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WebQuests as perceived by teachers: implications for online teaching and learning

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Abstract The WebQuest as an instructional tool has recently been widely adopted in K-16 education. However, its underlying principles and functionality are not well understood, which has resulted in an inconsistency in practice. This study identifies the underlying constructs of WebQuests as perceived by teachers and variables affecting their perceptions on WebQuests. A survey was conducted on teachers ($n = 226$) recruited from one large research university in the USA and a professional listserv. The findings reveal three constructs perceived by teachers as critical to WebQuests: constructivist problem solving, social interaction and scaffolded learning. Results also show that variables like purpose of WebQuest use, years of teaching, years of WebQuest use and gender predict, at various degrees, teachers' perceptions on WebQuests. Discussions are made on how the constructs identified can be used to improve online teaching and learning. Suggestions for future study are included by examining the influences of social, psychological and affective factors on learners' learning in WebQuests.

Keywords collaboration, constructivist, guided discovery, hypermedia, problem solving.

Introduction

Education as a professional field is constantly changing. The most interesting and important innovation in education in recent years is the widespread introduction of computers into K-12 schools, colleges and universities. Of particular interest are the Internet and more specifically, the World Wide Web, which is radically redefining how we obtain information and the way we teach and learn (Hill & Hannafin 2001; Wang & Gearhart 2006). Hill and Hannafin (2001) point out that as a resource-based learning tool, the Internet holds considerable promises for teaching and learning. However, current practices may prove insufficient in optimizing available electronic learning resources such as multimedia and hypermedia to prepare individuals to learn effectively in a resource-rich environment. This argument is further supported by the concerns among educators who are doubtful about the 'educational benefit in having learners surfing the net without a clear task in mind' (Dodge 1995, p. 10). Foshay and Bergeron (2000) argue that putting content on a web page is not a guarantee of learning. They maintain that there is a big difference between information and instruction, and that the web may be a great way to distribute information, but may not necessarily mean that one can teach with it.

Recently, there has been a concerted effort among educators to create a successful online learning

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environment through a learning-by-design approach which involves a systematic design of learning activities (Lim *et al.* 2001). For example, Giguere *et al.'s* (2004) large-scale online interaction model and Jones *et al.'s* (2002) framework for online instruction reflect the efforts in that direction. Giguere *et al.*'s model delineates a structured approach to design learning for effective large-group interaction, thus creating a meaningful and engaging environment for online learning. In Jones *et al.*'s framework, the online instruction is guided by a set of design principles that address learners' needs, relevant goals and objectives, instructional strategies and evaluation. Parallel with the above effort is the introduction of the WebQuest model into web-based learning in K-16 settings. Taking a structured, design-based approach, the model is primarily used for inquiry-oriented learning in which learners interact with resources on the Internet, develop interpersonal and collaborative skills, and engage in higher-level thinking (Zheng *et al.* 2005).

WebQuest

Originated by Bernie Dodge and Tom March in 1995, the WebQuest has been widely adopted in K-16 classrooms in more than 40 states in the USA, and in 10 countries and regions worldwide, including Australia, Brazil, Canada, Hong Kong, Germany, New Zealand, and so forth (WebQuest.Org 2005). It provides teachers with an instructional framework to create meaningful online learning activities. A well-designed WebQuest typically contains six steps: (a) introduction; (b) task; (c) information sources; (d) description of process; (e) performance evaluation; and (f) conclusion. Student-centred and inquiry-based, the WebQuest is generally constructed around a scenario of interest to students who work in small groups by following the steps in the WebQuest model to examine the problems, propose hypotheses, search for information with the web links provided by the instructor, analyse and synthesize the information using guided questions, and present solutions to the problems. Students are often assigned with certain roles in the group. By working on the topics in the area in which they assume a role, students collectively contribute to the understanding of the issues with considerable breadth and depth. The instructor scaffolds learners through the entire learning process using a structured approach. The ongoing, formative assessment which often takes the form of rubrics, is used to evaluate students' learning, the purpose of which is to help students grow rather than cataloguing their mistakes (Tomlinson 1999).

Since its inception, the WebQuest model has been embraced by many educators. Numerous WebQuests have been created by teachers for all grade levels (MacGregor & Lou 2004/2005). Research indicates that WebQuests can promote students' critical thinking, facilitate knowledge application, and develop their collaborative skills in learning (Dodge 1995; Brucklacher & Gimbert 1999; Zheng *et al.* 2005). Schweizer and Kossow (2007) describe how to use WebQuests to teach the subject of cloning to a group of gifted students in 6–12 grades. Students are challenged to explore the nature of cloning and its impact on research community and society. By assuming the different role as a scientist or a sociologist, students form small groups to examine the issues and propose hypotheses with regard to the impact of cloning research on their respective fields. They then search for information about cloning with the web links provided by the instructor, and use several questions to guide their work, such as 'Do you think cloning is ethnical?' and 'What are the potential benefits and potential risks of further exploration of cloning?' Information obtained from the Internet is analysed and synthesized through group negotiation to generate useful data to support or reject the hypotheses proposed. Finally, the conclusions reached by each group (i.e., scientists and sociologists) are converged to a comprehensive view that reflects the depth and breadth of this controversial issue. The entire learning process is scaffolded by the instructor using the six-step design model of WebQuests and evaluated with a rubric developed by the instructor. Schweizer and Kossow (2007) observe that with WebQuests, students are motivated to learn content information and engaged in 'higher level thinking skills required to complete the task' (p. 34). They find that students appreciate the collaborative learning in which they collectively contribute to the success of the project. Their findings are supported by the study conducted by Milson and Downey (2001), who conclude that WebQuests (a) help students engage in meaningful and dynamic learning by working as a team to solve problems related to the real world; (b) facilitate effective learning by providing structured resources so that learners do not have to 'spend time engaged in

fruitless searching' (p. 146); and (c) enable teachers to efficiently use computer resources in classrooms.

Four underlying constructs of WebQuests

It is critical to understand the underlying constructs of WebQuests when discussing the WebQuest as an effective instructional tool. The WebQuest is characterized by what Dodge (2001) describes as deep learning that involves constructing new knowledge through a critical thinking process. Studies show that the WebQuest is supported by four underlying constructs: *critical thinking*, *knowledge application*, *social skills* and *scaffolded learning* (e.g., Dodge 1995, 2001; Pohan & Mathison 1998; Brucklacher & Gimbert 1999; Vidoni & Maddux 2002).

Critical thinking

The construct of critical thinking has been emphasized in the WebQuest model since its inception. In discussing critical thinking in WebQuests, Dodge (1995) points out that the goal of WebQuests is to facilitate learners' analytical skills as well as their ability to transfer knowledge to a new domain. He later elaborates, 'WebQuests are designed to . . . support learners' thinking at the levels of analysis, synthesis, and evaluation' (Dodge 2001, p. 7). Studies show that the construct of critical thinking in WebQuests is operationalized on the concepts of examining things from multiple lenses, proposing solutions with multiple approaches, abilities to analyze and synthesize information, and so forth (Crawford & Brown 2002; VanFossen 2004; Schweizer & Kossow 2007). Schweizer and Kossow assert that 'WebQuests expose students to a specific, open-ended activity [that requires] . . . higher level thinking skills' to solve problems 'not through a single, simple solution' (p. 31). Vidoni and Maddux (2002) examine Weinstein's (2000) critical thinking framework which includes (a) skillful thinking; (b) responsible thinking; (c) non-routine thinking; (d) applying criteria; (e) self-correction; and (f) sensitivity, and conclude that 'WebQuests meet all six of Weinstein's key elements in critical thinking and therefore are powerful tools for inspiring critical thinking skills in students' (p. 101). In short, as an important construct in WebQuests, the critical thinking plays a critical role in the design and development of WebQuests.

Knowledge application

Another construct central to WebQuests is knowledge application. According to Dodge (2001), WebQuests require students to go beyond 'retelling and mastering factual information . . . to apply knowledge, engage in problem solving, creativity, design, and judgment' (p. 9). Knowledge application has been recognized as an important construct for learning (Dede 2004). Research suggests that the construct of knowledge application is supported by the concepts of effective use of information, retrieval of prior knowledge to new learning, knowledge association, and so on (Pohan & Mathison 1998; Brucklacher & Gimbert 1999; Lacina 2007). Pohan and Mathison (1998) maintain that developing students' ability to apply what they have learned to new learning is an important component in WebQuests. Brucklacher and Gimbert (1999) concur that emphasizing knowledge application fosters knowledge association and promotes meaningful, deep learning. Evidently, the efficacy of WebQuests is undergirded by the construct like knowledge application that facilitates effective use of information, as well as transfer of knowledge to new learning.

Social skills

In his 2001 seminal article, Dodge identifies the theoretical connection between WebQuests and cooperative learning theory (Johnson & Johnson 1994). Many of the concepts related to the construct of cooperative learning are similar to those subsumed under the construct of social skills in WebQuests. Dodge (2001) points out that the cooperative learning theory emphasizes positive interdependence, individual and group accountability, and interpersonal and small group skills in learning. He asserts that 'A well-orchestrated WebQuest has these qualities as well' (p. 8). As a theoretical construct, social skills support the learning activities/steps in WebQuests. For instance, the task, one of the six steps in WebQuests, is undergirded by the construct of social skills which support learning activities relating to positive interdependence, individual accountability and interpersonal skills. Research has shown that developing students' social skills enhances the efficacy of learning 'in the quest for knowledge' (Brucklacher & Gimbert 1999, p. 39).

Scaffolded learning

Studies show that scaffolding positively affects student's achievement (Bereiter & Scardamalia 1984; Lim *et al.* 2001; Baylor 2002; Cho & Jonassen 2002). As an important construct in WebQuests, the scaffolded learning entails the concepts of facilitating higher-level thinking and organizing new learning through scaffolding, connecting between learning and goals, and enabling goal attainment using a structured approach (Dodge 1995, 2001; VanFossen 2004; Schweizer & Kossow 2007). Dodge (2001) states that the role of scaffolding is to 'transform what they read into some new form' (p. 58). It facilitates, to some extent, what Mezirow (2000) called transformative learning. Like the other constructs discussed above, the construct of scaffolded learning is critical to the design and development of WebQuests.

The four constructs identified above are based on theories and evidence of past and current research that focuses on the essential components in effective learning. They reflect the theoretical as well as practical thinking in teaching and learning, and thus serve as the theoretical underpinnings for the WebQuest model.

Factors influencing teachers' perceptions on technology

Studies show that teachers' perceptions on technology can be influenced by such factors as teaching experience, experience in the use of technology, gender, age, and so on (Bussey *et al.* 2000; Stromfors & Glazewski 2002; Kanaya *et al.* 2005). Stromfors and Glazewski examine teachers' perceptions on the use of technology and find that years of teaching and use of technology are related to teachers' perceived value in technology use. In a similar vein, Kanaya *et al.* (2005) conclude that perceived relevancy and prior use of technology by teachers influence their perceptions of technology in teaching and learning. Hogarty *et al.* (2003) conducted a survey on 2156 teachers about the factors that may influence their perceptions of technology use. They find that environment (e.g., leadership, school settings, etc.), experience (e.g., years of teaching, years of technology use, use of particular type of software, etc.), personal interest (e.g., like/dislike computer technology), and service (e.g., technical support) are related to teachers' perceptions.

Of central interest is the issue of gender in computer use. Research has shown a gender difference in the use of technology in schools (Bain *et al.* 1999). Bostock and Wu (2005) claim that gender can be a key playing factor in the use of technology (see also Christensen *et al.* 2005; Mikk & Luik 2005). The above review reveals a wide range of factors that can possibly influence the direction of teachers' perceptions on technology use. For the purpose of this study, Hogarty *et al.*'s framework of four factors was used to identify the variables that influence teachers' perceptions on WebQuests.

The study

The purposes of this study were (a) to investigate teachers' perceptions of WebQuests and (b) to identify variables that significantly predicted teachers' perceptions. Thus, the research questions for the study were: (1) What are the factors perceived by teachers as critical to the WebQuests? (2) What are the variables that affect such perceptions?

The study was conducted in the autum of 2004. Two hundred and forty-seven school teachers from more than 20 states responded to the questionnaire. Of 247 responses, 21 were incomplete and therefore were excluded from the final data analysis. All participants had either created or used WebQuests in teaching. Of 226 valid responses received, 29% ($n = 66$) were elementary teachers, 32% ($n = 72$) middle school teachers, 33% ($n = 73$) high school teachers, and 6% ($n = 15$) post secondary instructors. About 34% of the participants ($n = 76$) were from urban schools, 51% ($n = 115$) from suburban, and 15% ($n = 35$) from rural schools. Participants included 59 men and 167 women who varied in age from 21 to 67 years old (Mean = 38).

Instrumentation and procedures

Two instruments were used for the study: (1) Demographic Information Questionnaire and (2) WebQuest Questionnaire for Teachers (WQFT). The demographic data questionnaire was to collect data on participants' demographic information and their experience in teaching WebQuests. The WebQuest questionnaire for teachers was used to gauge teachers' perceptions on WebQuest use.

Demographic information questionnaire

The demographic information questionnaire was created based on Hogarty *et al.*'s framework, which identified four categories of influences on the use of technology: environment, experience, personal interest and service. In addition, gender and age were also considered as valid factors for influencing teachers' perceptions. The questionnaire consisted of 10 items corresponding to four categories of Hogarty *et al.*'s framework. They included school setting (environment), the grade level taught, experience in creating WebQuest, purpose of WebQuest use, years of teaching and years of WebQuest use (experience), like/dislike WebQuest (personal interest), technical support (service), age and gender.

WebQuest questionnaire for teachers

The WQFT consisted of 20 items with a 5-point Likert scale ranging from strongly disagree to strongly agree (strongly disagree = 1, strongly agree = 5) (see Appendix). It was initially developed by the first author to measure college students' perceptions on WebQuests (Zheng *et al.* 2005). The instrument was constructed based on four theoretical constructs previously identified: *critical thinking*, *knowledge application*, *social skills* and *scaffolded learning*. It was carefully reviewed by a panel of five college professors who had previously developed and taught WebQuests to undergraduate and graduate students. Changes were made based on the feedback from the panelists. For example, Questions 4 and 5 were revised to reflect the operational concepts in critical thinking: 'Learners are able to propose a solution with more than one approach' and 'Learners are able to solve the problem with more than one solution.' The instrument reported a high reliability with Cronbach's alpha of 0.88, 0.85 and 0.83, respectively for the three factors identified. As the underlying constructs are similar in terms of the measurements that measure students' and teachers' perceptions, the instrument was adopted in this study to investigate teachers' perceptions.

Both demographic information questionnaire and WQFT were created as online forms that were hosted on a university server. The participants were recruited from two educational technology graduate classes in a major research university in the north-east of the USA and from a professional listserv powered by WebQuest.org which has about 400 members who are teachers from K-12 schools and colleges and have taught or used WebQuests in their subject areas. Subjects were given the URL to log onto the survey website. They must complete the demographic data sheet before they could proceed to WQFT survey. It took about 30 to 40 min to complete the entire survey.

Analyses and results

The Principal Component Factor analysis was performed using Oblique Promax rotation to extract the factors pertaining to teachers' perceptions on WebQuests. Multiple criteria were observed in retaining the factors (Gorusch 1983). They included (a) retaining factors with loading greater than 0.40 (see Hair *et al.* 1998) and (b) using a scree plot with Kaiser's eigenvalue greater than one rule. Meanwhile, considerations were given to the variances accounted for by each factor and the correlation between the factors while determining the retainability of related factors.

The analysis generated three interpretable factors: constructivist problem solving, social interaction and scaffolded learning (Table 1). All three factors accounted for a total variance of 62%, with constructivist problem solving accounting for 48% of the variances, social interaction 8% of the variances, and scaffolded learning 6% of the variances. The findings suggest that a majority of teachers perceived constructivist problem solving, social interaction and scaffolded learning as underlying constructs for WebQuests. Additionally, the reliability analysis showed Cronbach's alpha of 0.89, 0.92 and 0.88, for three factors, respectively, which indicated a consistency among teachers' perceptions pertaining to the concepts subsumed under each construct.

To further validate the above factors, a scree plot and a correlation matrix were performed. The scree plot showed that all three factors extracted had an eigenvalue greater than 1 (factor 1 = 10.08, factor 2 = 1.55 and factor 3 = 1.25), which means the factors perceived by teachers were retained based on sound statistical criteria. To find out whether the factors identified were theoretically related, a correlation matrix was performed. Using oblique Promax rotation method to obtain a simple structure, the results showed moderate correlations among the factors extracted (Table 2), which indicated that the constructs were all within one theoretical framework. For example, constructivist problem solving and social interaction are two theoreti-

Table 1. Principal component factor analysis using oblique promax rotation.

Number	Items	Factor 1	Factor 2	Factor 3
1	Assembling evidences through reasoning	0.51		
2	Examining problems from multiple lenses	0.52		
3	Challenging other people's view	0.70		
4	Multiple approaches to a solution	0.67		
5	Multiple solutions to a problem	0.69		
6	Focusing on problems	0.56		
7	Pulling knowledge from different fields	0.64		
8	Retrieving prior knowledge to new learning		0.40	
9	Knowledge transfer	0.58		
10	Effective use of information	0.41		
11	Interpersonal and small group skills		0.56	
12	Understanding from other's viewpoint		0.58	
13	Accountability		0.52	
14	Interaction between learners		0.75	
15	Positive interdependence		0.80	
16	Scaffolding goal attainment			0.82
17	Clarifying learning			0.75
18	Connecting between goals and activities			0.77
19	Content comprehension			0.71
20	Organizing for new learning			0.69
Eigenvalue		10.08	1.55	1.25
% of variance		48.41	7.72	6.15
Cronbach's alpha		0.89	0.92	0.88

Table 2. Factor correlation matrix.

Factor	1	2	3
Constructivist problem solving	–	0.678	0.682
Social interaction		–	0.611
Scaffolded learning			–

cally related constructs ($r = 0.678$) which may influence one another within the WebQuest theoretical framework. In other words, designing a WebQuest for constructivist problem solving may be affected by the degree of social interaction involved, and vice versa.

To find out whether demographic variables predict teachers' perceptions on WebQuests, hierarchical regression analyses were performed. Four variables *gender*, *purpose of WebQuest use, years of teaching* and *years of WebQuest use* were used as predictors based on the results of correlation analysis. Using forward inclusion method, the order in which the predicting variables were entered was: *purpose of WebQuest use*, *years of WebQuest use*, *years of teaching* and *gender*.

The regression analyses indicated that teachers' purpose in WebQuest use, that is, whether they used it as (1) worksheet; (2) problem-solving tool; or (3) information search, significantly predicted their perceptions on three constructs underlying WebQuests. Table 3 showed that *purpose in WebQuest use* was a significant predictor for teachers' perceptions on constructivist problem solving ($\beta = 0.241$, $R^2 = 0.324$), social interaction ($\beta = 0.261$, $R^2 = 0.391$), and scaffolded learning ($\beta = 0.328$, $R^2 = 0.315$). Next, *years of WebQuest use* seemed to predict significantly teachers' perceptions on constructivist problem solving ($\beta = 0.387$, $R^2 = 0.383$) and scaffolded learning ($\beta = 0.364$, $R^2 = 0.421$). In other words, the more teachers use the WebQuest, the better they perceive the value of WebQuests for constructivist problem solving and scaffolded learning. Finally, *years of teaching* seemed to be another variable that significantly predicted teachers' perceptions on constructivist problem solving ($\beta = 0.541$, $R^2 = 0.451$) and social interaction ($\beta = 0.421$, $R^2 = 0.528$). While research has shown the effect of gender on computer use in general, it only predicted teachers' perceptions on social interaction ($\beta = 0.349$, $R^2 = 0.563$), but not on constructivist problem solving and scaffolded learning.

Table 3. Summary of hierarchical regression analysis for variables predicting factors 1, 2 and 3 (n = 226).

Variables	Factor 1 constructivist problem solving				Factor 2 social interaction				Factor 3 scaffolded learning			
	B	SE B	β	R^2	B	SE B	β	R^2	B	SE B	β	R^2
Step 1												
Purpose of WebQuest use	0.512	0.157	0.241*	0.324	0.521	0.057	0.261*	0.391	0.565	0.214	0.328*	0.315
Step 2												
Purpose of WebQuest use	0.311	0.219	0.234		0.346	0.167	0.214		0.476	0.137	0.247	
Years of WebQuest use	0.430	0.155	0.387*	0.383	–0.178	0.215	–0.061	0.403	0.578	0.342	0.364*	0.421
Step 3												
Purpose of WebQuest use	0.341	0.183	0.259		0.338	0.283	0.159		0.338	0.287	0.154	
Years of WebQuest use	0.428	0.263	0.267		–0.218	0.203	–0.074		0.248	0.162	0.133	
Years of teaching	0.679	0.601	0.541*	0.451	0.571	0.310	0.421*	0.528	0.261	0.141	0.268	0.425
Step 4												
Purpose of WebQuest use	0.389	0.201	0.216*		327	0.193	0.172		0.397	0.363	0.259*	
Years of WebQuest use	0.439	0.028	0.230*		–0.139	0.156	–0.039		0.247	0.171	0.165	
Years of teaching	0.329	0.214	0.215		0.427	0.141	0.295		0.128	0.041	0.095	
Gender	–0.034	0.114	–0.043	0.453	0.448	0.236	0.349*	0.563	0.103	0.112	–0.063	0.427

*P < 0.05.

Discussion

The discussion of the findings was focused on the research questions proposed earlier: (1) What are the factors perceived by teachers as critical to the WebQuests? And (2) What are the variables that affect such perceptions?

The findings of this study have shown that teachers perceived constructivist problem solving, social interaction and scaffolded learning as critical constructs underlying WebQuests. As the WebQuest model is characterized by a scaffolded approach to guide students' problem solving through collaboration, the three constructs identified in this study align with the basic principles of WebQuest model, but with considerable depth. For example, instead of focusing on critical thinking or knowledge application separately, the construct of constructivist problem solving encompasses both constructs with an emphasis on constructivist thinking, examining problems from multiple lenses, multiple approaches to a solution, and so forth (Table 1), which is consistent with the literature that a constructivist learner (a) examines issues from multiple viewpoints; (b) self-initiates problems by posing thoughtful, open-ended questions; and (c) solves them using multiple approaches (Duffy & Jonassen 1992; Brooks & Brooks 1993). The finding implies that teachers believe that teaching critical thinking skills and knowledge application should be situated in a constructivist learning environment that would 'engage learners and require them to solve problems and construct knowledge that is most meaningful to them' (Zheng *et al.* 2005, p. 47).

Unlike the construct of social skills as identified earlier in the literature, the construct of *social interaction* entails both social collaboration and knowledge application (Table 1). This suggests that teachers perceived social interaction not just as a collaboration among learners but as an act involving collective effort to actively applying knowledge to learning. Evidently, the notion of collaborative learning in WebQuests as perceived by teachers has a broader meaning than it was traditionally defined, that is, effective collaborative learning involves meaningful knowledge application in learning. This finding has significant practical implications for instructional designers and teachers who would like to use WebQuests to engage learners in social collaboration: the design of social collaboration

in WebQuests should put in perspective knowledge application while engaging learners in collaborative learning.

The results of the study revealed that variables like purpose of WebQuest use, years of WebQuest use, years of teaching and gender predicted, at various levels, teachers' perceptions on WebQuests. The variable of the purpose of WebQuest use was most predictive of teachers' perceptions as it significantly predicted teachers' perceptions on all three factors. The finding suggests that the purpose of WebQuest use, that is, how and for what purpose one would like to use the WebQuest, is critical in influencing teachers' perceptions and consequently their implementation of WebQuests in teaching and learning. The other two variables, years of teaching and years of WebQuest use, both predicted significantly teachers' perceptions on constructivist problem solving. Additionally, years of teaching predicted significantly teachers' perceptions on social interaction and years of WebQuest use on scaffolded learning. The fact that both years of teaching and years of WebQuest use predict significantly teachers' perceptions on constructivist problem solving suggests that teachers' experience may influence their epistemology in learning. In other words, teachers' perceptions on constructivist problem solving, which in essence reflect an epistemological thinking in learning, are affected by their years of teaching and years of WebQuest use.

Finally, the variable of gender predicted significantly teachers' perceptions on social interaction, but failed to predict their perceptions on two other constructs: constructivist problem solving and scaffolded learning. As was previously discussed, teachers' perceptions on constructivist problem solving may be influenced by their experience. Thus, the variable of gender may be less predictive of teachers' perceptions on constructivist problem solving than does the variable of experience. Pertinent to the variable of experience is its predictability on scaffolded learning. As scaffolded learning is related to pedagogical practices, perceptions related to such practices would be presumably influenced more by the experience like years of teaching or WebQuest use than by the gender difference, which would probably be the reason why the variable of gender failed to predict teachers' perceptions on scaffolded learning.

Conclusion

The WebQuest as an instructional model has been adopted by teachers and learners for its easiness to design, develop and use in classrooms. However, it poses at the same time challenges to those who fail to understand the underlying principles and constructs of WebQuests, and who are therefore confused in the design and implementation of WebQuests in teaching and learning. The purpose of this study was therefore to identify the constructs as perceived by teachers that undergird the WebQuest model as well as variables that may affect teachers' perceptions on WebQuests.

The findings of this study have advanced our understanding on WebQuests at both theoretical and practical levels. Theoretically, the three constructs identified in this study provoke us to go beyond the traditional theoretical framework of WebQuests to reflect on the epistemological aspect of the WebQuest as an instructional tool. That is, instead of focusing on the components of critical thinking skills and knowledge application, the emphasis is now placed on the constructivist learning that incorporates critical thinking and knowledge application. Practically, the findings of the study offer the opportunity to reflect on the existing pedagogical practices in WebQuests. For example, rather than limiting ourselves to the development of interpersonal and small group skills, positive interdependence, individual accountability, and so forth, the practice of social collaboration should go beyond its traditional conceptual framework to include skills from other areas like knowledge application. It is therefore suggested that teachers, instructional designers and other educational professionals should become aware of the unique features of the WebQuests to design and develop WebQuests that would benefit learners at all levels.

Designing and developing WebQuests is a complex process that involves careful planning by putting in perspective all variables that may influence the learner's learning, including social, psychological, cognitive, developmental, and so on. Future research should be conducted to investigate the relationships among these variables to better understand the complexity of WebQuest learning. Although this study identified three constructs as perceived by teachers critical to WebQuest design and development, further empirical research is needed to validate the constructs in practice. Our understanding of WebQuests would be limited if the

identification and validation of above constructs are confined to the model of WebQuests itself without examining the influences of pedagogical and affective factors in learning. Therefore, it is suggested that the future study expand to investigate the relations among teacher perceptions, pedagogy and affective domain.

Appendix

WebQuest questionnaire for teachers

1 In WebQuest learning, learners are able to examine the problem from multiple lenses.
2 In WebQuest learning, learners develop the ability to challenge each other's point of view.
3 WebQuest learning facilitates learners to arrive at a conclusion by assembling the various evidences though reasoning.
4 Learners are able to propose a solution with more than one approach.
5 Learners are able to solve the problem with more than one solution.
6 WebQuests enable learners to effectively use the information to solve problems.
7 In a WebQuest learning environment, the knowledge gained from one problem solving situation can be transferred to another situation.
8 The task oriented nature of the WebQuest makes it clear what is to be learned.
9 In a WebQuest learning environment, learners are able to pull knowledge from different fields to solve problems.
10 The structured nature of WebQuests facilitates retrieval of prior knowledge to new learning.
11 Collaboration among learners in WebQuests learning promotes positive interdependence.
12 WebQuests learning promotes accountability among learners.
13 Learners gain a better understanding of each other's point of view in a WebQuest learning environment.
14 WebQuests promotes interaction among learners.
15 Learners develop better interpersonal and small group skills in a WebQuest learning environment.
16 Scaffolding in WebQuest learning facilitates the understanding of the subject content.
17 Scaffolding organizes the way for new learning.
18 Scaffolding enables learners to focus on problems.
19 In a WebQuest learning environment, scaffolding enables learners to connect between their learning activities and goals.
20 In a WebQuest learning environment, scaffolding enables learners to better understand how to achieve their goals.

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