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# Web-based inquiry learning: Facilitating thoughtful literacy with WebQuests

*WebQuests allow students to think critically about an issue and use many skills to develop and defend an opinion.*

Diane looked up, put her pen in her mouth and thought about the question for some seconds, and then looked at me. "Well...mmm...I will encourage the citizens in my city to reduce, reuse, and recycle waste. I can probably carry out a campaign to educate citizens about the dangers of polluting the environment. I think...I will make companies and individuals receive a penalty for environmental pollution and I will encourage the use of computers. I will study the successful programs that other cities are using and see how I can do it in my city...." (Interview transcript, June 8, 2004)

Diane (pseudonym) was responding to a question about the policies and programs she would initiate to encourage environmental protection, assuming she were the mayor of her city. To answer, she needed to think deeply and synthesize several weeks' worth of information she had read about environmental protection. Reading instruction and assessment increasingly require students to demonstrate a more thoughtful literacy and flexible understanding of text through explanation, discussion, reflection, and connections between the text and the real world (Allington, 2001; Block, 1993). Students are also expected to use thinking strategies to discern patterns of thought in disparate sources of information (Block).

The "knowledge explosion" of abundant information available on the Internet and in other media (print and electronic) are additional challenges for learners asked to gather, retrieve, synthesize, evaluate, and transform information. The essential skills for learning are no longer the memorization of facts or mere assimilation of knowledge. This has prompted calls for literacy educators to pay attention not only to the basic skills of listening, speaking, reading, and writing but also to other areas of literacy such as using information from text and responding thoughtfully and critically to it (Luke, 1995; National Education Association, 2000).

Teaching thoughtful response to text places additional demands on teachers because they now need to think about teaching and learning differently, especially about what and how they teach (Allington, 2001; Dunston, 2002). Teachers need to design instruction that challenges students to activate prior knowledge, interact with their peers about issues raised in the text, and apply what they have read to the world around them (Headley & Keeler, 2002). The Internet and other information and communication technologies (ICTs) have potential to revolutionize teaching and learning through purposeful integration of technology for thoughtful and critical literacy.

The National Educational Technology Standards for teachers (NETS•T) (International Society for Technology in Education, 2002) require the use of various technologies to plan and design effective learning environments and experiences for students. Students then use these technologies to locate, create, and evaluate information; solve problems; and make informed decisions. In order to maximize learning in a technology-rich environment, we need to expose students to learning opportunities that would enable them to learn the new literacies of the Internet and other ICTs (Leu, Kinzer, Coiro, & Cammack, 2005). These new literacies include the skills, insights, and strategic knowledge required to successfully exploit the ever-

changing ICTs (Leu et al.) while students learn. The new literacies of the Internet enable learners to search for, retrieve, and critically evaluate Internet resources; collaborate; and construct new knowledge. This can be achieved through Web-based inquiry learning activities such as WebQuests.

## WebQuests

WebQuests (Dodge, 1997) can be used not only for content learning but also to conduct research in an authentic, problem-solving environment. WebQuests are designed to make effective use of learners' time and to support their thinking and active involvement at the levels of analysis, synthesis, transformation of information, decision making, and evaluation (Ridgeway, Peters, & Tracy, 2002). WebQuests are therefore one technique for scaffolding higher order thinking and learning as well as advanced knowledge acquisition in the poorly structured Internet environment (Spiro, Coulson, Feltovich, & Anderson, 1994).

The essential parts of WebQuests include an introduction, a task or tasks, a list of resources for learners, the process that they would go through to accomplish the task, a criteria or rubric to evaluate learning, and a conclusion. There are two types of WebQuests, varying in duration and depth of treatment of the material. The first is the short-term WebQuest, which usually takes two to three lessons and focuses on knowledge acquisition and integration of some specific skills. The second type is the long-term WebQuest, which takes 4 to 12 weeks and requires extending knowledge acquisition and developing complex thinking skills through analyzing, synthesizing, creating, and transforming information.

WebQuests can be designed to offer learners opportunities for multiple knowledge representations and multiple perspectives so that they can capture the real-world complexities to which the knowledge is applied. With multiple knowledge representations (Spiro et al., 1994) learners experience the same content in different ways, with different activities and multiple media forms. This ensures that they can flexibly use their new knowledge in a real-world context. A well-designed WebQuest also provides learners with cognitive tools and procedural guidance, especially when a balance is created between the system-generated guide and the human facilitator (Lim, 2004). A WebQuest promotes thoughtful literacy because it enables learners to process information using a variety of complex thinking skills (Bradshaw, Bishop, Gens, Miller, & Rogers, 2002; Vidoni & Maddux, 2002). WebQuests offer many advantages associated with reading and learning on the Internet, but there are also some challenges.

## The benefits and challenges of learning on the Internet

ICTs enable information to be accessed and presented in multiple ways, while at the same time offering interactivity and opportunities for collaboration (Vidoni & Maddux, 2002). Such technology provides authentic problems that can enhance critical and complex thinking skills (Bradshaw et al., 2002; Owens, Hester, & Teale, 2002). The Internet also facilitates inquiry, communication, expression, and construction of knowledge (Bruce & Levin, 1997).

The major problems associated with learning on the Internet include navigational disorientation, information overload, and distraction (Bradshaw et al., 2002). Navigational disorientation arises from information overload, where learners may be overwhelmed by the vast amount of information on the Web and lose track of their search subject or simply become fatigued. Also, the nonlinear hypertext environment of the Internet means that information is sometimes unorganized. This places significant cognitive demands on learners to make appropriate connections between concepts (MacGregor & Lou, 2005). It is unlikely that many students who use the Internet possess adequate skills and strategies to efficiently and effectively negotiate the realms of available information to learn new content knowledge.

## Background for the study

With 99% of U.S. public schools reporting Internet access (National Center for Education Statistics, 2002), more attention is now being focused on the potential of the Internet as a learning tool. Several studies (Bradshaw et al., 2002; Owens et al., 2002; Ridgeway et al., 2002; Vidoni & Maddux, 2002) have theoretically linked

WebQuests to the development of higher order thinking skills. However, little attention has been paid to the processes involved in using WebQuests to facilitate these higher order skills or to the type of learning activities that promote such skills. Furthermore, the mere use of WebQuests—or any technology for that matter—will not guarantee effective learning of higher order thinking skills unless an appropriate instructional design is imposed upon the medium (Bradshaw et al., 2002; Lookatch, 1997; Maddux, 1994). In this study, we focused on the use of WebQuests to design and deliver instruction to enrich classroom interactions. Specifically, our goal was to demonstrate how to integrate and use multiple tasks during WebQuests to facilitate thoughtful literacy.

The study participants were six fifth-grade students—five girls and one boy—Diane, Tonia, Elaine, Lisa, Mindy, and Ben (pseudonyms). They were all middle class European Americans. They were considered average or above average students by their teacher. The setting was an elementary school located in a small middle-income suburban neighborhood near a large urban city in the north-eastern United States. Fifty percent of the students in the school were eligible for free or reduced-cost meals. Technology use in the school consisted of having students learn some isolated skills, or use some educational software for specific learning tasks. Each classroom had one or two computers and the school had a well-equipped computer lab.

Data collection was preceded by selection of a topic for the WebQuest and some brainstorming. (See http://WebQuest.sdsu.edu for a collection of WebQuests to get things started.) Participants' interests and choices were given special consideration in this process, and a WebQuest on environmental protection was eventually chosen. The WebQuest was long-term (lasting 10 weeks) and interdisciplinary, covering social studies, language arts, and science (see www.cobb.k12.ga.us/~keheley/kidpower/kidpower.htm). The original form of the WebQuest called for students to play various roles as a manufacturer, homeowner, teacher, or consumer, using the following two guiding questions.

1. What choices can I make to protect the environment?
2. What choices can I make that would be harmful to the environment?

After critically evaluating the WebQuest, we found these two questions to be inadequate. There was need for a more challenging question, as well as activities both online and offline that would strengthen students' thinking and interpersonal skills. The WebQuest structure was therefore reorganized and a third question was added to the original two—Why is environmental protection important?

We also created several new activities. For example, in the original WebQuest, only the student who played the role of a manufacturer could have read the poems on pollution. In the modified structure, all participants read the poems as well as composed their own poems. Collaborative role-playing was also introduced, during which students investigated environmental problems in their community, discussed their findings, and then used the information they gathered to write a Readers Theatre script. Other activities that were created to enhance the WebQuest included evaluation of websites and reflective writing.

The initial brainstorming included introductory lessons and activation of prior knowledge to help students better understand the purpose and scope of the project. Five- to 10-minute minilessons centered on Internet use and search strategies, and how to skim and scan for information. Students also spent considerable time exploring Recycle City, a graphical and multimedia depiction of a city available on the U.S. Environmental Protection Agency's website at www.epa.gov/recyclecity/mainmap.htm. Clicking on any section of the city or a building provides information about that facility and what the residents do to protect the environment. A simulation of a dirty city called the "Dumptown game" is also embedded in the website. This simulation was designed to help students think critically about various environmental programs. A flowchart was created depicting the effects of choices made about the environment (see Figure 1).

A website was set up in collaboration with the participants, where we posted students' homework and links to other websites. Data collection and analysis were done using the action research paradigm (McNiff, 2002; Wood, 1988). Action research, with its emphasis on "living practice" (McNiff, p. 22)—problematizing and improving practice—was the most appropriate for this study. This paradigm gave us the opportunity to plan, closely observe, reflect on, evaluate, and generate

**FIGURE 1**
**Some choices that can help protect or harm the environment**
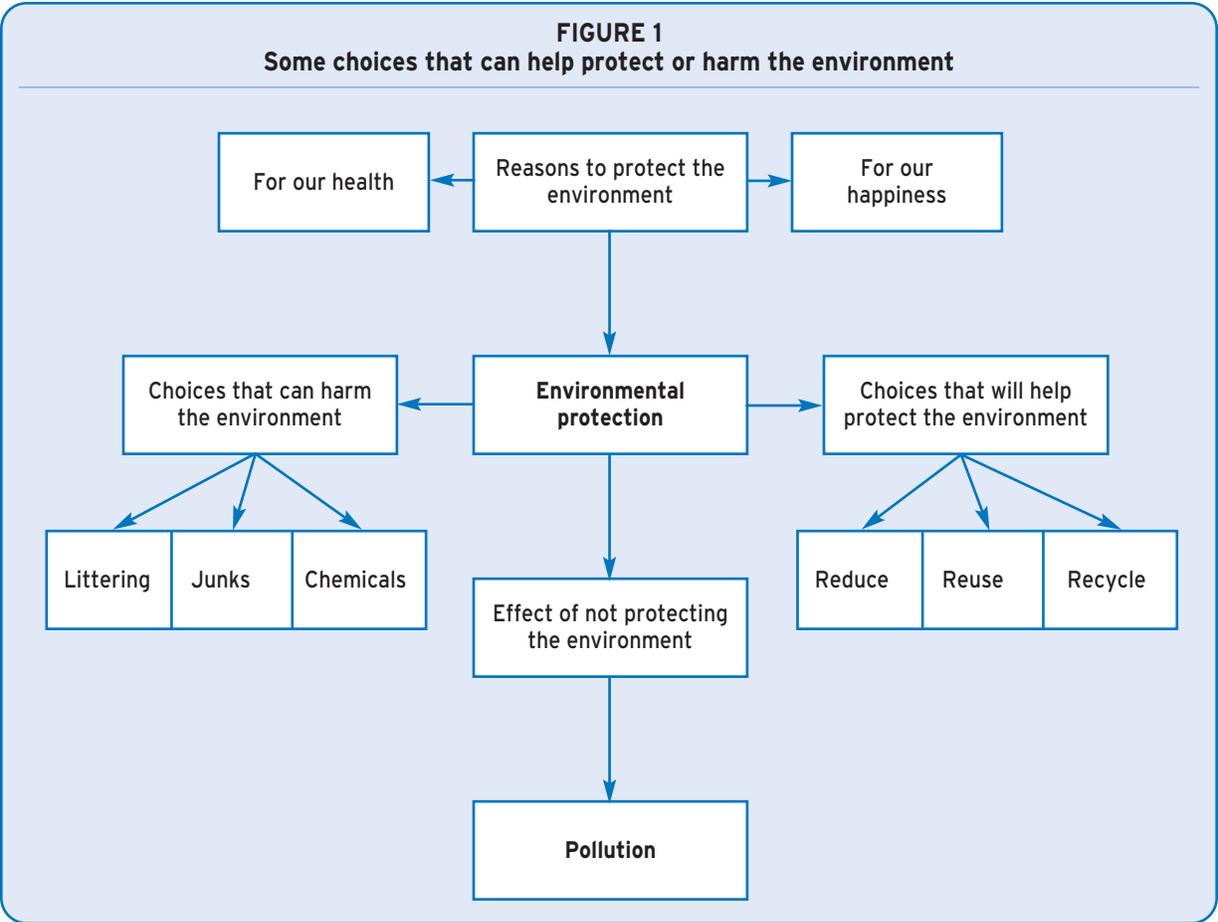


new understandings about teaching and learning in a Web-based environment. During data collection, the participants were taught for 50 minutes per lesson, two to three times in a six-day cycle, at the school's computer lab. Activities for each lesson included a review of previous lessons, question-and-answer sessions, group discussions, and hands-on activities.

Data sources included observations, field notes, written artifacts, evaluation rubrics, and reflective journals. There were also audiotapes of structured and semi-structured interviews of participants, classroom interactions, and discussions. Analysis was ongoing throughout the data collection process with a continuous cycle of preparation, action (teaching), observation, and reflection. Audiotapes were transcribed and field notes, students' writing samples, discussions, and other sources of data were thoroughly analyzed. Initial impressions were noted and tentative categories were identified. These categories were refined and major ideas and concepts were later used to develop emerging themes.

## Results

Findings from this study suggest that WebQuests can facilitate thoughtful literacy when tasks are carefully selected, organized, and delivered. Multiple tasks provided opportunities for collaboration, thoughtful connections, and critical reading. Such tasks increased students' engagement and motivation as well as built search, retrieval, multimedia, and hypertext reading skills. At the same time, students' participation in various activities highlighted the challenges involved in learning in a Web environment.

### The influence of multiple tasks

Multiple tasks provided varied learning experiences, practice with multimodal ways of learning (e.g., visual icons, animated symbols, audio and video clips), and exposure to other perspectives on environmental protection. For instance, role-playing helped participants to see environmental protection from others' points of view and provided opportunities for gathering, summarizing, analyzing, synthesizing, evaluating, and transforming information. The students paired up to research their roles but did not take ownership of their learning at first, as evidenced by their initial use of the third-person singular or plural. After the writing process was modeled for them they began to immerse themselves in their roles.

Mindy and Diane played the role of teachers in a rural community and learned what teachers can do to protect the environment. Part of Mindy's written response was a follows:

> As a teacher in the rural community, there are a couple of things I can do to protect the environment. I will teach my students how to reduce what they use, buy, or waste by renting and sharing things instead of always buying new ones. Reducing what we use means using less natural resources and energy. I will also teach them how to reuse things. They will learn how to save energy in their homes, how to handle chemicals properly and how to read labels on the products they use....

The above excerpt demonstrates Mindy's understanding of her role as a teacher. She noted that teachers are crucial to environmental protection because they model the proper actions to take in school and at home. Mindy also noted that roles are fluid. Teachers may also be homeowners, for instance, with additional responsibilities.

Another important activity that stimulated thinking was poetry writing. Two 50-minute lessons were spent on this activity. During the first lesson, students read a group of poems on the theme of environmental protection and answered questions. These poems had animations and music (see www.planetpals.com). Students also listened to the poems read aloud. Poetry readings helped students to compose their own poems on the theme of environmental protection. However, although the students enjoyed reading the poems, they were reluctant to engage in actual poetry composition. Tonia was worried about writing a poem. "Write our own poems? That's hard!" she exclaimed. The other students also expressed doubts, except Elaine who had written some poems before and who wants to be a writer when she grows up.

The poetry writing process was modeled through a 10-minute minilesson. Each participant then spent some time deciding on a title and choosing and arranging words, stanzas, and rhyme systems. They used the rest of the lesson to write their first drafts. The second lesson was used for revisions, editing, and publishing of the final versions of students' poems. Tonia, who had been intimidated by the mere mention of poetry, later admitted that poetry writing was not really difficult. She was also very happy and proud of herself when she finished her poem.

If poetry writing was thought provoking, the Dumptown game (mentioned earlier in this article) was even more challenging as it provided the opportunity for analysis, synthesis, and evaluation. Dumptown is a filthy town and the students had the responsibility of choosing effective environmental programs to clean it up. To play, participants read about the various environmental programs that cities use along with their costs, advantages, and disadvantages, then made decisions about which programs to implement for Dumptown. The decision to implement any program was based on a cost-benefit analysis because Dumptown had limited resources. The game was interactive and participants could immediately see the results of their choices. After the initial modeling and explanations of how to play, students were given a week to read, study the simulation, play the game, and write their reports.

The participants displayed divergent thinking and decisions as they played. Lisa chose to implement a very expensive program—the home recycling (pick-up) program. She explained that her choice of this program was due to the fact that it is very popular in many U.S. cities because it is convenient. Furthermore, all sorts of recyclable materials like glass, aluminum, steel cans, and newspapers would be collected. These recyclable materials would be sold to companies that need them and the money from the sale would be used to offset the cost of the program. Elaine, on the other hand, did not choose the home pick-up program. She decided to implement cheaper programs (grass recycling, home composting, and business recycling) to save money for other needs of the town. Her reason was that

Dumptown citizens can afford to dispose of their solid waste and these programs would force them to reduce the amount of waste they generate. Each student had good reasons to support her choices.

### Collaboration and social interaction

Two activities provided opportunity for collaboration. One was role-playing in pairs and the second was whole-group collaborative role-playing. In the latter activity, all participants worked as a group to investigate their community's environmental needs and problems, and generate questions for discussion. This activity provided informal opportunities for exchange of ideas as students talked and compared information they gathered from different sources. They had to agree on a number of things, including what questions were relevant, who would act as the mayor, and who would be in charge of the Readers Theatre script. Environmental issues that were brought up included lead paint problems and air and water pollution around the community. Ben reported that he heard on the local news that the city planned to impose a fine of US$250 on any person caught using pesticides outside his or her home. This was noted as an important issue to discuss with the mayor. Learning to cooperate, interact, and work together for a common goal and to coherently present their views was a major challenge for participants in this activity. One very important part of this exercise was that it helped the participants make real-life connections to their community's environmental needs.

### Making thoughtful connections

An aspect of thoughtful literacy emphasized in this study was how to make connections between what is read and the real world. Several 50-minute lessons were spent on this aspect of the study in order to complete a lot of readings from different websites. As students made connections between their reading and the realities of environmental protection, they were anxious to try out their new knowledge in their homes. For example, Elaine learned that taking showers instead of baths saves three times more water, and turning off water when brushing one's teeth saves about 3,650 gallons of water every year. She decided to start doing those things.

Making connections was not as easy for some students. They struggled to understand connections between what they read and environmental protection. Tonia evaluated the e-Patrol website (www.epatrol.org/) but she could not explain how saving energy helps to protect the environment. It was only after some discussion that she was able to explain the connection and state that "saving energy helps to conserve natural resources like oil and coal and reduces air pollution, so, it helps protect the environment."

Tonia was not the only one who experienced some disconnection. Ben could not understand why he and others were made to visit the PBS website http://pbskids.org/dontbuyit/. This website teaches kids how to be media smart and how to detect advertising tricks. But why talk about advertising when the topic was environmental protection? "What has advertising got to do with it?" Ben queried. However, later, he was able to make the connection as we can see from the following dialogue:

| | |
|---|---|
| Teacher: | What have you learned from this website? |
| Ben: | That we should beware of advertising tricks. |
| Teacher: | What are some of those tricks? |
| Ben: | Advertisers make their product look good so that we buy the product. |
| Teacher: | If we buy products that we don't need, how does it affect our environment? |
| Ben: | Mmm...we...may abandon it. |
| Teacher: | What happens? |
| Ben: | We make more garbage and the city spends money to throw them away. |

Making connections in this context means helping students understand the consequences of a possible environmental degradation on the socioeconomic lives of the people. Questioning was used to help students understand this relationship. The following excerpt from a whole-group discussion demonstrates this.

| | |
|---|---|
| Teacher: | What actions can we take that can harm the environment? |
| Diane: | If we cause pollution to occur. |
| Teacher: | How can we possibly cause pollution to occur? |
| Elaine: | If we throw stuff around and litter everywhere or throw chemicals in the river. |
| Teacher: | What happens if we have pollution? |
| Ben: | People may become sick. |
| Tonia: | They may not be able to go to work. |

| | |
|---|---|
| Teacher: | What do you think will happen if your teachers get sick due to pollution? |
| Ben: | No one will learn well in school. |
| Mindy: | Schools will look like garbage dumps. |
| Lisa: | The computers might be run by hamsters! |

Through questions and discussions, students were able to imagine the possible impact of pollution on health system, education, and the entire economy. Considerable time was also invested in teaching students to read critically.

### Critical reading

Two activities were used to teach critical reading. The first was the evaluation of web resources to determine the source and authenticity of information and the second was a critique of advertisements in different mass media and detection of propaganda in their text. Students worked in pairs to evaluate websites using a set of guiding questions such as the following. What can the URL of this site tell you, and what domain does this come from? Which organization or individual sponsored this website? Why do you think the author(s) put up this webpage? Can you tell if the information on the site is current? Is there a date that tells you when the information was posted or last updated? Can you verify the authenticity of the information? Are the links on the page functional and do they add to your knowledge of the subject? Does the design of the website allow for easy access to information or does it make it difficult?

Lisa was the first to finish evaluating the sites and she reported that all the websites used for the project were reliable and their purpose was to inform. She suspected that one site (http://members. aol.com/kidz4peace/dinopals/earthday.htm) did not meet the criteria because she could not read about the sponsors. However, Ben reminded her that the site in question was not the homepage and she should truncate the URL to get to the homepage and read about the site sponsors and authors. One site (not used for the study) (www.biofact.com/ cloning/human.html was included for evaluation so that students could compare it with the good sites. Lisa noted that this site had no information about its authors or its purpose, neither was there any indication of when the article was published on the

Web. She declared this site "unreliable" for information gathering.

A PBS KIDS website (http://pbskids.org/dont-buyit/buyingsmart/) was used to teach awareness and detection of propaganda in text. Guiding questions to help students evaluate commercials included the following:

- What type of music was used for this commercial?
- Do you think the music made it more exciting and influenced your choice of the product?
- Are there celebrities in the commercial?
- Do you think the celebrities really use the product?
- Will using the product make you as successful or popular as the people in the commercial?
- Does this product look better or bigger on TV, or in a newspaper or magazine than in real life?

Students noted that advertisers exaggerate their claims to sell products. Elaine summed up this thinking when she said that "Advertisers want to sell their products but we need to save our money," so we have to question commercials. She also observed that brand-name products are two or three times more expensive than their counterparts of similar quality. Elaine also found that many products looked more attractive and bigger on TV or in a newspaper or magazine than they actually were. She concluded that kids need to be smart shoppers.

### The challenge of learning in a Web-based environment

Students had problems with navigation and finding their way to various websites or even with reading multimedia. This was more apparent at the beginning of the project. For instance, Tonia, Mindy, and Diane could not initially locate the site used for this WebQuest. Lisa was the most computer-savvy, and she helped the others. Tonia frequently clicked on the wrong place and could not locate some of the information without help. As the project progressed, they all got better at navigation and became more independent.

Another major issue was information overload. All participants complained at some point about the amount of information in some sites. Text

chunking, skimming, and scanning for information were taught to help with this. With text chunking, large blocks or chunks of text were separated into smaller sections. For example, participants were occasionally instructed to read from a specific paragraph, webpage, or graphic, thus limiting the amount of information accessed at a given time.

Furthermore, there was the issue of distractibility. Some of the participants used every available opportunity to visit favorite websites or play online games. Lisa and Ben usually checked e-mail or played some online games before settling down to work. Icons, animations, and music that accompanied some texts also contributed to this problem. For example, all the participants were captivated by the music and animations on the poetry website. While navigational disorientation decreased as students became more proficient with search skills, incidents of distraction continued, largely because students regarded such off-task activities as part of the motivation for using the Internet.

## Discussion

WebQuests represent an important bridge between content learning and technological literacy. In this study, students learned about environmental protection through various activities. However, because these activities were embedded in the Internet environment, participants had to learn navigation, search, and retrieval skills, as well as multimedia and hypertext reading. In addition, they learned to evaluate information from various sources. Role-playing in pairs and as a group helped them to see environmental protection from different perspectives and enhance their collaborative skills. These learning experiences equipped the participants with new literacy skills (Leu et al., 2005). New literacies are essential for today's learners so they can use Internet resources, adapt to the continuously changing ICTs, and prepare for the workforce of the future (Leu et al., 2005).

The patterns in the results of this study corroborate the need for understanding of multiple knowledge representations (Spiro et al., 1994). With multiple tasks, students were able to capture some of the real-world complexities to which their knowledge of environmental protection could be applied. As they researched their roles, worked to-

gether to locate their community's environmental problems, played the simulation of a polluted city, generated their own questions, composed poems, and reflected on their learning, they demonstrated a flexible and deeper understanding of content. This helped them to discuss and explain the topic. They were able to listen and interact with others, speak, read, and write about the topic as well as synthesize, analyze, and evaluate the information they gathered from different sources.

Throughout these activities, participants' choice was given a priority. They chose the WebQuest topic (environmental protection) in conjunction with the researchers and their teacher. They chose the roles they played and the individual projects they researched. These choices reflected their interests and desires, which motivated them to take ownership of their learning. This is in line with constructive approaches to learning, which emphasize that students should be allowed to make choices that reflect their interest and to be in control of their learning. When they are engaged in activities that are intrinsically motivating, they are actively engaged in learning through exploring, discussing, questioning, and constructing their own knowledge.

Helping students to make connections between what they read and the world around them is a catalyst for thoughtful literacy (Allington, 2001). Most of the assignments were geared toward getting students to identify practical things they could do in their homes, school, and neighborhood to protect the environment. This made the learning meaningful for them. During the collaborative role-playing, each participant carried out a community-based research project, conducted interviews with parents and other community members, read the community newspaper, listened to community news, and then generated questions to ask the mayor of their city based on their findings about the environmental problems or needs of their community.

The students' questions and the mayor's answers were collated and transformed into a Readers Theatre script, which they read and acted out. The questions they generated facilitated their understanding of issues involved in environmental protection as well as their information retention and ownership of the learning process. Also, integrating poetry writing with the lessons increased students' interest in poetry writing. Poetry composition be-

came easier after students read some poems on the same theme and built vocabulary about the topic.

It must be pointed out that scaffolding was a very important part of this project. This was done through explicit instruction, elaborative questioning, modeling, and individualized instruction. Scaffolding helped learners focus on essential information and make internal and external connections, and allowed them to articulate their knowledge and recognize ineffective strategies and misconceptions. Questions were followed by extensive discussions aimed at helping participants think and make connections between ideas. Graphic organizers were used for visual presentation of information.

Although students successfully completed most activities, they encountered some problems with navigation, distraction, and time. This observation supports previous findings that identified navigational disorientation, information overload, and distraction as disadvantages of learning with the Internet (Bradshaw et al., 2002; Owens et al., 2002). Distraction was the biggest challenge in this study because the students were excited each time they worked online and tended to explore and wander in cyberspace. Time management was also problematic and should be taken into consideration in any Internet learning. Some of the activities took more time than was originally earmarked. Most times, students completed the exercises at home or had the reading materials downloaded for them.

Assessment was an integral part of the entire learning process. Assessment was ongoing throughout the teaching period and was focused on the goal of instruction and on students' developmental stage. Each teaching session was followed by a process evaluation and reflection on the teaching and learning process. Instructional decisions were made on the basis of these evaluations and reflections. For example, students' initial perception that poetry composition was not easy necessitated a minilesson on poetry writing. The decision to teach website evaluation and Internet use strategies was made after initial brainstorming, when it was evident that the students needed this instruction to effectively use the Internet and evaluate informational resources.

Students were assessed not only through written responses but also through oral responses to questions, discussion, active participation in group collaboration, and by making connections to real-life contexts. An evaluation rubric was used to quantify students' performance in all activities.

## Implications for teaching

The results from this study suggest that WebQuests are a natural way to teach literacy and technology skills simultaneously by immersing students in authentic problem-solving. An important decision concerning integrating WebQuests is whether to create the WebQuest from scratch or to adapt an already existing one. If the latter option is chosen, it is important to evaluate the WebQuest to ascertain its quality and suitability for instruction. Teachers using WebQuests need to ensure that learners are sufficiently scaffolded while at the same time giving them opportunities for exploration and encouraging them to take ownership of their learning.

Teaching methods should vary from whole groups to small groups and individualized instruction, to accommodate various types of learners. Individualized instruction is particularly useful with the Internet because it provides an opportunity to closely monitor the way students surf the Internet and notice problems they encounter. It is also very important to model the learning process and use the right questions to stimulate students' thinking.

Evidence from this study indicates that WebQuests are a learning tool that teachers can use to implement thematic, interdisciplinary teaching. WebQuests provide a variety of activities for in-depth study of content, and facilitate critical and complex thinking skills. However, the success of a WebQuest depends on the type of activities selected for students as well as on creativity and flexibility on the part of the teacher.

Another important implication is the need to incorporate learning that is meaningful to the learner. This means relating classroom teaching as much as possible to students' lives or choosing learning experiences to which they can easily relate. WebQuest activities could involve data that students collect from home or from other sources to supplement information on the Internet. This will also teach them the need to assess multiple sources of information and critically analyze them before reaching a conclusion.

Helping students to be thoughtfully literate implies that teachers should help them acquire thoughtful habits of mind. This involves teaching them to tolerate ambiguity but at the same time be able to question, counter, complement, compare or supplement information when necessary. Students need to be thoughtfully guided to learn to justify their viewpoints but still be open to and willing to consider others' points of view and revise their views if there is enough evidence to support such revision. WebQuests are a learning tool that could help students acquire thoughtful literacy through activities that nurture creative and imaginative thinking and opportunity to demonstrate such thinking through explanations, discussions, and reflections.

However, teachers using WebQuests may face new challenging roles as they are expected to scaffold students' learning within a more complex learning environment. In order to maximize the benefits of WebQuests, we need to address some of the challenges that might arise when using this instructional tool. First, adequate time should be invested in planning, organizing and supervising learning in a Web-based environment. Secondly, before students embark on a WebQuest, there is a need to ascertain their comfort level and proficiency with the use of the Internet. If necessary, Internet and computer literacy instruction could be incorporated as part of the students' learning process. Such instruction should include topics like Internet search strategies and familiarity with terms associated with the Internet (e.g. *URL*, *domain names*, *search engines*, *website*, *blog*, *hyperlink*). Students also need to be aware of ethical issues such as plagiarism, and proper documentation of their sources. Furthermore, cognitive barriers that arise from reading on the Internet like navigational disorientation and information overload could be reduced through careful chunking of text and teaching students how to skim and scan information.

Distraction and off-task activities could be minimized through close supervision of students and making them not only responsible for their own learning, but also accountable for the learning process. To achieve this, reflection should be made an integral part of students' learning. Such reflective writing may require students to document websites they visited, problems they encountered, and what they liked or did not like about their learning experiences. Students' reflection allows for self-as-

sessment and provides feedback to the teacher about students' perception of their own competence. Finally, it is important to ascertain if the time allocated for WebQuest activities is adequate for the amount of exploration and analysis that students need to do.

When students are involved in active exploration, analysis, synthesis, and transformation of information, it is unlikely that they will have enough time in the classroom to complete their work. In that case, they should be encouraged to use their computers at home to complete the exercises. For the benefit of students without Internet access at home, materials can be printed for them or they can be given extra time in the classroom or computer lab to complete their projects.

To ensure that teachers use WebQuests constructively as a learning tool, teacher education and professional development programs should incorporate WebQuests. This is important because many teachers still do not feel comfortable using Internet resources for their teaching. Teacher educators need to model the procedure for developing new WebQuests or adapting existing ones, and give teachers the opportunity to create their own WebQuests. They can also use special WebQuests designed to enhance the professional development of teachers, available at www.wm.edu/education/reading/resources.htm.

## Looking ahead: WebQuests and classroom learning

Today's classrooms need to incorporate certain pedagogical practices that involve the use of multiple forms of representation and multiple perspectives. Instruction should balance individual and collaborative activities, and students should be encouraged to engage in learning activities that reflect their interests.

Students need experiences that foster engaged learning, creative thinking, and skills necessary to access new knowledge and solve problems in today's world of information and communication technology. They need to be able to effectively comprehend information and respond thoughtfully and critically to text. Inquiry-based learning like WebQuests facilitates not just reading and writing but other vital aspects of literacy such as participa-

tion in meaningful activities, explanations, reflections, and strengthening of critical thinking skills.

Given the usefulness of WebQuests as an instructional tool, more research should be directed to WebQuest processes and how they could be used to promote inquiry learning and thinking skills with more and diverse student populations.

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