CHAPTER 6

FOSTERING STUDENT ENGAGEMENT IN SCIENCE THROUGH THE ADOPTION OF A WEBQUEST

In this case study, the action research experiences of Katrina, a mid-career grade one teacher, are described as she incorporated a webquest (see Appendix-Part A) into her science curriculum. Katrina conducted her research with a group of 25 students; 16 boys and 9 girls, whom she described as "typical, active six- and seven-year olds from diverse families and mixed socio-economic backgrounds." While she was not part of a school-based action research team, she collaborated with two other grade one teachers from another school in the same district.

EXPECTATIONS/RESEARCH FOCUS

Katrina decided to become involved in action research because of her desire to change her teaching approach in science. Katrina indicated that "a lot of [her] teaching was direct instruction, and [she] wanted to do something that was more exciting and would be more engaging for the children." While she enjoyed learning science herself in school, she often placed limited emphasis on science in her own classroom, instead choosing to focus on reading and math development. Her interest in the area of technology, coupled with her wish to create a more inquiry-oriented learning environment in science, led her to pursue a project focused on webquests. She hoped this would facilitate her shift away from transmission-oriented approaches to more student-centred instruction. Her specific research questions were: a) How does a webquest engage students in learning?, and b) How does using a webquest influence the role of both the teacher and the student in the science classroom?

DEVELOPING A PLAN OF ACTION

In developing her plan of action, Katrina, in collaboration with two other action researchers in her school district, talked to other teachers and educators who had experience in using webquests. She explored a variety of websites and conducted a literature review to develop an understanding of the nature of webquests, to determine how a webquest aligns with constructivist principles of learning, and to synthesize the research on how webquests have influenced student learning.
    Katrina searched the Internet to find a webquest that would align with the science outcomes in a "Living Things" unit (see Appendix-Part B for a list of

49

targeted outcomes). She decided to use an existing webquest, rather than designing her own, as it matched her targeted learning outcomes very well. The webquest was designed by a grade one teacher and was published at the San Diego State University webquest portal (see http://webquest.org/). Katrina made some modifications to how the webquest was intended to be used, based on early feedback from her students as she implemented the unit. The website included text, numerous pictures, audio of real penguin sounds, and a real-time webcam of penguins being fed in a zoo. In addition to selecting a webquest, Katrina's planning involved designing assessment tools, a letter apprizing parents of the project work and specific learning activities, considering student grouping logistics, and choosing appropriate data collection sources and methods.

To find answers to her research questions, Katrina used her journal reflections and a parent survey to collect some baseline data about her teaching and her students' experience with using computers. Her journal entries allowed her to reflect on her beliefs about curriculum, student learning, instruction and assessment, and how they were being impacted by the project. In addition to these data sources, she recorded observational notes (e.g. changes in student behavior) during the implementation process, reviewed work generated by students, and analyzed a short survey completed by students at the end of the unit. Examples of some of these data collection tools and data sources are included in Appendix-Part D.

IMPLEMENTATION

Katrina implemented five lessons over a three-week period. She also engaged a number of grade six students in the school to act as helpers to support the grade one children as they explored the webquest. The following list provides a brief summary of what was done during each lesson:

Lesson 1: This was a general introduction to the topic and the webquest. Katrina used one computer and a computer projection unit to show the students the various components of the webquest and to introduce the main problem or task: "Why can't PB the polar bear find any penguin friends to play with?"

Lesson 2: Students were assigned specific roles (artist, geographer, and reporter) within teams as team members completed webquest activities. This session involved students in the initial exploration of the webquest.

Lesson 3: In this session, the students used a very short worksheet to record information about an assigned penguin. Katrina noted that this did not work overly well as some members of the team were becoming bored. Katrina wrote in a journal entry: "After reflecting on the session, I felt it was too cumbersome for the students; they had too many tasks."

Lesson 4: Based on the response from students in the previous session, Katrina decided to assign all students the role of artist. They were asked to draw a penguin that would reveal the physical characteristics of their team's assigned penguin. Katrina noted an increased level of engagement and more productivity during this session: "Students were much more engaged and seemed more interested in manipulating the webquest. Even though I did not ask students to write anything about their penguins, many of them recorded sentences about their penguin in addition to creating a picture."

Lesson 5: In this lesson, the students used the webquest to find information about the habitat of penguins. They had to place an "X" on a map to identify the habitat and then draw a picture of their respective penguins in the habitat.

At the end of each session, students were asked to share what they had learned with the whole class or sometimes to share with other groups. In the previous year, Katrina had only used textbooks when implementing the unit on Living Things. Katrina felt that this new approach fostered "more independence by the learner and a lot less teacher direction and more student ownership of learning" (Katrina, Conversation with the author).

EVALUATING AND AMENDING THE PLAN

While Katrina engaged in data analysis as she collected her data, the more intensive interrogation of the data occurred at the end of the project, with support from her colleagues. In the data (journal reflections, observational notes, students work, responses to the survey), Katrina looked for evidence of changes in student learning. She tabulated frequencies of responses from the parent and student surveys, grouping like-responses together to form themes. She examined student work and compared observational notes and survey responses to look for common themes related to student behavior. Her reflective entries allowed her to analyze changes in her own classroom behaviors and beliefs about teaching.

By conceptualizing and implementing a collaborative action research project, Katrina was able to change her orientation to teaching science from teacher-directed to more student-centred. She referred to this shift as "taking small steps" towards moving her teaching to a more inquiry-based approach. At the time of implementing this project, a new science curriculum framework had been introduced. Thus, she became more knowledgeable about curriculum outcomes for the Living Things unit through examining new resources and analyzing the content of a webquest to determine its alignment with new curricular outcomes.

Katrina became very cognizant of the need to obtain more feedback about student thinking in an inquiry-based learning environment and to provide more consistent feedback about student work. This is reflected in one of her journal

entries: "I wasn't quick enough at giving them the feedback on what they had done the previous day. So then they stuck with what they had done from the beginning, even though every day I would say – 'give me more; give me more; give me more.' So when assessing this type of work, I need to be more consistent with the feedback on a daily basis to get the product that I want." These new insights about student learning allowed her to reflect on the changing roles of the teacher and student: "Students took more control of their learning and I let go of control as the keeper of knowledge … letting students build on what they already knew about penguins" (Interview). The results of the student survey data also reinforced Katrina's belief in the need to design classroom learning experiences that cater to the needs of all students. She was quite surprised that three of her 20 students did not enjoy the webquest experience, and concluded "Children learn in different ways and these need to be considered in science and all areas" (Debriefing session).

In the following section, Katrina shares her insights and perceptions about the nature of collaborative action research and how it impacted her professional knowledge and classroom practice.

KATRINA: REFLECTIONS ON COLLABORATIVE ACTION RESEARCH AND
PROFESSIONAL LEARNING

The "Science Across the Curriculum" project was my first experience with action research. Although I had heard the "buzz" of action research during many professional development sessions with the school district, I did not have a clear understanding of what action research really was. Since participating in this project, I have learned that action research is actually more systematic than I had thought. There are steps that must be worked through towards answering a research question. Continuously reflecting on the question is an important element of action research because it allows for a greater understanding of the issues and sometimes leads to changes in the action. Data collection, through such things as surveys, students work, teachers' journals, are essential to action research because it provides the evidence that is needed to answer the research question. The only limitation is the time it takes, above and beyond the day-to-day teaching responsibilities, to organize an action research project. Although I found each step of the process to be necessary and worthwhile, it was a process that consumed a lot of time. The support of the "Science Across the Curriculum" staff was essential for me because their experience provided informative feedback that allowed for a more efficient process for this first-time action researcher.

For me, the action research methodology provided a systematic approach towards changing my teaching instruction from mostly teacher-directed to one that was more motivating and engaging for the students. The step-by-step process allowed me to focus in on my problem and led to the development of my research questions. The process of acting, observing and reflecting on my research question

kept me focused, but also led to some changes in the implementation of my research. I found journal writing to be very useful in the reflection process because it provided insights into observations and helped me to problem-solve as I implemented my plan. The collection and analyzing of student surveys, parent surveys, other student work and my own journal entries was critical in providing the evidence that really helped me to see that I had indeed made a change in my teaching and had provided a more motivating learning experience for my students.

As I think about my own understanding of science, I realize that during the past few years, I had really moved far away from the premise of science as inquiry. This project helped get me back on the path of science as a topic that is meant to be interesting and fun where students have the opportunity to investigate, observe and discover things for themselves. Science is an opportunity to tap into the natural curiosity of children and help them discover things about the world around them. This webquest provided students with a chance to hear real, live penguin calls and to see actual penguins being fed at a zoo while working towards solving a problem. To see the expressions on their faces as they stared at the computer screen while the penguins hopped from rock to rock at the zoo made me realize the importance of taking the time to take the extra step to see what resources are available to deliver the best programs we can. To hear the children ask, "Are we doing webquest today?" showed me that we need to let go of some of the control of student learning and enable them to be independent learners who are able to make connections to what they already know.

Through conducting research in my own classroom, I learned the importance of reflection on my own practice in making changes in my own teaching. Taking the time to reflect and record these reflections really gives powerful insight into student learning and encourages you to make changes that can lead to better student learning. Also, taking the time to conference with students and find out what they liked/disliked about topics and activities can also impact instruction.

I believe that action research is a viable form of professional development. However, it must be undertaken with the support of your school's administration and someone who has had experience with conducting their own action research. The support of the administration is essential because teachers who are conducting action research in their classrooms need time to organize their plan, do research, and reflect on their actions. Having the support of someone who has had experience with action research is also essential because it helps to have a sounding board to bounce ideas and questions off and keeps you on track.

This project has impacted my classroom practice. Through webquests, I have found an approach that fosters student learning through graphics, sound clips, video clips and the solving of real problems. I have discovered that there are many different webquests for many different subject areas and different grade levels, and how easy it can be to implement webquests in my own classroom. I will definitely use this inquiry-based approach in my classroom again because of its ability to

enhance student learning while at the same time allowing for independent learners that need the teacher as a facilitator rather than the controller of information.

I would like to continue with this project because it provided the opportunity for me to examine current approaches to teaching science. It also provided the opportunity for me to learn and problem-solve with a community of my own peers who deal with the same issues that I do on a daily basis. I would like to further investigate inquiry-based learning approaches and to find out what other primary teachers are doing in their classrooms to help children make connections that are more meaningful and authentic.

APPENDIX

Part A: Webquests − An Overview

Since they were introduced by Bernie Dodge in 1995, webquests have been widely adopted for use in many disciplines and at many levels ranging from kindergarten to higher education. According to Dodge (1995), a webquest is an "inquiry oriented activity in which some or all of the information that learners interact with comes from resources on the Internet, optimally supplemented with videoconferencing" (p. 10). Webquests may be completed in several short sessions or may span a longer period of several weeks. They usually follow a standard format and include an introduction, task, process, evaluation, and conclusion. They typically require students to work in small collaborative groups to address an issue or problem; and students are often assigned roles within collaborative groups. Many resources have been developed to guide educators in the design and implementation of webquests (see Part B below).

By working through the suggested steps in a webquest, students can engage a variety of abilities and skills such as hypothesizing; gathering, analyzing, and synthesizing information; and presenting solutions. Several authors (Dodge, 2001; Pohan & Mathison, 1998; Vidone & Maddux, 2002; Zheng, Perez, Williamson, and Flygares, 2008) have described the principles and constructs − critical thinking, knowledge application, social skills, and scaffolded learning − that should undergird webquest design and implementation.

Recently, there have been calls for more research to be conducted on the strengths and limitations of webquests as a teaching and learning tool (March, 2003; Robyler & Knezek, 2003). In 2008, Abbitt and Ophus reviewed the research that has examined the impact of webquests on teaching and learning. These authors reported that there is a scarcity of research on the effects of the webquest approach, thus it is difficult to make a recommendation regarding their ability to improve content learning and skill development. However, they did suggest, based on the research available, that webquests do have a positive impact on collaborative working skills and learner attitudes.

Part B: Selected Resources

Kathy Schrock's guide for educators. (2009). Retrieved September 23, 2009 from
http://school.discoveryeducation.com/schrockguide/webquest/webquest.html

Dodge, B. (2007). The webquest.org. Retrieved September 23, 2009 from
http://webquest.org/index.p

Educational Broadcasting Corporation. (2004). Webquests-Concept to classroom:
A series of workshops. Retrieved September 21, 2009 from
http://www.thirteen.org/edonline/concept2class/w8-resources.html

Part C: Living Things (Learning Outcomes)

Students will be expected to:

− Make and record relevant observations and measurements, using written
  language, pictures, and charts
− Identify and use common terms for the parts of animals
− Identify and describe common characteristics of animals, and identify
  variations that make each animal unique
− Listen and respond to other students' description of an animal
− Ask questions about the needs of living things that lead to exploration and
  investigation
− Identify and use a variety of sources of science information to answer questions
  about the needs of living things
− Make predictions about the movement of animals based on observations

Part D: Examples of Data Sources

Item A (Journal reflection)

Session #1: March 6
This was my introduction day to webquest! I had initially planned on setting a
computer to the projector so that the webquest would be enlarged and easier for the
children to see. However, the Learning/Computer Resource person suggested that
the kids might be too distracted. I followed her advice and took the children to the
library where they all sat in front of one computer and I went through the
webquest, explaining the problem they had to solve, i.e. why can't PB Polar Bear
find any penguins to play with? PB needs you to find out as much info as you can
about penguins! The children seemed very interested in what was happening on
the screen and eagerly watched as I moved from page to page. They especially
liked the Live Cam of the Aquarium that actually showed the penguins moving

around on the rocks and an aquarium worker cleaning out the cage. I heard comments like "Miss is that real?", "show it to us again miss." A grade two class came in while I was going through the last few pages of the webquest and I noticed the teacher and assistant even stood watching as I went through the pages. The session in the library lasted for less than 30 minutes and my observations showed a class that was excited and eager to start webquest.

Item B (Student survey)

Please answer the following questions:
1. Did you like learning about penguins? Yes or No?
2. Did you like using the Internet to learn about penguins? Yes or No?
3. What did you like about using a webquest?
4. What didn't you like about using a webquest?
5. Why could PB Polar Bear not find any penguins to play with?