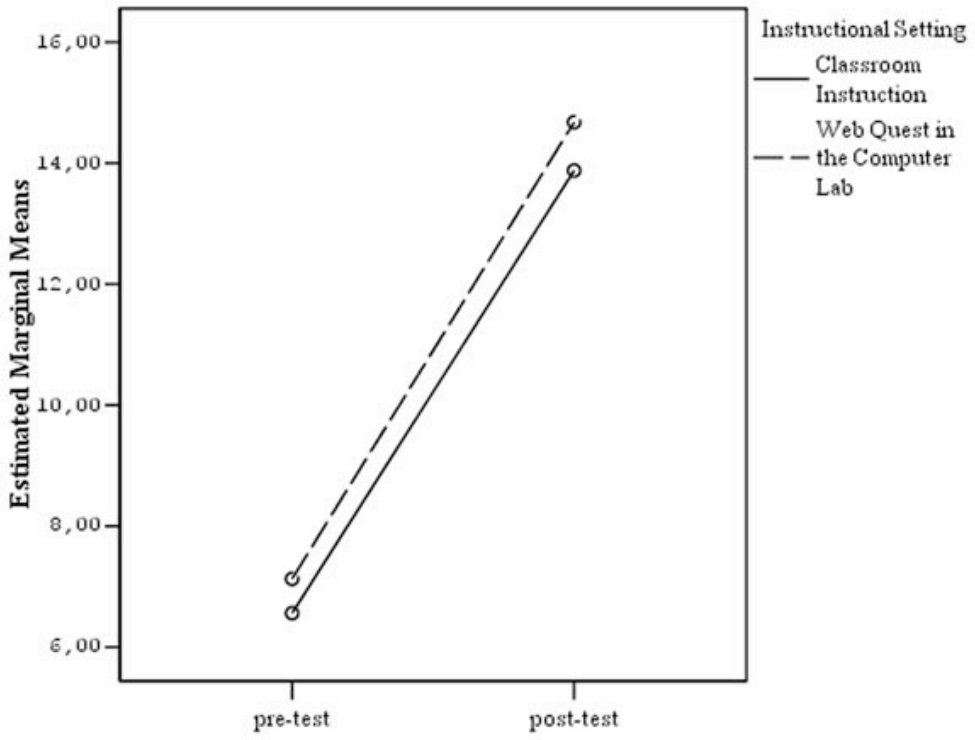

Table 3. Geology Descriptive Statistics

	Instructional Setting	Mean	Std. Deviation	N
Pretest	Classroom	6.61	2.55	41
	Web Quest	7.13	2.85	31
Posttest	Classroom	13.9	5.45	41
	Web Quest	14.7	5.12	31

Table 4. Geology ANOVA

Source	SS	df	MS	F	Sig.
time	1931.318	1	1931.318	142.215	.000
time * group	.818	1	.818	.060	.807
Error(time)	950.619	70	13.580		
group	15.921	1	15.921	.729	.396
Error	1528.517	70	21.836		

The pre-test scores were not significantly different from one another. The post-test scores were not significantly different from one another.

INTERVIEWS

The interviews suggested that both the teachers and students were quite satisfied with the WebQuests. In response to initial, open-ended questions about the WebQuest, the teachers said (edited for clarity):

Science Teacher: From what I saw from the *PowerPoints*, I think the students were able to find the information. They were finding extra information that we really didn't have time cover, like some of the rocks

and some of the minerals, things like that. So, it did a pretty good job; it was really focused, which I think was one of the big keys of it. The students don't have the space to wander too much.

History Teacher: It was very detailed. I have a counterpart history teacher who teaches another part of the history section for freshmen, and he is right now getting to this topic in his program, so I told him about the WebQuest. I told him that the WebQuest is very detailed. We could have gone another day easily, but on the other hand, no one got off task earlier and didn't wander around the computer lab without any work to do. A lot of times, teachers feel like their class got away from them, but this happens just because kids don't have enough to do. The WebQuest kids had a little bit extra advantage over the other kids.

The students also were pleased (edited for clarity):

History Student 1: I thought it was fun – I like to do hands on things, like making a *PowerPoint*. I like to do something like that – it is fun.

History Student 2: I thought it was easier than just being in the classroom because you can actually see it on the screen.

Science Student 1: I didn't have to sit in a classroom and just listen to the teacher the whole time. I could go around and look for the stuff.

Of the twenty students interviewed, nineteen responses were positive. The least positive response to the opening question was:

Science Student 2: It was difficult. It was too difficult, I don't do well hands on with those things. It was not so fun.

As is often found to be the case, students often respond well to learning activities in which the learning is less effective (Clark, 1982). In response to the specific question, "Do you feel that the WebQuest helped you to learn the topic?", a typical student response was:

History Student 2: Yes, Much more beneficial than learning in the classroom.

This response suggests that the student believed she/he learned more when the data suggest that learning in history was less effective.

DISCUSSION

The qualitative data suggest clearly that both students and teachers enjoy WebQuests. In these studies, the authors developed the WebQuests for the teachers and designed the details of the WebQuest activity. Also, the environment was one with rich support for technology and in which access to hardware was easy and levels of student savvy with respect to technology use were high. It was clear that, in spite of these factors, neither the students nor the teachers in this study were accustomed to using WebQuests as teaching/learning activities.

The strongest aspect of this study was that, for each experiment, both the pre-test and post-test were the same. So, any learning differences can be ascribed to the treatment. There are many other issues, however. It may be that the teacher instruction during the history class may have inadvertently rehearsed student responses for the test. Only the treatment students were expected to

develop *PowerPoints*, a potentially confounding factor. In the science experiment, students worked in pairs. Working in pairs inevitably raises the level of performance-based feedback received by the students. Also, the students in this group were expected to present their *PowerPoint* programs to their peers. In other words, there may be special reasons that enhanced the traditional history performance or the WebQuest science performance. Nevertheless, in neither of these experiments did the WebQuest activity lead to superior learning relative to conventional instruction.

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