What We Know About the Impacts of WebQuests: A Review of Research

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This article examines the body of research investigating the impacts of the WebQuest instructional strategy on teaching and learning. The WebQuest instructional strategy is often praised as an inquiry-oriented activity, which effectively integrates technology into teaching and learning. The results of research suggest that while this strategy may have a positive impact on collaborative working skills and learner attitudes, there is little direct impact or advantage for increasing student achievement when compared with other instructional activities. Included in this article is a discussion of the notable research studies that have investigated the WebQuest strategy as well as a discussion of the implications and future direction for web-based inquiry projects.

 Since the concept of an inquiry-oriented WebQuest activity was first introduced in 1995, this educational strategy has been the focus of professional development workshops and preservice teacher preparation courses as an example of the effective integration of technology in education. A recent search of the WebQuest.org database yielded over 1700 user contributed WebQuest activities with all K-12 curricular areas represented, as well

as many topics for adult and higher education. Similar searches using internet search engines yielded a seemingly inexhaustible supply of Web-Quest activities and related resources. Like many educational pursuits however, it is necessary to continually evaluate the impact of these strategies on the teaching and learning process in order to further the evolution of a promising concept.

WebQuests were introduced by Bernie Dodge (1995) 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 video conferencing" (p. 10). Dodge further described the two levels of WebQuests as Short Term WebQuests that "are designed to be completed in one to three class periods" and also Longer Term WebQuests that are designed to be completed in a time period ranging from one week to one month. Underlying the WebQuest strategy is a central inquiry-oriented activity that is described in a web-based format. While various methods have evolved for presenting the activity in a web page, the content of a WebQuest activity is divided into several sections, including: (a) Introduction, (b) Task, (c) Process, (d) Evaluation, and (e) Conclusion. In his 1995 article, Dodge detailed the cognitive skills that may be required while completing a WebQuest activity and noted that these activities are likely to be group-based and may be interdisciplinary.

While the form and function of a WebQuest activity has been well documented, there has been some debate concerning the value and longevity of this strategy. Maddux and Cummings (2004) described WebQuests as "an innovation at risk of suffering the fate of all educational fads" (p. 525) that is highly praised initially, widely implemented without support of research and evaluation, and then abandoned when they fail to live up to their initial promise. Though these authors acknowledge the connection of WebQuests with learning and developmental theory, they questioned the implementation of the WebQuest strategy without regard to the discipline and/or age level of the students with which the activity is used. This discussion has been recently continued by Maddux and Cummings (2007) to examine the age appropriateness of the WebQuest concept and the lack of focus on the learner in the development phase of the activity. Noting specifically the omission of learner characteristics in the "Rubric for Evaluating WebQuests" (Bellofatto, Bohl, Casey, Krill, & Dodge, 2001), Maddux and Cummings (2007) asserted that the "lack of concern with the learner is the major weakness of the WebQuest approach" (p. 120).

The creators of the WebQuest strategy have also engaged in discussion regarding the further development of the strategy. In an article titled "FOCUS: Five Rules for Writing a Great WebQuest" Dodge (2001), provided suggestions for improving the quality of teacher-developed WebQuests with a focus creating a challenging and valuable web-based inquiry project. In a later article, Dodge furthered the discussion of the need to research on WebQuests by suggesting a closer examination of the motivational aspects of the WebQuest approach. WebQuest co-creator Tom March (2003) also noted that "the implementation of WebQuests sometimes falls short" (p. 42) when activities are created that use the basic formatting and structure of a WebQuests but fail to incorporate the learning theory that should guide the development of such a web-based activity. In a later publication, March (2005) further described the need for learning activities to be "real, rich, and relevant" (p. 19) in order to engage today's media savvy learners and offered WebQuests as one possibility for an authentic learning activity when implemented appropriately.

As with any widely popular learning activity, it is necessary to engage in a deeper discussion of the merits of strategies such as the WebQuests to better understand their impact on teaching and learning. Robyler and Knezek (2003) discussed the need for a national research agenda that would investigate the theories underlying technology-enhanced educational methods and provide evidence of the true impact of these instructional methods on student achievement and motivation. In response to Robyler and Knezek, Strudler (2003) agreed that "research needs to help us sort through the myriad of approaches to using technology and help identify 'promising practices' that may consistently be effective in address particular education-al needs" (p. 74). Milson (2002) described much of the literature on WebQuests as "anecdotal accounts of success" (p. 335) and suggested a need for research to understand the effectiveness of this instructional strategy. While the WebQuest strategy has become very popular among technology-enhanced teaching strategies, it is the focus of this article to determine what is currently known about the impacts of the WebQuest approach on teaching and learning.

RESEARCH PROCESS

The overarching goal of this literature analysis is to better understand what has been learned about the WebQuest approach since it was first introduced

in 1995. Specifically, this research seeks to identify what has been revealed by the body of research about the impact of WebQuests on the multiple facets of the teaching and learning process including student achievement, cognitive level, and motivation.

The research process for the study included a preliminary literature search for all published articles, theses, dissertations, and conference proceedings relating to the implementation of the WebQuest strategy at all levels of education. The search included sources in the Educational Resources Information Center (ERIC) database, EBSCO Academic Search Premier and Educational Research Complete databases, the Education and Information Technology (ED/IT) digital library, the Ohio Library and Information Network (OhioLINK), as well as the Google Scholar Internet search engine. These databases provided access to a wide array of refereed journals and professional publications relating to educational technology as well as conference proceedings for several professional organizations.

Abstract, title, and full-text searches were conducted using each source for the keywords "WebQuest" and "Web Quest," as well as works that included a citation to the original WebQuest articles. Additional references were also discovered from the citations within the compiled articles. Following the preliminary literature search, all collected documents were reviewed and an article coding system was created for classifying. The initial search produced 114 published sources, 108 of which were identified as being related to WebQuests. Of these 108 references, 58 were papers presented at conferences and 44 were reviewed or refereed articles. Also included were two were reports, two web pages, and two theses.

Following the compilation of sources, an analysis was completed independently by two reviewers to classify the type of each article using three primary and nine secondary classifications. The primary classification identified each article as (a) research, (b) descriptive, or (c) informational while a secondary classification was used to identify the specific types of research methods used in the study. For the purposes of this study, articles were classified as research articles based on a broad definition of research including quantitative, qualitative, mixed-method, and case-study research methods.

Table 1

First Level Classification System for Compiled References

Primary Classification	Secondary Classification	
1. Research Article described a research study that was conducted involving WebQuests.	a) b) c) d) e)	Empirical Qualitative Case Study Action Research Evaluation
2. Descriptive Article was primarily descriptive in nature and described the design, development, or implementation of a WebQuest.	a) b) c) d)	Activity Overview General Information Literature Review Descriptive Statistics
3. Informational Article described the concept of a WebQuest in general or theoretical foundations concerning the use of WebQuests in education.	a) b)	General Information Theoretical Foundation

As indicated in Table 2, the majority of the articles identified by the literature search were descriptive in nature and were predominantly articles describing how WebQuests were used in a specific context. These articles were relevant to the secondary research goal of better understanding the context in which WebQuests are being implemented. Though some of these articles suggested practices and methods that would support the use of WebQuests in various learning contexts, they did not meet the selection criteria for identifying research-supported practices as they did not incorporate a research method. Forty-one of the retrieved articles (37.9%) described some type of formal research method and met the criteria for further review. The majority of these articles were either empirical or evaluative studies, though case studies, action research, and qualitative methodologies were identified as well.

Following the initial classification of each article, those articles identified as research studies were analyzed further for impacts on teaching and learning as well as promising practices and recommendations for the implementation of the WebQuest instructional method that were supported by the research findings.

Table 2

Frequency of Articles by Primary and Secondary Classifications

Article Type	Number of articles
1. Research	
Empirical	13
Evaluation	13
Qualitative	3
Action Research	4
Case Study	8
2. Descriptive	
Activity Overview	52
Literature Review	1
3. Information	
General information/ theoretical foundation	14

RESEARCH FINDINGS

The analysis of published literature yielded multiple sources relevant to the research goals. In seeking to identify the impacts of WebQuests on teaching and learning as well as the promising practices and strategies for implementation, the review was limited to those sources that described a specific research process and design. Twenty-six out of the 41 compiled research articles that met this criterion also identified specific impacts on teaching and learning. These impacts of WebQuests on teaching and learning described in the literature could be grouped into three general categories.

1. Attitudes and perceptions of learners

2. Impacts on learning content and skills

3. Investigations of the cognitive requirements of WebQuests

Most prevalent among these research studies were investigations of the attitudes and perceptions of learners toward WebQuests. However, notable research was discovered in all three categories. The following is a summary of the notable findings of the positive and negative impacts of WebQuest.

Learner Perceptions of WebQuests

Many of the studies compiled included an evaluation of the impacts of the WebQuests on the attitudes and perceptions of learners. While several studies identified attitudes and perceptions that were generally positive towards WebQuests (Carroll, Legg, & Taylor, 2003; Fox, 1999; Gaskill, McNulty, & Brooks, 2006; Santavenere, 2003), the most notable research identified impacts on motivation, clarification of information, benefits of collaboration, and perceptions of technology skills.

While investigating the impacts of WebQuests over the 10 years since the concept was first proposed, Murray (2006) used a mixed-method approach to discern students' perceptions of a WebQuest on "What It Means to Be Australian." While Murray found attitudes were generally positive towards WebQuests, his findings also suggested a link between the difficulty of a WebQuest and the motivation to complete the activity. Murray also reported that a majority of students wanted to quit working when the activity became difficult. However, it was noted that a slight majority of students wanted to work harder to better understand the material. By the end of the study, however, 61% of the students believed the activity was NOT too difficult for them to complete. In follow-up interviews, the students noted a loss of interest in the activity over the two-week period. It was found, though, that the students preferred the WebQuest activity to "textbooks and lectures" (p. 6). These results are also reflected in a study by Tsai (2006b) in which a correlation was found between motivation and perceived learning vocabulary and reading skills in an EFL course. While this evidence does support the argument that WebQuests are an engaging activity, it may suggest simply a preference toward nontraditional types of learning activities which may be viewed as less difficult by participants and not necessarily a preference for WebQuests specifically.

In addition to motivation, three studies also suggest the WebQuests have an impact on the students perceptions related to the structure of the activity

itself. WebQuests are often touted as providing a sound structure and scaffold for learning. Tsai (2006b), in addition to investigating motivation, also identified a connection between WebQuests and the ability of students to identify contextual clues and main ideas in readings within the context of an English as a Foreign Language (EFL) course. Tsai found the structure of the WebQuest activity served as an advanced organizing mechanism for preparing students in an EFL to complete readings. Further, in studies by Gorrow, Bing, and Royer (2004) as well as Beyerback and Burrel (2004), the WebQuest strategy was found to assist students in identifying key information in linked resources and also to help students locate higher quality resources. Gorrow et al. also found that students perceived a clarification of expectations in the WebQuest activity and believed they could achieve a higher grade on the assignment. These studies suggest that WebQuests can have a positive impact on skills closely related to achievement.

One of the more popular reasons for using the WebQuest strategy is that it is a mechanism for integrating technology into teaching and learning. The research investigating the integration of technology supports this advantage of WebQuests. However, it is less clear whether this connection is unique to the WebQuest strategy or how much of an advantage WebQuests may offer in this area. Gorrow et al. (2004) noted that students perceived an increase in technology skills while completing the WebQuest activity. These skills, however, were directly linked to requirements of the activity in which students were required to use specific technology. Not surprisingly, when required to use specific communications technology, students believed that their skills with this technology increased. Similarly, Dell (2006) found that by requiring students to design a WebQuest using PowerPoint, students perceived that their skills in using PowerPoint increased. In examining these studies, however, it is unclear how unique this may be to the use of a WebQuest. In situations where a WebQuest did not require any specific technology other than an Internet browser, the impact on technology skills was not typically measured. Therefore it is unknown if the WebQuest strategy offers any particular benefit to increasing technology skills that other technology-based activities would not also offer.

Perhaps the strongest evidence suggests that WebQuests are an effective way to develop collaboration among students. Using case study methodology, Milson (2002) arrived at several hypotheses concerning the implementation of a WebQuest strategy. His hypotheses included the assertion that

students perceive the value of inquiry-oriented investigations differently. While his findings suggested that there may be a benefit in special needs students working collaboratively with higher-ability students in an inquiry activity, Milson continued to describe his findings as the basis for further research into the impacts of the WebQuest strategy. Kortecamp and Bartoshesky (2003) further supported the idea that WebQuests can foster collaboration among students and found that the majority of students perceived a benefit of this collaboration. In a larger scale study, Leahy and Twomey (2005) found that students were sometimes challenged and frustrated by collaboration, but perceived the ultimate benefit of developing collaborative work skills. It was in this study that students acknowledged that collaborative work was not as easy as they had believed it would be. However, 77% of the 300 students in this study reported that they worked together on all aspects of the activity and were largely satisfied with this collaborative work. Students who reported negative perceptions of collaborative work were in the minority, but were also found to have a preference for working alone. Those who preferred working alone also had a negative perception of self-selecting collaborative groups. In investigating the development of collaborative working skills, however, it is again difficult to connect specifically to the WebQuest strategy, though clearly a group-based WebQuests can foster these skills. Though not all WebQuests are group-based activities, these findings suggest that those that do employ group-based strategies are capable of developing collaborative working skills and may also benefit special needs students through collaboration.

Impact of WebQuests on Learning and Achievement

As is the case with any instructional strategy, method, or model, one primary concern of research and evaluation efforts is to better understand the impacts of these methods specifically on learning and achievement. Though it has been noted that there is a lack of this type of research with regards to WebQuests (Milson, 2001, 2002; Strickland, 2005), the research that has been reported does not reveal many notable advantages of this instructional method. In a study by Strickland, a comparison was conducted of 86 seventh-grade students that completed either a traditional poster activity or a WebQuest activity regarding Texas history. It was found that groups completing the traditional activity scored significantly higher than the WebQuest group on an end-of-unit exam. Though Gaskill, McNulty, and

Brooks (2006) conducted two studies of older students, one of their two experimental studies yielded similar results. Both of their studies compared a control group that used traditional instructional methods with a experimental group that used WebQuests. In their first experiment, Gaskill et al. found that the control group outperformed the WebQuest group using pre and posttest measures of history. Also reported was a similar experiment in which no significant difference was found between the traditional and WebQuest groups using pre and posttest of geology knowledge. The second experiment produced similar results to those found by Burke, Guffey, Colter, and Riehl (2003). No significant difference was found among groups of college students in an introductory biology course that used either WebQuest or traditional activities.

Only one demonstrated an advantage of using the WebQuest model to improve student learning and achievement. Tsai (2006a) investigated the impacts of using the WebQuest model in an English as a Foreign Language (EFL) program. In this study, the students who completed the WebQuest activities were rated higher on measures of vocabulary performance and story reading performance, though no difference was found between the groups on thematic reading comprehension. While the lack of random assignment to the experimental and control groups is a notable threat to the validity of this study, these results, however, do provide one example of the context in which WebQuests may provide a slight advantage to traditional methods of instruction.

Cognitive Requirements of WebQuests

The investigations of the cognitive requirements of WebQuest have largely focused on whether WebQuests promoted higher-order thinking and inquiry skills. In comparing WebQuests to other strategies, a study by Kanuka, Rourke, and Laflamme (2007), suggested that WebQuests were more effective than some other activities at supporting a higher "cognitive presence." This study compared the quality of postings to online discussions while students were taking part in five communication activities.All student contributions to online discussion were categorized according to four levels of cognitive presence (Level 1: Triggering Event; Level 2: Exploration; Level 3: Integration; Level 4: Resolution). The result indicated that, while the overall ratings at the highest level of cognitive presence (resolution)

were low, students in the WebQuest and debate activities scored the highest ratings. The authors cite the advantages of a highly structured activity with clearly defined roles in explaining the high frequency of postings at all four levels of cognitive presence in the WebQuest activity. Within the WebQuest activity, postings rated as "Phase 2: Exploration" in which learners are "searching for explanations of the problem" (p. 264) were the most frequent.

Two research studies were identified that related to the problem-solving nature of WebQuests. Popham and Wentworth (2003) investigated the cognitive requirements of WebQuests within the context of a WebQuest workshop for inservice and preservice teachers. While evaluating WebQuests that were created during the workshop, the study found a significant correlation between problem-solving activities and critical thinking. These findings suggest that activities, which were more focused on problem-solving activities, were also more likely to exhibit characteristics of a critical thinking instructional activity. The authors caution, however, that "additional work needs to be done with the teacher educators to focus WebQuest development on higher level thinking skills and problem solving" (p. 3773). Molebash, Dodge, Bell, and Mason (2002) however, suggested that there may be difficulty in supporting some of these higher level thinking skills. In this study, authored in part by one of the cocreators of the WebQuest strategy, it was found that a majority of sampled WebQuests contributed to the WebQuest.org database exhibited were classified as at a lower level of inquiry. The study used Herron's "Four Levels of Inquiry" (1971), and rated 75 WebQuests as (0) Confirmation/Verification, (1) Structured Inquiry, (2) Guided Inquiry, or (3) Open Inquiry. The study found that 20% of the sampled WebQuests had no component of inquiry, while 4% were rated as Confirmation/Verification, 60% were Structured Inquiry, 16% were Guided Inquiry, and none were rated as Open Inquiry. The authors of this study acknowledge that "while WebQuests are touted as 'inquiry-oriented' activities… [they] were intended to be structured inquiry [Level 1]" (p. 68), when originally conceived. To address the next step in the evolution of web-based inquiry-oriented activities, the authors propose the use of Web-Inquiry Projects (WIPs) as one possible solution toward promoting higher levels of inquiry and higher levels of thinking. It is suggested that Web-Inquiry Projects "are intended to be used as inquiry roadmaps for teachers desiring to promote higher levels of student-centered inquiry, specifically by leveraging uninterpreted online data to answer inquiry-oriented questions" (p. 69). The WIP model suggests a six-stage spiral inquiry model in which students, teachers, and the Web-Inquiry Project play various roles through-

out the inquiry process with the ultimate goal of achieving a higher level of inquiry that is more difficult to achieve using the "heavily scaffolded" (p. 71) WebQuest strategy.

DISCUSSION

While WebQuests are often touted as an exemplary strategy for the effective integration of technology into teaching and learning, the results from the reviewed studies are mixed. One overarching issue with what is known about the WebQuest strategy is the scarcity of research on the effects of this method on teaching and learning. In searching for published research on WebQuests, only 41 resources were found that included a research method. Far fewer still were found to employ research methods that could contribute to the understanding of the impacts of this strategy on teaching and learning. Since the majority of resources located in the literature search were descriptive of a WebQuest activity, it appears that Milson (2002) was correct in his assertion that most of our knowledge regarding the benefits of the Web-Quest strategy comes from anecdotal accounts of how this strategy is being used.

With regards specifically to learning and achievement, the WebQuest strategy does not seem to offer any notable advantage over other types of activities. Of the studies reviewed that included a measure of learning, only within the context of an English as a Foreign Language course was there found to be any advantage to the WebQuest approach. Findings from most other studies commonly found that a more traditional approach was either more effective or not significantly different from a WebQuest in terms of learning and acheivement. Given that WebQuests can be time consuming to design and maintain, it is difficult to argue that the WebQuest approach is worth the effort. However, with such a lack of studies that have investigated this issue directly, it is also difficult to make a clear recommendation either against or in favor of the WebQuest strategy as a method to improve content learning and skill development.

In contrast to the mixed impact of WebQuest specifically on learning, it has been demonstrated that WebQuests can have a positive impact on motivation and are often preferred by students. This may simply be an example of what Milson (2002) indentified as an initial preference toward the "path of

least resistance" or this may be representative of a preference toward inquiry-based activities or a preference toward technology-based activities. While this also remains somewhat unclear based on the existing research, it does indicate that the motivational aspects of WebQuests are a topic that can provide valuable insight into this and other technology and inquiry-based activities. In considering the future evolution of the WebQuest strategy, it would be helpful to better understand exactly which facets of these activities increased students' motivation to learn.

It is in considering the cognitive requirements of WebQuests that we begin to see the possible evolution of the WebQuest strategy. WebQuests are often described as a strategy that supports higher-order thinking skills. While it has been demonstrated that students engaged in a WebQuest activity do demonstrate a higher level of cognitive presence that in other activities (Kanuka et al., 2007), the question remains as to which of the facets of the WebQuest activity contribute to this finding. It is possible that the increased collaboration among students may contribute to this. It is also suggested by Molebash et al. (2002) that the inquiry level of the WebQuests has a direct influence on the level of thinking required of the students and also that there is a limit to the inquiry-level that can be achieved by a WebQuest.

CONCLUSIONS

This review of literature should not be interpreted as criticism of the WebQuest strategy, but rather an effort to bring to light what exactly is known about the benefits of WebQuests. When WebQuests were first introduced in 1995, the Internet was still in the early stages of integration into K-12 and higher education institutions. At the time, WebQuests achieved an important instructional goal by providing structure, focus, and purpose to an increasingly unstructured mass of information that was available on the Internet. Further, creating a framework for incorporating the wealth of informational resources into an inquiry learning activity made the WebQuest strategy a highly innovative approach at the time. Based on the findings of this literature review, a WebQuest could be more accurately described as a technology-supported activity that may support structured inquiry and, in some cases, a higher cognitive level than some traditional activities. The current body of research does not indicate that incorporating a WebQuest into an educational setting will lead directly to improved

learning and achievement. However, factors that often precede or promote learning, such as increased motivation and the integration of technology into teaching and learning, can be positively influenced by using WebQuests. With this in mind, it is critical that the educators temper the excitement the often accompanies technology-supported teaching strategies with research-supported knowledge about exactly what can be achieved when these strategies are used in the teaching and learning process.

Suggestions for Future Research

In the years since it has been introduced, the WebQuest strategy has seen little evolution while at the same time being applied to a wide variety of instructional situations. In contrast, the availability of resources on the Internet as well as the common Internet-based activities has seen dramatic growth and innovation. In 1995, Dodge noted that WebQuests could be supplemented by video conferencing technology. Now that technologies such as Voice-over-Internet-Protocol (VoIP) and web-based video conferencing are commonplace, there appears to be little or no integration of these new technologies into the WebQuest strategy. Further, with the popularity of online social networks as well as the shift by many internet users towards being creators of content rather that of simply consumers, the possible future for inquiry-oriented activities the use the internet-based technologies is primed for the next steps. There are undoubtedly many practicing educators who have already begun to use emerging technologies such as Web 2.0 tools for the benefit of teaching and learning. It is imperative, however, that we consider how best to research and evaluate these ideas in a manner where research and continue to inform practice, even on the cutting edge of innovation.

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