

PEL07275

**WebQuests: An Online Learning Strategy to Promote  
Cooperative Learning and Higher-Level Thinking**

Dr Lina Pelliccione and Gavin (Jim) Craggs

Faculty of Education, Language Studies and Social Work  
Curtin University of Technology

## Abstract

*With an ever-increasing number of information and communication technologies being integrated into the classroom environment, educators are continually being offered new learning and teaching strategies. One such strategy has been the WebQuest. This instructional tool was designed as a vehicle to help transport students through a problem-based, cooperative learning environment, whilst encouraging higher-level thinking and providing links to appropriate Internet resources. The aim of this research was to identify whether WebQuests actually promote cooperative learning and high-level thinking in a typical primary school context and if so, how is this achieved. A qualitative approach was implemented, which included ongoing content analyses and a case study, involving observing and interviewing a group of year seven students. The key findings from this study identified that the WebQuest framework has evolved into a structure that not only promotes cooperative learning and higher-level thinking, but demands it. The WebQuest promotes cooperative learning by allocating individual roles to students and requires them to share their different results within a small group context. The study also revealed that higher-level thinking is embedded within the WebQuest model through a number of structural mechanisms.*

## Background

In a time when the World Wide Web (WWW) is becoming a popular resource for classroom use, many teachers are looking for new and innovative ways of effectively integrating this technology into the classroom arena. In 1995 an investigative team at San Diego State University developed an instructional tool, called a WebQuest, to support successful use of the Internet (Peterson, Caverly & Macdonald, 2003). This was designed as a vehicle to help transport students through a problem-based, cooperative learning environment, whilst encouraging higher-level thinking and providing links to appropriate Internet resources.

A WebQuest is an instructor-created website that sets up a problem for students to accomplish, and guides their work with specific web-based resources, individually or in small groups (Peterson et al., 2003). WebQuests are to be regarded as educational tools, rather than educational theories, which help students harness the vast number of on-line resources available to them.

## Research Objectives

A number of recent claims have suggested that an effective instructional tool to assist in the integration of technology into the classroom environment is the WebQuest model (Lipscomb, 2003). As the literature suggests, WebQuests support an environment that fosters cooperative learning and promotes higher-level thinking skills (March, 1998). Consequently, the first objective of this research was to conduct a content analysis to identify the specific areas of a WebQuest that may promote cooperative learning and higher-level thinking skills.

During this analysis two specific questions were asked:

1. *What components of a WebQuest promote cooperative learning and how are these conveyed to the user?*
2. *What types of questions and tasks are used in the WebQuest model to encourage higher-level thinking?*

These two questions guided the second key objective, which was to develop a generic instrument that could be used to evaluate WebQuests, in order to determine their potential for promoting cooperative learning and higher-level thinking. In addition, the research sought to obtain data through a case study, which identified the specific small-group interactions that are affected by the WebQuest model. The key question that ultimately guided this study is: 3. *In what ways do WebQuests promote cooperative learning and higher-level thinking?*

## Literature Review

*A WebQuest is a scaffolded learning structure that uses links to essential resources on the World Wide Web and an authentic task to motivate students' investigation of a central, open-ended question, development of individual expertise and participation in a final group process that attempts to transform newly acquired information into a more sophisticated understanding. The best WebQuests do this in a way that inspires students to see richer thematic relationships, facilitate a contribution to the real world of learning and reflect on their own metacognitive processes. (March, 2004, par. 9)*

First devised by Bernie Dodge and Tom March at San Diego State University in 1995, the WebQuest has become a frequent topic of discussion at both technology and general education conferences (Lipscomb, 2003). Even though the WebQuest is a fairly recent development in the classroom, educators are already applauding its impact and encouraging its use (Milson & Downey, 2001). Since the introduction of WebQuests, educators at all

levels in many subject areas have submitted activities to Dodge for inclusion on his on-line matrix of sample WebQuests (Lipscomb, 2003). This online matrix can be found at <http://webquest.org>.

The name 'WebQuest' can be divided into two main parts:

- Web – to indicate that the World Wide Web is used as the primary resource in applying, analysing, synthesising and evaluating information, and
- Quest – to indicate that a question is presented within the WebQuest, which encourages students to search for new meaning and deeper understanding.

### Structure of WebQuests

WebQuests are deliberately designed to make the best use of a learner's time. According to Dodge (1997), to achieve efficiency and clarity of purpose, WebQuests should contain at least five components: Introduction; Task; Process; Evaluation and Conclusion.

More recently, a number of additional features have been suggested, for inclusion in the WebQuest framework (March, 2004). These ongoing changes provide an assurance that the WebQuest framework is an evolving product, which continues to be developed and refined by its original creators, in order to meet the demands and needs of a changing world in education. These additions include specific sections: Central, Open-ended Question; Background for Everyone; Individual Roles; and Group Synthesis.

With the evolution of the WebQuest model, March offers a revised definition of WebQuests, which includes:  
*A WebQuest is a scaffolded learning structure that uses... development of individual expertise and participation in a final group process. (March, 2004, par. 9).*

Tom March has developed a number of Internet Websites for the support and training of teachers who wish to use WebQuests in the classroom context. Bestwebquests.com is one of March's sites, purely devoted to the ongoing development of the WebQuest model (March, 2004). This site consists of a comprehensive database of selected 'best' WebQuests (according to March's online assessment matrix) and current articles. In addition to this is an online assessment matrix that readers may use for evaluating their own WebQuests.

During a chat room discussion B.J. Dodge, one of the creators of the WebQuest model, stated that there have not been many studies done on WebQuests (personal communication, November 12, 2003). Further to this, J.P. Frazee commented that while the WebQuest model is very well received by teachers and students alike, there is very little in the way of empirical research on the elements that make an effective WebQuest, and most evidence of its effectiveness is anecdotal (personal communication, November 12, 2003). These kinds of comments have instigated the need for research in this area. With the many WebQuests that have been made available for Internet use, the question must be asked as to whether or not these foster cooperative learning and higher-level thinking.

Alongside the definite structure, the literature has identified that WebQuests have a number of distinguishable characteristics. During an interview with Education World (Internet Website), Dodge, one of the creators of WebQuests, made the following comment:

*The key idea that distinguishes WebQuests from other Web-based experiences is this: A WebQuest is built around an engaging and doable task that elicits higher order thinking of some kind. It's about doing something with information. The thinking can be creative or critical, and involve problem solving, judgment, analysis, or synthesis (Starr, 2000, par. 16).*

### Cooperative Learning

As much of the literature suggests, WebQuests are an instructional tool that can be used to foster cooperative learning practices in the classroom arena. Cooperative learning is a relationship in a group of students that requires positive interdependence, individual accountability, interpersonal skills (communication, trust, leadership, decision making, and conflict resolution), face-to-face interaction, and group processing (Johnson & Johnson, 2003). Cooperation is working together to accomplish shared goals and cooperative learning is the instructional use of small groups so that students work together to maximise their own and one another's learning. In cooperative learning situations, students perceive that they can reach their learning goals only if the other students also perceive this (Brubacher et al., 1990).

### Higher-Level Thinking

Within the literature March (1998) points out that one of the main features of any WebQuest is that students tackle questions and prompts that facilitate more advanced, higher levels of thinking. March (2004) suggests that WebQuests that 'only hang around the lower levels of Bloom's taxonomy' will not help students construct new meaning.

## Research Approach

Several methods can be used for research in educational settings, however for this study a qualitative approach was implemented, which included: ongoing content analyses; and case study, involving observations and interviewing.

**Table 1: Research Design**

<b>STAGE ONE</b> (Rubric Data) Content Analysis on a Sample of 100 WebQuests	Phase One: Literature Review
	Phase Two: Content Analysis on a Sample of WebQuests
	Phase Three: Design, Production and Pilot Study – Instrument
	Phase Four: Content Analysis on 100 WebQuests Using the Rubric Instrument (Rubric Data)
<b>STAGE TWO</b> (Case Study Data) Case Study involving the implementation of a WebQuest	Phase One: Introduction to the Webquest
	Phase Two: Background Information
	Phase Three: Individual Work
	Phase Four: Small Group Work

### Stage One: Rubric Data

#### Phase One - Content Analysis

A literature review was conducted to investigate other sources of information about WebQuests. The following areas of interest were focused on: WebQuests; Cooperative learning, and Higher-level thinking.

#### Phase Two – Content Analysis on a Sample of WebQuests

One of the vital components of this research project included the development of a generic instrument which would be used to measure WebQuests, using a Rubric style approach. For the creation of this instrument a content analysis was required to identify specific details within the WebQuest framework. A purposive sample of 18 WebQuests, from the Bestwebquests.com website, was used for the initial collection of data. This site was chosen as a starting point for the sample of WebQuests because Tom March, one of the developers and world's leading authorities of the WebQuest model, hosts this site. Primary school level (year one to seven) WebQuests were examined which covered a number of disciplines including English, mathematics, history, social studies, science, arts and health.

Johnson and Johnson's 'model' of cooperative learning was used as a framework for the collection of data from the sample of WebQuests. Extensive field notes and anecdotal records were generated in respect to the following areas of interest: Positive interdependence; Individual accountability; Teamwork; Small group skills; Group processing; and Questions/Tasks. This data was then used for the development of a purpose-designed instrument to identify the ways in which WebQuests may promote cooperative learning and higher-level thinking.

#### Phase Three - Design, Production and Pilot Study Testing of the Instrument

This phase involved the design of a generic purpose-designed instrument. Once the rubric instrument was created a pilot study was conducted to ensure reliability and validity.

#### Phase Four – Content Analysis on 100 WebQuests Using the Rubric Instrument (Rubric Data)

This content analysis involved the researcher critically reading through a purposive sample of 100 WebQuests. This sample was accessed through two particular websites, chosen because the original developers of the WebQuest model host them: Bestwebquests.com – hosted by Tom March, and Webquest.org – hosted by Bernie Dodge. Data collection involved systematically reading through each WebQuest, while using the rubric instrument. This data would later be used for further analysis. It was also used to provide information for the selection of a suitable WebQuest that could be implemented as a case study investigation. This lead into Stage Two of the research design process.

### Stage Two - Case Study Investigation (Case Study Data)

From the data collected in Stage One of the research design, the sample of WebQuests could be rated from 1 - 100, subject to their allocated score. This list identified, according to the rubric instrument, which WebQuests were likely to promote cooperative learning and higher-level thinking. A short list of WebQuests was given to the classroom teacher and through collaborative discussion with the researcher a WebQuest was selected. The chosen WebQuest for the case study 'Taking the Bite Out of the West Nile Virus' can be seen online at: <http://www.web-and-flow.com/members/dbuco/westnilevirus/webquest.htm>

The West Nile Virus WebQuest was implemented within a 'typical' classroom context with a sample of year seven students from a 'typical' Western Australian coeducational, government primary school, located within the southern suburbs of Perth. In this situation the participants were selected based on recommendations from the students' teachers. The implementation phase involved 15 sessions between 25/02/04 – 7/04/04 and with the average time frame between 60 – 90 minutes.

## Reliability and Validity

The following section aims to highlight how the issues of validity and reliability were addressed in the case study:

- Sufficient time was spent on the case in order to be immersed in its issues, build the trust of those who provided data and to avoid misleading ideas;
- Collected data was discussed with the participants to check that it was an accurate record of the events,
- Sufficient triangulation was used to bring together data from different sources;
- 'Peer debriefing' was invaluable in strengthening this research project (Bassey, 1999). This person was the researcher's supervisor who played the devil's advocate in questioning the research process and outcomes;
- An adequate audit trail was an ongoing process throughout this study.

The actual validity of the design and implementation of this instrument was founded in the information gathered during the initial literature review. The review of this literature provided specific data, which was used as the framework for the design of the instrument. The reliability of the instrument was challenged through a pilot test study.

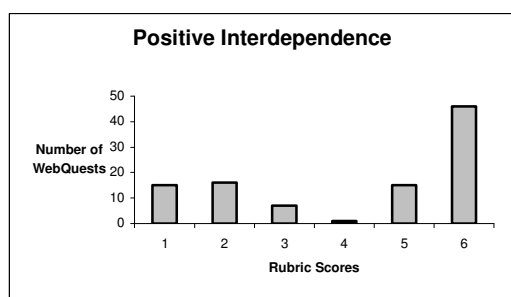
## Results

The key focus of this study was to identify the ways in which WebQuests promote cooperative learning and higher-level thinking. To maintain a broad perspective on this question the researcher collected data through content analyses and a case study.

### Rubric Data

This data was collected using the purpose-designed rubric, while analysing a sample of one hundred WebQuests. The primary reason for using this Rubric was to employ a numerical measuring system, in order to select an appropriate WebQuest for the case study component of this research. A copy of the rubric can be found at **Appendix A**. The researcher analysed each WebQuest and allocated a specific score, from one to six (these dimensions are identified in the rubric). By using a numerical system the researcher was able to visually determine, according to the instrument, which areas of the rubric scored highly. The following figures represent the tallied scores for: Positive Interdependence; Individual Accountability; Group Processing; and Questions/Tasks.

**Figure 1: Positive Interdependence Scores**

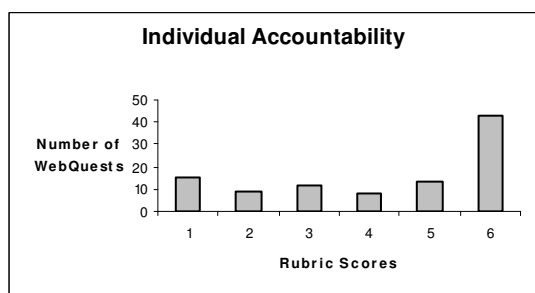


significantly contributes to the group's goal.

- 1 = No group work is required.
- 2 = Workload is shared by all members.
- 3 = Students' individual research has an impact on the group's goals.
- 4 = Students are rewarded for helping other group members.
- 5 = Students are required to share and discuss their research to achieve group consensus.
- 6 = Each student adopts a specialized role which significantly contributes to the group's goal.

It is interesting to note that 46% of the WebQuests analysed required each student to adopt a specialised role, which

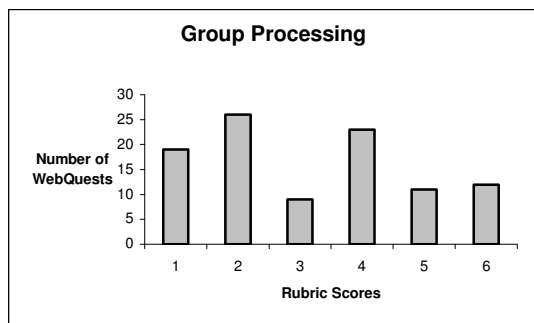
**Figure 2: Individual Accountability Scores**



- 1 = Individual work– no group work required.
- 2 = Students work in groups with no accountability required.
- 3 = WebQuest prompts students to contribute equally.
- 4 = Students are given individual grades for their own individual effort.
- 5 = Students are required to report their progress to the group on a periodical basis.
- 6 = Students required to teach the group / discuss with the group the researched information.

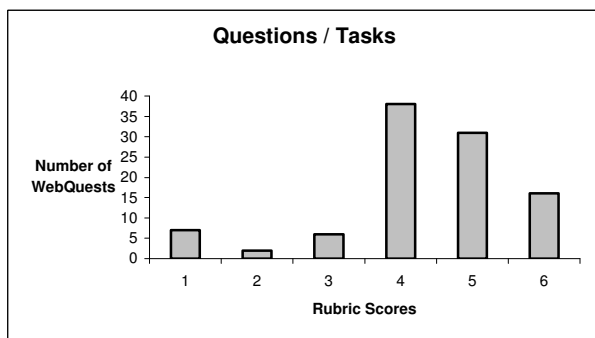
Interestingly, 43% of the WebQuests analysed required the students to teach the group/discuss with the group the researched information.

**Figure 3: Group Processing Scores**



- 1 = Individual tasks with no group work required.
- 2 = Encourages students to get together and practice / rehearse the final performance / show / presentation.
- 3 = Conclusion section encourages students to reflect on the group's processes.
- 4 = Prompts students to meet together to discuss their progress.
- 5 = Evaluation tool provides a guide for the students to use when evaluating the group's processes.
- 6 = Students are instructed to complete a 'meeting journal' and report / reflect on their group progress.

**Figure 4: Questions / Tasks Scores**



- 1 = WebQuest provides tasks for students to simply locate information.
- 2 = Contains one or two low-level thinking questions/tasks.
- 3 = Contains many low-level thinking questions /tasks.
- 4 = One or two high-level thinking questions combined with many low-level thinking questions/tasks.
- 5 = Many high-level thinking questions/tasks.
- 6 = Many high-level thinking questions/tasks, with prompts to use other thinking tools eg. DeBono's thinking hats.

A total of 38% of the WebQuests analysed contained one or two high-level thinking questions, combined with many low-level thinking questions / tasks.

## Case Study Data

A large component of this research involved the actual implementation and application of the West Nile Virus WebQuest with four year-seven students as the participants. The types of data collected from the case study included: The researcher's descriptive field notes; the researcher's reflective field notes; extracts from interview notes; extracts from the tape recorded transcripts; and the implementation schedule of the case study processes. The data is presented using the following format: Background Information to the Webquest; Individual Work, and Small Group Work.

### Background Information within the WebQuest

The first task within the WebQuest provides opportunities for the students to familiarise themselves, and grasp an understanding, of the basic facts of the topic. With the latest generation of WebQuests this is being recognised as an additional component, which appears to be becoming a standard feature of the WebQuest framework (March, 2004). The 'Background Information' section reveals how this is the first component of the WebQuest to promote cooperative learning and is therefore included here as part of the data.

At the completion of this section of the WebQuest the researcher recorded the following reflective field note:

In the WebQuest it suggests that everyone knows the basics. It appears that this strategy of having the students generate questions is geared towards the lower levels of Bloom's taxonomy, that is, knowledge and comprehension. Although the students suggested they had never attempted this before, they were very competent in generating questions. This appears to be an important step in the scaffolding of students' learning. This gives the group the opportunity to create low-level questions that they may all concentrate on, before tackling the higher-levels of thinking within the synthesis and evaluation areas of Bloom's (Field notes, 3/3/04).

### Individual Work within the WebQuest

The researcher recorded reflective field notes about the students' individual roles. Some of these comments include:

Suggested to the students to look at what the WebQuest is asking them to do, that is – look at the question from different perspectives and then come together to share their learning. WebQuest (adopting roles) is like looking at the text with different eyes. i.e. text participant, text analyst. This is one positive toward cooperative learning because during the group synthesis stage the students will be trying to make sense of the information from their perspective – that is, the perspective of the character they have adopted. Students understand that they are taking on the role of

parent, doctor etc. but are unsure what this looks like and what its purpose is. Pretending to be the person and trying to adopt their viewpoint is unclear for the students at this stage. They are not actually reading the Websites as though they were the person, but rather, are collecting the appropriate information, because that information is in the recommended websites that they are reading (Field notes, 10/3/04).

### Group Work within the WebQuest

This phase of the case study corresponds to the ‘Group Process’ component of the WebQuest and included data, highlighting examples of some of the students’ responses to this task. With the latest generation of WebQuests this is being recognised as an additional component, which appears to be becoming a standard feature of the WebQuest framework (March, 2004). This can be achieved using a variety of tasks and objectives, however the West Nile Virus WebQuest is a ‘typical’ example of how this is achieved.

The group synthesis task commenced with the students sharing their information. Table 2 points out a number of examples of student communication at this phase of the case study and is directly linked to how well the students were achieving within Bloom’s taxonomy level of ‘synthesis’. These examples provide crucial data, which identify the students’ responses, and are discussed in greater detail in the discussion section.

The researcher’s reflective field notes in response to the students’ initial sharing of ideas:

The group was very positive when sharing information and displayed a keen attitude toward learning. The majority of this time was spent with the students making separate comments about what they had found out. They were very eager to share their information. I believe that the contributing factor here is the fact that the students gathered information from a variety of sources. Occasionally one of the students would elaborate on another’s comments. At this point in time there was no synthesis of ideas (Field notes, 24/3/04)

**Table 2: Student Comments During the Initial ‘Group Synthesis’ Phase**

Date	Student Comments
24/3/04	
Tony	I think this is pretty interesting. Do any of you know what the reservoir host of the virus is? Because the mosquito didn’t actually start off with the disease. It was another animal.
Mark	Dog bowls are a problem too.
Julie	My dog has got all moss stuff around it like my dog’s old bowl and it’s got all these mosquito things going all around it and it is still in the back yard.
Mark	If we wipe out all the mosquitoes they would have to stop the food chain and people, then spiders wouldn’t have anything to eat but we won’t worry about that yet.
Julie	I don’t think we should get rid of all of them because like bats and other animals eat the mosquito so we need them to keep.
Julie	Yeah. They don’t like the cold.
Mark	They need blood to survive.
Julie	Yes and they need water and they need blood to lay eggs as well.
Sally	People over 75 are most at risk of getting it.
Julie	They are attracted to sweat, heat, body odour.

The students were given approximately one hour to share their information, before being asked to answer the primary WebQuest question, “What should we do about the West Nile Virus?” Table 3 highlights the students’ answers to this question.

**Table 3: Students’ Initial Answers to the Primary WebQuest Question**

Date	Student Comments
24/03/04	
Sally	I’m not really sure. I don’t know how to put it into words. Don’t really leave water out and stuff.
Tony	I think that as we discussed we should keep, like get rid of all possible lying water in your back yards and your front yards.
Julie	We can get everyone to wear mosquito repellent or bug repellent all the time.
Sally	We could live in igloos because they don’t like the cold.
Julie	Try finding huge mosquito squatters so when the mosquito comes we can squat it, like huge ones and you put them near where mosquitoes breed, and they can just kill them.
Sally	I think the first one and I’m not sure about number three because I’ve looked at insect repellents and there has been nothing on them. So I’m not really sure about that question.
Sally	When you have BBQs you can put you know those candles out.
Sally	Ummm...I said the kids should take mosquito repellent in their bags.
Mark	Get rid of dead animals. Teach people and to watch people over 75 as they are more at risk, to kill all the mosquitoes and everyone wear mosquito nets and put mosquito nets around your house.

During the beginning phases of the Group Synthesis section the researcher recorded a number of reflective comments regarding the specific task that the students were asked to complete. Some of these include:

At this point the students appeared totally confused with the group synthesis task. Have too many concepts be presented to them at once? Their primary task for the WebQuest project is to create an action plan, in the form of a 'product', that is to be presented to the Governor - They didn't know what to do. I believe one of the problems is that the students are unclear of the scenario. I don't think they have grasped the idea that the Governor is not interested in dogs' bowls and how much water is in them. The students had gathered their information and thought that this is all they needed to know at the table. They couldn't understand the idea of creating 'ideas' for the Governor. They wanted to share their information because they had comprehended what they had read (and were excited about their learning) but were having troubles applying this to a specific situation. Their knowledge and comprehension of information appeared very detailed, even their application of this information, but no synthesis was taking place (Field notes, 25/3/04).

The researcher questioned one of the students about the problems the group was having with generating ideas to help combat the West Nile Virus. Table 4 illustrates the student's response.

**Table 4: Student's Response to the Problem with 'Group Synthesis'**

<b>Researcher's question:</b> When the team was attempting the group synthesis task they seemed to be having some problems. Why do you think that is?
Because we weren't really looking at our questions and things. The answers are there in front of us in the document. When we were on the Internet we were just writing answers to the questions. We weren't really going beyond that. (Mark, 29/3/04)

At the end of the group synthesis the researcher generated a number of reflective comments, which include:

This has been an important time in the whole case study. The conceptual framework of this WebQuest, in particular the inclusion of the 'Group Synthesis' section appears to be a complex set of tasks for the students to understand and complete with great success. The students are having difficulty in the Bloom's area of synthesis, in particular:

- Synthesis 5.10 – Production of a unique communication, and
- Synthesis 5.20 – Production of a plan, or proposed set of operations.

Without question, this is the most crucial point of the case study data. I have also been questioning the actual strategy of implementing the WebQuest as a 'holistic' project, or in separate parts. (Field notes, 25/03/04).

## Discussion

### *What components of a WebQuest promote cooperative learning and how are these conveyed to the user?*

Before any attempt can be made at discussing the various components of a WebQuest, it is important that the 'evolving structure' of WebQuests be addressed first. It was evident from the current literature that although the WebQuest model was only introduced ten years ago, its structure and format have continually been refined. It is the researcher's inference that although Tom March was one of the original developers of the WebQuest framework, his professional commitment and passionate approach to education is an assurance that WebQuests will continue to evolve as highly effective and valuable tools that bridge the gap between student learning and the cyberspace of information, known as the World Wide Web.

A look at Table 4 highlights the distinguishable differences between the 'first' generation and the 'new' generation of WebQuests. A relative comparison with a specific focus on the 'Background Information', 'Individual Roles' and the 'Group Process' sections are discussed here. However, 'The Question' section is discussed later, when addressing the next research question. The more recent additions to the WebQuest model are indicated in **bold** and *italic*.

**Table 5: The 'Evolving Structure' of WebQuests**

'First' Generation	'New' Generation
Introduction	Introduction <ul style="list-style-type: none"> <li>• <b>The Question</b></li> <li>• <b>Background Information</b></li> <li>• Resources (1)</li> </ul>
Task	<b>Individual Roles</b> <ul style="list-style-type: none"> <li>• Resources (2)</li> </ul>
Process	<b>Group Process</b>
Resources	
Conclusion	Conclusion



Essentially the main difference to the structures is the abolishment of the 'Task' and 'Process' sections, which have been replaced by the 'Individual Roles' and 'Group Process' components. In addition to this the 'new' generation of WebQuests contains two 'Resource' sections within the framework. Instead of devoting an entire section of the WebQuest to the resources (URL websites that the author provides for the students to access), these are located in strategic positions throughout the WebQuest, only where necessary.

It is the researcher's inference that the revised definition (presented earlier) supports the notion that WebQuests promote cooperative learning by encouraging the students to gather individual expertise, which is then used for participation in a final group process. In many earlier WebQuests the tasks allocated to the students did not necessarily involve individual expertise, or in fact group work. Figure 2 of the rubric data illustrates this fact, which identifies 15% of WebQuests that do not promote group work. The importance of this inclusion in the definition is seen when assessing, and identifying, whether or not a WebQuest is really in fact a 'WebQuest' at all. March has been scrutinizing many WebQuests, which have been submitted to him for assessment and feedback, and it can be seen from a number of these examples that they are in fact not WebQuests at all (March, 2004). As the WebQuest model has been 'evolving' through the years, it appears that March is guaranteeing the quality of this product by strengthening the definition of what a WebQuest should be. The researcher considers March's definition of WebQuests to be a key point in this study, and believes that the use of this will serve its purpose towards ensuring only the highest quality of WebQuests are developed by teachers and educators alike.

### ***What types of questions and tasks are used in the WebQuest model to encourage higher-level thinking?***

At this point the central point of discussion shifts away from the area of cooperative learning and now focuses on higher-level thinking, and how this is promoted using the WebQuest model. This question is addressed in three parts, which include: The 'Main Question', Individual roles, and Group process.

#### **'Main Question' - Real World Issue**

As previously stated, the name WebQuest may be divided into two main parts. The first part, *Web*, indicates that the World Wide Web is used as the primary resource, while *Quest* indicates that a question is presented within the WebQuest. This section examines the types of questions analysed from the Rubric data, and provides discussion on how these are included in the WebQuest model, and conveyed to the students.

Within the current literature Lipscomb (2003) suggests that 'good' WebQuests require students to answer some sort of 'real world' question. The recent generation of WebQuests now have an addition, which clearly promotes the use of such a question. Typically, this is referred to as the 'Main Question' of the WebQuest and is aimed at the whole group of students. Although the first iteration of WebQuests called for a clear statement of the task, it did not ask for teachers to frame the task as a question. March (2004) advocates using a question because it is clear that students must do more than 'know' facts. In addition to this, it is suggested that questions can create the cognitive dissonance that leads to investigation and assimilation of a more robust understanding (March, 2004). Of the one hundred WebQuests measured, 11% used a question for the WebQuest title.

#### **Individual Roles – Scaffolding the Learning**

In order to engage students in higher-level thinking, WebQuests use scaffolding or prompting which has been shown to facilitate more advanced thinking (March, 1998). Part of the scaffolding process involves asking the students a number of low-order thinking questions, and using these to build the students' knowledge base so that higher-level thinking questions may be confronted with a sense of confidence.

Good and Brophy (2003) suggest that varying combinations of lower-order and higher-order questions should be used for effective questioning, depending on the goals that a teacher is pursuing. Sequences that begin with a higher-level question and then proceed through several lower-level follow-up questions are appropriate for purposes such as asking students to suggest possible applications of an idea and then probing for details about how these applications might work (Good & Brophy, 2003).

The West Nile Virus Webquest provides an excellent example of how this combination and sequence of questioning is used. A 'main question' is used to deliver a high-level thinking response from the students, in combination with a series of lower and higher-level questions, which are directed at the individual students. According to the data presented in Figure 4, 38% of WebQuests measured use this technique of using one or two high-order questions, combined with many low-order questions or tasks. In addition to this, 31% of WebQuests use many high-level thinking questions or tasks. The WebQuest model accommodates the use of this technique of varying combinations of questions. The major advantage of this is that when designing, or choosing a WebQuest, an appropriate level of scaffolding may be determined by the teacher, by varying the ratio of low and high-level questions.

## Group Process - Constructing a Deeper Understanding

It is the researcher's belief that the central issue of this research study is the following discussion about the 'Group Process' component of the WebQuest model. 'Group Process' is presented here, as an integral part of this study, with an explicit focus on identifying how WebQuests promote higher-level thinking.

As previously stated, in the latest generation of WebQuests the 'Group Process' component is now becoming a standard feature (March, 2004). Even though the 'main question' of a WebQuest is an important inclusion, it is the 'Group Process' section that actually engages students in a pursuit that requires them to use the acquired information and expertise in a new way, thus constructing a deeper understanding. March (2004) suggests that the key to this 'something new' is that it must be substantively new, not merely a new compilation of information. The 'Group Process' section does this by communicating a series of tasks to the students, in order to answer the 'main question'. The following example is an extract from the West Nile Virus WebQuest, and is found under the heading of 'Group Synthesis':

*Congratulations! Your team is absolutely 'buzzing' with expertise! Each person on your team have become experts on the topic of West Nile Virus. You've all learned a lot of information. Share all of this information and come up with a 'plan of action' to swat the WNV! ... Convince your team that your ideas are important and should be part of your team's answer to the question (Buco, 2003, par. 17).*

This 'Group Synthesis' section of the WebQuest requires students to make something new out of what they have learned. The above statement suggests to students that they have gathered and learned specific information, within their respective roles, and now it is time to do something with it. The 'main question' serves its purpose in creating a cognitive dissonance, and the 'Group Process' tasks the students through the required procedures.

The researcher's field notes concur that the group members spent most of this time communicating what they had discovered from their research, and occasionally elaborated on each other's comments (Field notes, 24/03/04). One example of this was when Mark suggested that dog bowls are a problem, and then Julie contributed with comments about her own personal experiences. The researcher noted that the students appeared very eager to share their information, however no synthesis of ideas was taking place (Field notes, 24/03/04).

Table 3 provides examples of the students' responses, when asked the question, "What should we do about the West Nile Virus?" These comments suggest that the students experienced difficulties in 'creating new solutions' to the WebQuest's proposed problem. This data also shows that the students were able to communicate an understanding of the knowledge they had acquired, but experienced problems synthesising the information to create ideas. Table 4 supports this viewpoint with Mark's comment, "When we were on the Internet we were just writing answers to the questions. We weren't really going beyond that."

## Conclusion - Key Findings

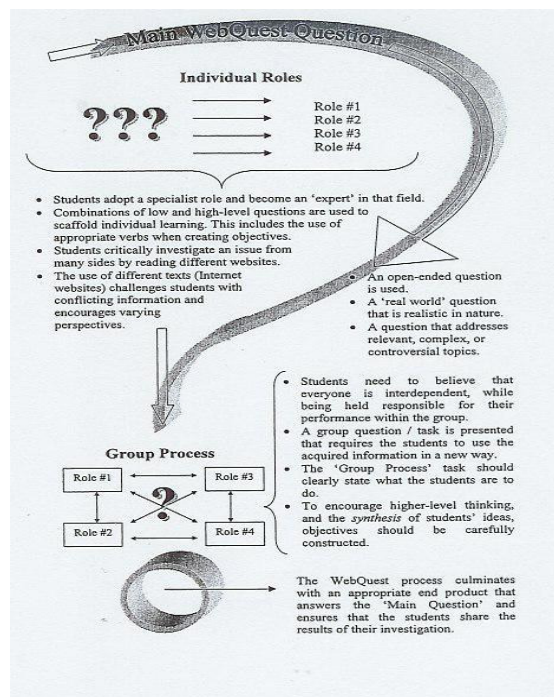


Figure 5 is presented as a theoretical framework, by drawing together the main discussion points from the previous questions. The overall design of the framework is presented as a question mark, which is to symbolise the use of a 'Main Question' within the WebQuest. It is the researcher's inference that this is the heart of the WebQuest framework, and the key issue to be addressed when identifying how WebQuests promote higher-level thinking.

The actual shape of the question mark, overlaid by the large arrow, indicates that a WebQuest involves a learning journey, with the 'Main Question' weaving its way through a number of processes. The wide arc of this shape surrounds the 'Individual Roles' section, representing the investigative voyage into cyberspace that each student must complete, in order to acquire new information and return with a personal perspective. Finally, the small circle at the point of the question mark represents the final leg of the journey, an end process, symbolising an all-encompassing complete answer from the group's synthesising effort.

### **Main WebQuest Question**

At the tip of the framework resides the 'Main WebQuest Question'. This bold lettering serves as a title for the framework and suggests that the 'Main WebQuest Question' is the overarching feature of the WebQuest. This key issue addresses the point that the overarching question serves its purpose in creating a cognitive dissonance, and guides the learning process from the beginning stages, through to the end process. The best example of this was highlighted during the case study phase of this research. In this WebQuest the main question was asked, "What should we do about the West Nile Virus?" This 'real world', open-ended question addressed a complex topic and promoted higher-level thinking throughout the implementation of the WebQuest, from beginning to end.

### **Individual Roles**

Within the large arc of the question mark is the 'Individual Roles' part of the framework. Essentially this comprises three separate areas. The smaller question marks represent the combination of low and higher order thinking questions and tasks that are used within WebQuests, while the four arrows, picturing the rungs of a ladder, symbolise the scaffolding processes that these questions support. The third part of this section indicates that each of the individual roles are separate entities, with each student adopting a specialised role and becoming an expert in that particular field. This important feature of the WebQuest model challenges students to acquire conflicting information and encourages different perspectives to be developed.

### **Group Process**

As the question mark encompasses the 'Individual Roles' section it turns downward towards the 'Group Process'. This significant change in direction is consistent with the WebQuest learning journey. As the students complete their individual investigations they are required to work together as a team, and use their acquired information in a new way. This 'Group Process' is illustrated with four small rectangles, a series of bi-directional arrows, and a central question mark. Each box depicts an individual role and represents interdependence among the team members, while the small arrows symbolise the sharing of information. The small question mark at the centre of this process represents the group synthesis task, which should encourage a synthesis of ideas and higher-level thinking.

Finally, at the base of the framework is the culminating point. This circle symbolises the completeness of the Webquest task; an appropriate end product that answers the 'Main Question' and ensures that the students share the results of their investigation in order to develop deeper understanding of the topic.

With such a broad investigation being conducted, this research study unveiled many issues with regards to how WebQuests promote cooperative learning and higher-level thinking.

From the initial content analysis there were suggestions within the literature that WebQuests have been well received within the primary school classroom, as an online educational tool that brings together effective instructional practices. In addition to this it was clear that the original creators are committed to the continual development and refinement of the WebQuest model. The key finding surrounding these points is that the WebQuest framework has evolved into a structure that does not just promote cooperative learning and higher-level thinking, but demands it. The new inclusions within the WebQuest model, in particular the 'Main Question', as well as the 'Individual Roles' and 'Group Synthesis' sections support this notion.

In regards to cooperative learning, the WebQuest framework promotes this by allocating individual roles to students through which they are required to gain a personal perspective on a topic, while being accountable to their group of peers. Through this process the students are then required to share the results of their investigation, within a small group context, in order to develop a deeper understanding of the topic, while contributing to the group's ultimate goal.

The key finding in reference to higher-level thinking is that WebQuests use an overarching, open-ended question, as well as a combination of low-level and high-level thinking questions to support the scaffolding of students' learning. In conjunction with a 'Group Synthesis' task, with carefully chosen verbs, the WebQuest model promotes higher-level thinking, in accordance with the framework of Bloom's taxonomy.

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## Appendix A: WebQuest Rubric – Cooperative Learning and Higher-Level Thinking

	1	2	3	4	5	6
Positive Interdependence	No group work is required	Workload is shared by all group members	Students' individual research has an impact on the group's goals	Students are rewarded for helping other group members	Students are required to share and discuss their research to achieve group consensus	Each student adopts a specialized role which significantly contributes to the groups' goal
Teamwork	No teamwork required - individual work only	WebQuest suggests that students will be working in groups	WebQuest suggests to students that teamwork will promote success	Team role is required to produce a group report to be presented to the class	Group consensus is required to form an agreed perspective	Evaluation tool for assessment - how well did the group work together effectively as a team?
Individual Accountability	Individual work – no group work required	Students work in groups with no accountability required	WebQuest prompts students to contribute equally	Students are given individual grades / points for their own individual effort	Students are required to report their progress to the group on a periodical basis	Students required to teach the group / discuss with the group the researched information
Small Group Skills	Individual work only	Group work is required however the WebQuest makes no comments about small group skills	Includes a 'standards section' that identifies specific small group skills to be evaluated by the teacher	Prompts the group to work cooperatively eg. Encourage each other, resolve conflicts, share ideas	Provides group with additional information on how to work cooperatively eg. Use of conflict resolution skills	Evaluation tool is used to assess students' communication skills, eg. Listening, taking turns, asking questions
Group Processing	Individual tasks with no group work required	Encourages students to get together and practice / rehearse the final performance / show / presentation	Conclusion section encourages students to reflect on the group's processes	Prompts students to meet together to discuss their progress	Evaluation tool provides a guide for the students to use when evaluating the group's processes	Students are instructed to complete a 'meeting journal' and report / reflect on their group progress
Questions / Tasks	WebQuest provides questions / tasks for students to simply locate information	Contains one or two low-level thinking questions / tasks	Contains many low-level thinking questions / tasks	One or two high-level thinking questions combined with many low-level thinking questions / tasks	Many high-level thinking questions / tasks	Many high-level thinking questions / tasks, with prompts to use other thinking tools eg. DeBono's thinking hats