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Teaching Media Literacy in Grade Five: The Development of Technological Literacy Among Teachers and Students - A Case Study

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Abstract

This is the second of two articles about a study of the implementation of a media literacy curriculum project in three inner city schools Grade 5's in Montreal. The authors describe the development of technological literacy among the teachers and students as they learned about two Media Literacy concepts. The teaching featured the use of a SMARTboard interface, a list-serv and Web resources. The findings affirm the positive contribution of the devices to the development of technological literacy among teachers and pupils. But they also raise other issues: technological determinism and the role of interpretive teaching in educational technology.

Résumé

Il s'agit du second de deux articles consacrés à une étude sur la mise en œuvre d'un projet de programme d'études d'initiation aux médias dans les classes de cinquième année de trois écoles du centre-ville de Montréal. Les auteurs y décrivent, en termes d'initiation à la technologie, les progrès des enseignants et des étudiants au fur et à mesure que ceux-ci se familiarisaient avec deux concepts d'initiation aux médias. L'enseignement s'appuyait sur l'interface SMARTboard, un gestionnaire list-serv et des ressources sur Internet. Les conclusions confirment l'effet positif de ces dispositifs sur les progrès des enseignants et des étudiants en termes d'initiation à la technologie. Elles soulèvent cependant d'autres questions, telles que celles du déterminisme technologique et du rôle de l'enseignement interprétatif au sein de la technologie pédagogique.

Introduction and Review of Literature

In this article we examine the development of technological literacy among three groups of Grade 5 students and their teachers as they followed a short (eight-week) curriculum in media education. The curriculum project, initiated in three inner city schools of the English Montreal School Board (EMSB), ran for eight weeks from April to June 1999. The students and teachers used a SMARTboard interface, a list-serv and Web resources to learn about two key concepts of Media Literacy.

Our overall approach to studying the students and teachers and our observations and our commentary reflected a multiliteracies perspective (New London Group, 1996) which emphasizes that negotiating the multiple linguistic and cultural differences in our society is central to being able to work, to be good citizens and to develop personally in this post-modern era. Our focus is on the understandings and abilities the teachers and pupils developed through using computer technology to learn about the media and to communicate. Specifically, we were informed by theories of media education and how it should be taught (Buckingham, 1990; Emery, 1995; Masterman, 1985; Rother, 2000) and the notion that students at the elementary level can benefit from critical study of the media, (Shepherd, 1993). For a more complete discussion, see Emery and McCabe (2003). Despite a plethora of programs in media education for secondary and tertiary institutions and numerous calls in the literature for the implementation of Media Literacy curriculum at the elementary school level, there is a dearth of systematic classroom studies of Media Literacy curriculum implementation, especially at the elementary level. (Emery and McCabe, 2003). Our approach to research was modeled on previous work by Buckingham and colleagues (Buckingham, 1990; Buckingham and Sefton-Green, 1994; Buckingham, Grahame and Sefton-Green, 1995). Unlike the Buckingham team, however, we followed teachers who had little in the way of formal training in Media Literacy education and our selection of three classrooms as data sites offers a more generalized description and different focus from their studies.

Purpose of the Research - Research Questions

The research component of the project studies the "literate" behavior of the students and the ways in which the teachers nurtured and developed it. It is an examination of teachers' and students' understanding and use of the technology employed in the project as well as their understanding of key Media Literacy concepts. The study also looks at student involvement and communication skills with respect to media and technology. Generally, we wanted the answers to the following questions: What did the students learn and how did it seem to happen? What were the teachers' perceptions of the process, including their feelings about their roles as facilitators and their insights about student development? Did they act differently in such a setting? How? More specifically, we looked at the development of technological literacy among the teachers and students in order to learn the Media Literacy concepts: *the media construct reality* and *audiences negotiate the meanings of media texts*. (Ministry of Education, 1989).

Teaching Objectives: The Media Construct Reality

The students were to come away with the understanding that media messages are

constructed by organizations for specific purposes. The realities represented in mass media messages, even those which are considered to be of "live" or "real" events, have been subject to considerable constraint, control and organization, not only by the producers of the messages, but also by the contexts in which these messages are generated and distributed. (Masterman, 1985; Masterman & Mariet, 1994). We wished to teach pupils about some of the ways messages are constructed and constrained so that they could better understand the represented realities. Advertising was one of the topics all three teachers decided to use to explore this concept. The teachers felt that most of their students would have considerable experience of the codes and conventions of advertisements and the teachers decided to use that foundation to explore ideas of ownership, celebrity endorsement, marketing techniques, target audience, etc.

Audiences Negotiate Meaning

The underlying premise of the second concept - *audiences negotiate the meanings of media texts* - is that audiences are not "passive receivers of meaning" but active meaning makers. As Emery (1996) writes, "audiences re-construct media texts, investing them with meaning and integrat[e] them into their own understandings of the world," (p. 137). The understandings are highly influenced by such factors as culture (including class and race), gender, previous experience with texts and/or messages of the same or similar type, their frame of mind at the time of "reading" the message, and the kind of use they make of the text, (Dick, 1990). One of the goals in teaching this concept was to nurture the students' alternative visions of reality, and, thus to encourage some critical autonomy in interpreting the meaning of the messages. (Buckingham and Sefton-Green, 1994).

Computer Literacy and Media Literacy

One of the key channels to be used by the students to explore the two concepts described above was the Internet. The project team wanted the students and teachers in the three grade five classrooms to communicate findings and experiences with each other. So Maureen Baron, the curriculum consultant for the EMSB, and the technical consultant established a list-serv through which the students could exchange information and resources. Teachers and pupils alike could also take advantage of the Media Literacy web site already developed by the School Board. Finally, for teaching purposes Maureen obtained, through a grant from the Ministère de l'éducation du Québec, three large SMARTboards (one for each classroom) which were used for whole class demonstration and sharing of information. Thus, part of the development of Media Literacy engendered in the project itself was literacy in the use of computers, the Internet, the list-serv and the SMARTboard.

Research Design

The research methodology we adopted for this study is qualitative (Bogdan and Biklen, 1992). Our study reflects the following characteristics of the qualitative paradigm:

1. It describes the activities in the three classrooms in some depth, attempting to develop understanding and generate grounded theory (Glaser and Strauss, 1967) and theory of action

(Argyris, 1982).

2. The "researchers" - Winston and Rachel - are participants and observers; but, the researchers also include the teachers of the three classes, the media consultant and, occasionally, the students.
3. The study is an *emergent design* - we modified the design as new insights and questions arose during the teaching and collecting data.

Thus, in some ways, this study is a combination of research on teaching and teacher research, as discussed in Cochrane-Smith and Lytle (1993).

The Context

In a previous article (Emery and McCabe, 2003), we described in detail the schools, the teachers and the methods of data collection and analysis. To summarize: We studied three Grade 5 classes in three inner-city schools of the English Montreal School Board (hereafter referred to as EMSB): St. Laurent Elementary (teacher, Lynn Salter), Plateau School (teacher, Melissa Stuart) and Queen's Elementary (teacher, Laura Turnbull). The schools, teachers and students have all been given pseudonyms. Inner-city schools were chosen because pupils were less likely to have access to computers and Internet technology at home and were likely to be heavy media users. The schools were sufficiently spread geographically so that it would be unlikely that students could communicate with each other except via the list-serv.

Of the three teachers, two were competent computer users and one was a beginner, but had student teachers, who were very competent, to assist her. Only one teacher had been introduced to the field of Media Literacy before. In order to prepare the teachers, the Media Technology consultants of the EMSB conducted three all-day workshops at which the teachers were given specific instruction on the use of the SMARTboard, the list-serv and Internet access protocols. They also introduced the teachers to Media Literacy, with specific focus on the two key concepts to be taught and provided them with traditional (print and audio-visual) and on-line resources. Rachel and Winston participated in these workshops.

The Researchers

As teachers with strong belief in Media Literacy education and considerable technical expertise, we recognize our ideological positions. Although our experience and expertise can be regarded as a source of bias, the "insider" (Cochran-Smith and Lytle, 1993) knowledge - knowledge and trust gained through spending considerable time with the teachers in planning the units and in their classrooms - and expertise we possess enables us to generate and interpret credible theories of action in the classroom (p.16). We have also attempted to mitigate potential problems of validity through triangulation of data sources (Bogdan and Biklen, 1992) and by instituting member checks (Emery and McCabe, 2003) with participating teachers, project professionals and students as a feature of the research design. The multi-site/ multi-subject design was used so as to conduct the research in such a way that the findings might be meaningful in a broader context.

Data and Sources

Data collection consisted of material from the following sources:

1. **Journals** kept by the students and the teachers.
2. **List-serv postings** by the students in each of the three schools.
3. Weekly **observation** in each school by the researchers as participant-observers.
4. **Interviews:**
 1. Informal discussion and feedback with teachers and students.
 2. Formal structured discussions in the final weeks of the project with small groups of 4-5 students (15-25 minutes).
 3. One-on-one interviews with participating teachers (40 minutes - 2 hours).

Data Organization and Analysis

In conformity with established procedure in qualitative analysis, we developed initial codes for the data. Using the constant comparison method (Glaser and Strauss, 1967), besides the situational codes - information regarding the schools, teachers and pupils - we developed three broad categories of codes as they emerged from the data and our weekly interactions with teachers and students: Technological Literacy, Media Literacy, and Traditional Literacy. Under the first category, Technological Literacy, the focus of this article - four sub-categories emerged. These were: technological support and classroom environment; power sharing and problem solving; modeling and practice; jargon; and teacher training and resources.

Technological Literacy

A major aspect of the project was to familiarize the teachers and students with the Internet, the SMARTboard and the list-serv. Technology was used as a tool for research and instruction, as a medium for communication and as a source for critical evaluation. The technological concepts emphasized in the project design included: navigational strategies and search methods, the purpose of a list-serv and web *netiquette*, Internet safety, copyright, and the evaluation of web sites.

Because the technology and much of the conceptual jargon was new to the teachers as well as the students, the role relationships between student and teacher were affected. Traditional divisions of authority were blurred, in many instances, as the teachers struggled to keep a few steps ahead of the students. Students modeled navigational strategies as often as the teachers. Troubleshooting often became a joint venture, the students being less fearful of doing something "wrong", and while the jargon was taught as formal vocabulary in most cases, some students quickly incorporated the terms into their own, more popular, lexicon. The following sections discuss how instruction through technology influenced student- and, in some cases, teacher- learning and literacy.

Technological Support and Classroom Environment

Creating a technological classroom can be a daunting task for a teacher with limited experience and professional help. Successful integration of technology into the classroom involves more than an understanding of the purpose and utility of the technology on the part of teachers and students. According to Heide and Henderson (1994), " for significant

change to occur and continue, the educator should understand the change process and be provided with ongoing support throughout the process of integrating technology into students' daily school experiences".

A sense of isolation. The Media and Technology consultants at the school board conducted workshops in late March to introduce the most important technological aspects of the project and, were available to assist the teachers over the phone and in person (from time to time) as the project progressed. They were not, however, a part of the daily integration process. While the teachers involved in this study had varying levels of computer expertise, from a "relatively illiterate state" (Laura) to having taught computer classes (Lynn), all three expressed a need for technical support and/or resource people to facilitate the integration of technology in the classroom. Lynn spoke often of the lack of support staff in the school with respect to computers,

I am the computer expert here. Last year I taught computers. There is nobody to teach computers this year. Ten classes are connected to the Internet and there is a computer in every class but no one uses them. Some teachers are so clueless they don't even realize they have a password. (Dbf., Lynn 02/06/99)

Despite her "expertise", her sense of isolation seemed to contribute to Lynn's anxieties at the beginning of the project. Although she took advantage of the new technology immediately, using the SMARTboard and Internet to complement on going class activities before the project even began, she felt she was one of the few teachers in her school making the effort to integrate computers. She wanted more support in her immediate surroundings. As she writes in her journal during the first weeks:

Part of my frustration is that I don't know what I'm doing at the computer end. Every time something goes wrong, I have to pray that Rick or Maureen are at the board to help me. Support staff would be great!

Still can't download *Privacy Playground* or write on the list-serv. (Jrnl., Lynn)

In our debriefing she explained her frustration with "troubleshooting over the phone":

I was unsure about my knowledge of computers and I had nobody here to help me. I would have to run and phone Rick, run to the computer to try something, and then run back to the phone to let him know whether it worked or not. (Dbf., Lynn, 02/06/99)

Lynn was concerned that the other schools involved had more on-site assistance. Melissa had her husband, who worked on computer-enrichment activities with the students, and Laura had two (in succession) student teachers to assist her with the technology. Melissa and Laura, with or without "more help", also expressed their desire for more assistance throughout the project. Melissa was accustomed to integrating computers into the classroom:

It is apparent that Melissa and her husband have been working with computers previous to this project across quite an impressive array of topics. The walls and partitioning panels are covered with typed interviews between Mr. Stuart and different students regarding popular toys and video games, there are pictures of class members mutated graphically into different animals, it also looks like some students are helping Mr. Stuart with a hockey pool on the computer. Computers are very well integrated into this classroom, it is used as a natural extension of class activities and seems to form a part of the class culture. (F.N., 3, 28/04/99)

The classroom set up at Plateau School was most conducive to technological integration.

Learning stations in adjacent areas were provided with computer resources and web access. The classroom learning space was partitioned into different stations by colorful panels. Mr. Stuart worked at one of these stations helping small groups of students with computer activities. The students, under Melissa's supervision, used the other computer resource areas quite freely.

Melissa admitted that she has "a great set up" but said that one of the biggest challenges of this project was working without technical assistance. Melissa wanted to emphasize Internet safety with the students. In our debriefing she felt a resource person would have been beneficial because the planning (finding and reviewing relevant sites), teaching and monitoring "takes so much time". She was enthusiastic about team teaching and thought that having someone working with her would have been "more effective".

Throughout the project Melissa was concerned about "keeping her anxieties (about the technology) from the students".

Dealing with "glitches". In the first weeks of the project the three teachers experienced a set-back when the list-serv system wasn't responding to their passwords. In Rachel's very first visit, Melissa was also having difficulties downloading a game she had planned on using in that afternoon's lesson. Melissa expressed her frustration, but was resolved to put on a positive face for the students, postponing the planned activity and substituting one of similar intent, using the blackboard and the desktop. The computer friendly classroom depends on developing healthy attitudes about technology, one of which is to anticipate glitches. The students at Plateau School seemed to accept the numerous glitches that accompany working with computers. One student recorded the following in his journal:

Today, we started our new scavenger hunt. We didn't get one answer because the Internet was too full. The girl from McGill and my group were talking and she said 'Do you think it would be fun to make your own hunt'. We loved the idea so my group asked the teacher and she said that it was a good idea. Maybe we will make one. I hope we do.
(P,Jml., Franco)

This student mentions the technical difficulty in his journal but remains positive about what can be done with the technology. Maintaining a pragmatic outlook also seemed important to Lynn. It happened often that Lynn experienced difficulties downloading certain information with her class. After exhausting various troubleshooting strategies she would simply move on to something else - the working idea being that the user controls the technology. Being insecure and fearful of the technology in front of the students sends out the alternative message; the technology controls the user. Laura experienced the greatest struggle in taking control of the technology as she moved forward from her "relatively illiterate state". (Jrnl., Laura)

Crises of confidence. Laura agreed to the project, feeling secure in her experience with Media Literacy, but was unsure of her technological know how. She had, at the time of agreement, a student teacher who, she expected, might help her with the technological aspects of the project. After participating in the introductory workshops with her student

teacher, Laura writes the following:

Ms. Banks' expertise in the subject was immediately apparent - I felt better already. I must admit when the subject was first brought to my attention a couple of weeks earlier I was in fog -not knowing how I would get from my relatively illiterate state to the handling of the SMARTboard -whatever that entailed. Now I began to feel that this project could actually happen. (Jrnl., Laura)

Having a support system was an important factor in Laura's participation and confidence. She was committed to learning about the technology but very unsure about her knowledge. She writes the following journal entry about her first experience with the SMARTboard,

On the first day I was really stunned by my boldness - I connected up to the SMARTboard with a little help from my friends. This is the first time I'd ever done anything so outrageous and I was able to take constructive criticism without crumbling! I'll be a techie yet one of these years. I could wax (il)literate about how difficult this is for someone of my age group to enter in without adequate, trustworthy support at home or at school but I think you get the picture. (Jrnl., Laura)

Laura felt willing and able "with a little help from my friends". Her student teacher, Kathy Banks, assisted with the project for the first weeks but when her placement at the school was drawing to an end, Laura found herself struggling with the planning and execution of certain activities. She writes:

Nothing that Kathy had planned was really coming through to the class. We were still working on the fly -she would not have the zeal/will/time/presence of mind to work out the lessons promised in detail -I'd have to pinch hit in context at 2 minutes notice to keep things going. It was getting tiring for me, and sometimes downright scary. True fear: this flim-flam existence was no way to have the basics in place to start a new project. (Jrnl., Laura)

With Kathy, it was a challenge for Laura to find balance in team teaching certain aspects of the project, especially given the gap in expertise. Daniel St. Cyr, a teaching aid at Queens, joined the project to help Laura at the end of April. The new team dynamic developed quite successfully in terms of Laura's sharing in planning and execution of activities involving technology. In the culminating class project, developed jointly by Laura and Dan, the students were to construct web pages using digital camera images they had taken of their neighborhood. The teaching assistance in this case was more productive than the earlier experiences because Dan took time to familiarize Laura with the technology so they could work together. Laura wrote:

Dan would show me (around) pre-entry level website training - with trepidation I undertook the study and I must admit that Dan was patient with all my scardy reactions - I know my way around some access and have enough confidence that nothing will break as I do trial and error for others. (Jrnl., Laura)

Laura's confidence with the technology had improved by the end of the eight weeks but she still didn't feel secure enough to take over when the lesson was centered around the manipulation of technology. The day Rachel came to observe the web page construction, it was clearly Dan who directed the class. Laura felt that her biggest challenge in the project was learning how to use the technology and feel comfortable about it. In our debriefing session she said that maintaining "a baseline confidence" was a "personal battle". She mentioned the numerous glitches, which made her "feel stupid" and said that she felt "guilty" for being so slow in getting started. She also expressed concern about being "zero

steps ahead of the kids". In observations, Rachel noticed the students did grow impatient at times with Laura's lack of technical expertise, in one instance a student grabbed the mouse for control when she wasn't fast enough at the SMARTboard. Laura said she would have liked "more practice" and possibly a "whole course in technology".

The classroom environment in Queens was less than ideal in terms of computer integration. The room was very warm and Laura felt that with the SMARTboard and computer it became even warmer. She brought a fan in to make things more comfortable. Space was also a problem. The room was long and narrow and the location of the SMARTboard, in the centre portion, created traffic and visibility problems. The screen stood facing the entrance to the room and the connecting cables ran to the opposite wall. A significant number of the class had only a partial view when seated at their desks and it happened twice in one lesson that someone unknowingly tripped over the modem wire, disconnecting it and leading Dan to suspect the server was down.

The need for technological support. Technological support was a concern for the three teachers involved. The teachers often questioned their own expertise, especially in their first attempts at troubleshooting. When the process of integration is new, it is hard to anticipate what problems might occur. Melissa said in a debriefing session that it was more difficult to teach because she was learning as she went along. In other subject areas she has a clearer idea of the progressive steps to follow because she can see the big picture. In this project, however, she wasn't always sure where she and her class were headed.

While it may have proved difficult for the teachers to use familiar *teaching* strategies (because they hadn't formally processed the material themselves), the learning situation provided an excellent opportunity to model successful *learning* strategies. Modeling problem solving strategies while learning cooperatively was an advantage born out of a situation where the teachers weren't sure of their expertise. The teachers were more likely to look to the students for their suggestions and expertise because the teachers *were not* all knowing. The situation called for power sharing.

Power Sharing and Problem Solving

As the weeks progressed and the teachers encountered new technological difficulties, from problems downloading to server connection problems, they began to call more often on students for help and suggestions. Problem solving became, in many instances, a cooperative effort. Because the technology was gradually becoming part of the classroom environment, items such as the SMARTboard became accepted as resources for the entire class rather than a presentation tool for the teacher. Teachers and students were using problem-solving strategies together. On numerous occasions students were given the opportunity to demonstrate their knowledge of computers and model their troubleshooting skills. Handing over the voice of authority wasn't easy for all three teachers and varying levels of teacher direction characterized the power sharing. Overall, however, looking to the students for answers was an important factor in developing student, and teacher literacy skills. Problem solving together, in real, rather than contrived, circumstances

reinforced purposeful student participation.

Power sharing and problem solving at St. Laurent. Joint problem solving was a strategy we observed right away at St. Laurent Elementary. Lynn trusted the students with the technology and seemed secure in proceeding with an activity even when she hadn't tried it before. During Rachel's first visit, Lynn decided to try and download *Privacy Playground*, a game she mentioned Plateau School had played the previous day. Lynn had not planned it ahead of time but used the opportunity as a "how to" exploration with the students.

The class used a search engine to find the game. Lynn asked for keyword suggestions from the students, reviewing the terminology with them as they proceeded. The students were at the SMARTboard navigating back and forth and opening links until they found the appropriate site. At this point Lynn noticed that it was proving difficult to download. Gabriel, a student who Lynn refers to as her "resident computer expert" told her that without a "zip drive" it would take them hours to download the game. Lynn admits openly to her students that she is not an expert when it comes to the ins and outs of the Internet. She allows the students the opportunity to "teach", while working in the direction she wants to go.

Lynn uses the students as technical assistants as well as resource people. Just two weeks into the project, one student writes the following in his journal:

Today we went to a web site for Kids and played some fun games We did the "routine" stuff also (orienting the board, setting up the cables, etc.). Overall we had lots of fun on the site with the many games. (SLJrnl., Gabriel)

The students not only accepted responsibility for setting up the technology, some even referred to it as "routine stuff". By the end of the project Lynn came to expect the students to take care and control of the technology. Rachel noted the following during one of her last visits:

As I approached the back of the room I noticed that the students had just begun to orient the board. The projection on the SMARTboard was a little slanted and two students were figuring out how to manipulate the projector in such a way as to allow for better resolution and visibility. This meant they had to restart the orientation procedure and as Lynn was occupied with greeting me she didn't notice immediately what was going on. She turned to check on things, reminding the students that "we don't have all day" and that "you have a science test to write later". (F.N., 7, 28/05/99)

Lynn is comfortable delegating tasks. She doesn't feel that she alone has to control the technology. The project has allowed her to learn *with* the students. The learning experiences recorded in Lynn's journal entries are phrased in terms of "we". Note her entry about four weeks into the project:

Went to CBC4Kids and tried to do a scavenger hunt. The answers required the URL of the site from which you found it. We learned how to highlight the URL (with our finger on the SMARTboard), copy it, and then paste it in the correct box for the answer. Cool! (Although most of us are still not experts at that). (Jrnl., Lynn)

Lynn is learning both *with* the students and often *from* the students. She is still very much the facilitator, however, as she seizes the opportunities for learning and problem solving

with the students and points the students in a purposeful direction. The following journal entry from a student describes a common experience of learning and problem solving in Lynn's class:

On the List-serv we sent the hardest slogans we did in class to the other schools and asked them to give us some of their slogans too. In two days they answered. We were about to go and write another long letter to reply but just then my teacher remembered an easier way to reply, the reply button. Then the teacher told us a story about how she knew this. I call it a "Mrs. Salter moment". When you press the reply button you click on "quote original message". So now you can just write in the other person's message. (SLJml., Kendoll)

It is often the teacher who takes notice of the students "moments of illumination". In this case, because the teacher is also the learner, a student notices the teacher's process of discovery. Sharing the experience of discovery can reinforce positive learning strategies while sustaining interest and participation. The working philosophy is: How can we do this?, rather than This is how it is done!. It is an interpretative model rather than a transmission model of teaching (see Barnes, 1990, 1972).

Power sharing and problem solving at Plateau. Problem solving became a cooperative activity, more often, when the students worked in small groups on the various computer stations with Web access. Melissa organized the groups to work on activities such as the CBC4Kids Scavenger Hunt, a list of questions whose answers are found on the Internet. The students had to work together to find the appropriate navigational strategies and later demonstrate to the class how they arrived at their answers. The problem solving varied between groups. One group of boys was so impatient with the slow server speed that they froze the screen by constantly clicking the mouse. Another group was dominated by a student who did as she pleased, regardless of suggestions from other group members. This same student, curiously, writes in her journal that when at the SMARTboard she is "shy" and "afraid".

Melissa spent many hours of preparation time previewing sites and web activities in order to work out any foreseeable problems *before* the lesson. She had a split Grade 5/6 class and, because it was only in the afternoon that they were all together, she wanted to make sure that everything worked at the appropriate time. Whereas Lynn experienced the problem of downloading the *Privacy Playground* game with her class, Melissa experienced the "frustration" alone, as she prepared during her lunch hour. By the time the students came back from their recess, Melissa had worked out the problem with her husband.

Melissa is very encouraging of the students when she facilitates activities on the SMARTboard. She is enthusiastic about what her students can teach her about the Internet. Rachel recorded the following after a visit to Plateau School:

As I entered the classroom today I found Melissa, Marco and Alex sitting around the computer linked to the SMARTboard. Marco and Alex had designed a web page and were proudly showing Melissa what it looked like. She said she was just "amazed" and repeatedly told them that they were "wonderful". (F.N., 5, 18/05/99)

Marco and Alex were eager to answer Melissa's questions about how they constructed the page. Melissa later had the two students present the web site to the class. This is what some of the students wrote about the incident in their journal:

Today on the SMARTboard Marco and Alex made a new web page and showed us it on the SMARTboard. There was Pokemon and hockey on their web page. It was really cool. (PJrnl., Mario)

We looked at 2 kids in my classes web site. Their names are Marco and Alex. Their web site is very cool. On their web site there are 3 pages. One page is the cover page, two is Pokemon, and three is hockey. And on the hockey page there is AskJeeves, AskJeeves for Kids, WWF, WCW, Hockey 98 and Hockey 99. When you click on them it brings you right away to that page. (PJrnl., Franco)

Marco and Alex made their own web page and they showed it to us on the SMARTboard. I found it fascinating and I want to make mine. (PJrnl., Debra)

Using the students to demonstrate their technological expertise opens up new relationships in the classroom. The students are encouraged that they too might improve their knowledge and expertise when it comes to technology and so pay close attention to the work of their peers. Web creation in this way, becomes not merely one more thing being taught by the teacher, but a skill the students want to acquire for their own purposes.

Power sharing and problem solving at Queens. Laura was more reluctant to share power in the technological aspects of the project. She felt insecure being "zero steps ahead" of her students and she said that her group was prone to mismanagement when entrusted with expensive equipment. Laura told Rachel during our debriefing that she was disappointed with how her students cared for things, from steel drums to computers.

Laura explained that it was difficult to facilitate activities with the technology because she was constantly struggling to maintain "a baseline confidence". It was more natural for the student teacher and teacher's aid to "power-share" because they were more secure in their knowledge in case the students did something "wrong".

Dan believed strongly in entrusting the students with the technology. Although he recalled having to stress caution and care with the equipment in some instances, he believed that the students did take responsibility when the circumstances were explained to them. When Dan trusted the students with his digital camera he made a point to explain that the camera was his, "as in: 'I bought it'; and", he said, "they seemed to respect that". During one of Rachel's visits when the camera was passed around she noted the following:

At one point during the presentation I caught a glimpse of Edwina handling the digital camera. She did not know I was watching her. She held the camera with such care and well intention that it caught my attention. She gingerly put her hand through the handling strap and examined the camera as if time stood still. All her attention was focused on that camera. It was a weird mixture of awe and fear (of breaking it?). (F.N., 5, 17/05/99)

Dan also noticed this student's behavior. Earlier in the year she had done some exceptional photography in a project facilitated by a Concordia University professor, but had missed an opportunity to use the digital camera with the rest of her class this time. It was important to Dan that the students feel a sense of ownership. He said, "the more the students handle the materials the more they come to 'own' the activity". Dan wanted the students to be self-directed when it came time to take the photos for their web page. The technological tools were to be of use to the students as well as the teachers. He wanted to encourage the students to handle and experiment with the equipment, problem-solving as

they went along.

The ability to solve problems with technology was revealed; most strikingly, the day the students presented their digital photos to the rest of the class. Dan had arranged it so that all the students' photos were numbered in a computer file. They were then able to select their images using the SMARTboard and have them projected one by one, as they saw fit. It happened sometimes that some of the subjects/objects the group wished to capture on film were hard to pinpoint in the image on screen. Once it was asked of them to figure out a way to solve the problem, the students discovered a way to enlarge the photo using an option in one of the toolbars. The group that figured this out seemed quite proud of their resourcefulness and the groups that followed enjoyed adjusting the image and minimizing it as well. When the class was asked why after a certain point (usually over 200%) the images didn't look clear as they got bigger, Elijah responded, "it's like a TV screen, the closer you get to the picture, the bigger and fuzzier it is". The student's intuitive understanding of resolution on a TV screen was successfully applied to the digital photos on the SMARTboard.

In debriefing sessions with Laura and Dan, they said that the week of picture taking and presenting was a real turning point in the project. They noticed a new kind of enthusiasm and sense of purpose. The students were free to use the technology as they chose, creating digital images with the camera and presenting their photos on the SMARTboard. The students were keener on solving problems when they were presenting their own work at the SMARTboard because they were allowed to be the authorities.

Sharing the voice of authority worked quite successfully for all three schools. The students felt proud to participate in technological problem solving. They seemed to enjoy contributing to the learning experience, whether they felt more knowledgeable about a particular aspect of technology or they just approached a problem in a different way. Power sharing and authentic problem solving positively contribute to student interest and participation. In this case the lack of expertise with the technology was a great equalizer. Before most students are confident enough to take on an authoritative voice, however, they need a certain amount of modeling and practice.

Modeling and Practice

The teachers may have been insecure with their limited computer expertise with regards to the project, but being expert teachers, they realized the importance of modeling what they did know and allowing students the opportunity to practice. The SMARTboard allowed the students to see how the teacher and other classmates manipulated the technology. When asked about his favorite part of the eight-week project, one student responded immediately that, "being able to see everything on the SMARTboard was the best". Demonstrating problem solving procedures and literate behavior was greatly facilitated with the technological tools provided in this project. From demonstrating how to use computer toolbars to teaching navigational strategies and critical thinking, the SMARTboard helped improve students' technological literacy because it simplified modeling

to a large group and allowed for student practice under scrutiny.

Modeling and practice at St. Laurent. Lynn spent the first weeks becoming familiar with the technology together with her students. They practiced using search engines, surfing the Internet and book marking their favorite sites. Lynn also allowed the students to practice using the SMARTboard and computer by playing games they found on the Internet. The following journal entries describe one such experience as seen by two different students:

Today our class went on the Internet. We went on (<http://media.emsb.qc.ca>) then clicked on the Web. From there we went on a link that led to a lot of games. We first did Tangram. Djuna got to move the pieces on the computer. She took soo long and had an easy shape. On top of that she kept getting mixed up with rotate and flip. To play, you choose a shape. Then you have to put the different shapes into the bigger shape. After around 25 minutes she finally stopped flipping the shape and started to rotate it. Then she was finally, and actually, finished. The teacher chose another student to do the next shape, me. My shape was an elephant and Djuna's was a rabbit. I finished in half of the time Djuna did. I rarely got confused flipping and rotating. (SLJrnl., Julian)

The kids.com site was great! There were so many games to play with we only had time to play with two of the games. The first game we played with was with the tangrams. Djuna and Julian were the ones who played. Djuna went first. She had the choice of a diamond or a rabbit. She chose the rabbit. It was just like a puzzle with geometry shapes. You could either flip the shapes or rotate the shapes. It kind of took a while for her to finish but that was because everybody kept on shouting and telling her what to do. But she soon got it. I think that next time she plays a game, she'll finish it very fast because it will be her third time on the computer. Julian had a choice of a hat , an elephant, or something else. He chose the elephant. He was pretty good at it! It didn't take him a long time but this time, no one yelled. (SLJrnl., Sarah)

These passages demonstrate the careful attention paid to how others manipulate technology. The students are teaching each other by modeling learning strategies. In watching the different approaches modeled by their peers, the students are not only able to see what strategies are most effective, but also what factors might influence successful task completion (confusion between flipping/rotating, students yelling what to do).

Lynn modeled excellent strategies when using the technology. She often thinks "out loud" with the students, demonstrating her logical thought process and asking pertinent questions. When exploring the Internet with the class, Lynn always engages the group in a process of critical thinking. By questioning such things as the order of links on a keyword search or the advertisements on web sites, Lynn introduces a critical framework that the students are encouraged to use in turn. Note the following student journal entry:

The search engine for today was Dogpile. Dogpile has this thing that's the same like all search engines you will see something that says search, at Dogpile it says "fetch", pretty cool. When we got to the Lego web page we saw this peculiar thing. There was an eight cents link right next to the Lego. We didn't understand what it meant so we clicked on it. It explained to us that whenever we went on that link Lego would have to pay eight cents to Dogpile. (SLJrnl., Kendoll)

Kendoll was learning more than how to use a search engine. He was being encouraged to ask and answer critical questions about the Internet.

Modeling at Plateau. Melissa was able to provide her students with a considerable amount of practice time with the technology. The computer workstations allowed Melissa to set the students up to work through an activity after she had introduced it on the SMARTboard. The CBC4Kids Scavenger Hunt was an activity the students were able to do

in small groups. Melissa had modeled navigational strategies and "book marked" search engines for the students to experiment with, but once they understood the basics they were able to sort through the Hunt themselves. It happened that some students completed the Scavenger Hunt at home but because the group was required to demonstrate how they got every answer, the process was what counted in the end.

There were some students who struggled with the activity, unsure of what keywords to use or how to narrow their search. One student seemed convinced there was a "right way" to proceed. He was annoyed by the carelessly experimental strategies of his peers. He wanted to find *the* logical sequence of steps. Another student seemed to be looking for the answer to be written in bold. She rifled through sites barely reading the information provided.

The Scavenger Hunt ended with the groups presenting their navigational processes for their classmates. Melissa said that "some had forgotten what they did" and others grew "impatient waiting" but in the end the activity proved successful because the students "demonstrated to each other how to surf".

Modeling at Queens. At Queens, Laura and Dan planned the modeling and practice opportunities. Because Dan had a much greater expertise in technological matters, he often set up the activities and/or handouts that would allow the students to become more technologically literate. Dan attempted to stay away from a teacher-directed transmission approach. He wanted the students to explore the technology and grow more confident as users with practice. The students took turns orienting the SMARTboard and touching the screen and they were all given opportunities to handle the digital camera. Most students learned how to operate the technology very quickly because they were able to see exactly how their peers executed tasks on the SMARTboard.

Modeling and practice became significant issues the day that Dan tried to facilitate a web page creation activity with the students. The students (in groups) were to select one of their digital photos and insert that image and an accompanying text on to a page, saving it all as "HTML". Dan had prepared an instruction sheet for the students to follow and he and Rachel circulated to offer assistance if necessary. Rachel recorded the following field notes and followed up with some reflection:

The students went in their groups to one computer, handouts in hand. I didn't notice anyone looking at the instructions before they began. They were immediately confused about what to do. I circulated as a participant observer during the session prodding the students to figure things out by reading their instruction sheet. They fared much better once the steps were showed to them. (*F.N.*, 6, 21/05/99)

Perhaps they were insecure about their ability to understand the instructions. If the task at hand is new and there are many uncertainties, no matter how clear and specific the instructions are, students are more fearful and refuse to read before they call on a teacher. I think if Dan had modeled the procedure previously on the SMARTboard things might have run smoother. (*O.C.*, 6, 21/05/99)

During debriefing Dan said he had "spent *hours* reflecting on what happened". He described the experience as "insane" and "organized chaos". He wasn't prepared for the students to completely disregard his written instructions. He realized later that " you can't just give

these kids instructions and say 'here you go' ". The following is an excerpt from the instruction sheet hand out:

Inserting a picture

To insert a picture from your diskette, you must first open the **File** drop down menu at the top of your screen.

From the menu, select the **Insert** or **Import** function. This will make a new window appear. That window will help you find the picture you want to insert.

To insert:

1-Click the **Desktop** button on the right hand side of the new window.

2- .

The instructions are clear and the language sophisticated but this is not how the students had been used to learning technological procedures. Previously, they had always had the opportunity to see someone model what they were supposed to do on the SMARTboard. The instruction sheet wasn't a resource they had any practice with. Once each step was demonstrated physically, the students had very few problems repeating the step, often racing through the motions in subsequent attempts. While it might be useful to prepare the students to read through directions and learn how to help themselves in the future, this activity called for what they were accustomed to - modeling.

Modeling successful learning strategies and allowing for student practice were important in developing technological literacy. The activities centered on *showing* and *doing* rather than *telling* and *imagining*. The hands-on approach improved student thinking skills because students were required to problem solve on a regular basis. It happened often that a student mis-hit a sensor on the SMARTboard, sometimes a new file opened mistakenly, sometimes a window was closed accidentally. In all cases the students had to fix the error to continue. Becoming technologically literate required practice troubleshooting. The students became more comfortable *showing* each other what to do as the weeks progressed. Developing a vocabulary to describe the technology was an integral part of the process.

Jargon

Terms such as *URL*, *emoticon*, *netiquette*, *flame war*, *link* and *hit* formed part of the technological vocabulary developed in this project. Students were encouraged to learn the jargon and use it to communicate effectively about what they were doing. Some of the student journals are replete with new vocabulary words regarding technology. Many students seem to enjoy using the jargon, creatively incorporating new words into their writing. Other students were slightly confused with the abundance of technological terms. Still others were introducing terms to their teachers. The student writing revealed a broad spectrum of *tech talk*.

Tech talk at St. Laurent. Lynn took the time to reinforce proper vocabulary with her class. She said that she "expected a lot" and that she wanted her students "to use the vocabulary and the concepts properly". Lynn would stop often during a lesson to check for

understanding and vocabulary. She wanted to make sure that everyone had a working knowledge of the technological terms. Lynn used many analogies to help student understanding. Most analogies were successful. Some students had difficulty understanding the abstractions however, as one student asked if humans could "catch" computer viruses.

The students took to using the proper terminology in the very first weeks of the project. One student records the following in his journal:

Today we went on the world wide web (WWW). We were trying to locate a list-serv with another class Once we entered the list-serv webpage it was very cool. We looked at the glossary and the webmaster (people who watch over the web). We looked at a web-site called Ask Jeeves, the URL for Ask Jeeves is <http://www.askjeeves.com>. When we were at the site we checked on whales When we were finished we looked at other search engines. (SLJrnl., Denzil)

Lynn reinforced proper vocabulary use by reading and responding to the students' journals. Sometimes she was surprised by the sophisticated use of jargon. Note the terms used by a student in this passage:

In 1996 (I think) the original version of the game Quake was released by a company called ID. I read about a hacker who managed to break into ID's website and for a few hours managed to make the source code (basic programming) of the game visible to everybody on the net. The price for the legal license of the Quake engine fell from thousands of dollars to hundreds. The hacker was caught but I don't know what happened to him. Because people had the source code for Quake they programmed 'bots (home made enemies) for the game. The 'bots were such a big success, ID used them in the sequel, Quake 2. (SLJrnl., Gabriel)

Lynn responded jokingly in the margin of this entry. She wrote, "I wish that I understood what you wrote here! You are using vocabulary that is too hard for me!". Lynn is pleased when her students show a mastery of language. Effective communication is a skill that she constantly works on with the students.

Tech talk at Plateau. Melissa used the technological jargon with her group regularly but unlike Lynn, she did not formally respond to her students' journal writing. In order to check if her students did remember the meaning of the new vocabulary she administered a test at the end of the eight-week project. The questions asked the students to describe the SMARTboard and define terms such as listserv, emoticons and netiquette.

A large majority of the students did an excellent job describing the SMARTboard, list-serv and emoticons. The following are examples:

The SMARTboard is a big board that can show with a projector what is on the computer. When you touch it, it works just like a computer but your finger is the mouse. (C. Test, P, Rosanna)

The SMARTboard is a white board that has a stand. The board is like an interactive computer. It has sensor touch, so say we are looking for a web site instead of using the mouse we use our fingers. (C. Test, P, Debra)

: -) This is a picture of a smiling face. An emoticon is a picture using computer keys. (C. Test, P, Franco)

Emoticons show feelings or they just show abbreviations. We used them a lot in messages on the computers, like BBFN (bye-bye for now). (C. Test, P, Debra)

A list-serv is a private site that you're sharing with some other schools. (C. Test, P, Robert)

A listserv is a web site which you could e-mail people and read their letters whenever you want. (C. Test, P, Rosanna)

The students had greater difficulty remembering what netiquette meant.

Netiquette is when someone gets your mail by mistake. (C. Test, P, Oren)

Netiquette is inside the web and is used to help you. (C. Test, P, Mario)

Answers sometimes described the opposite of the term:

A netiquette is an insult people can write on the Internet which is very bad.(C. Test, P, Rosanna)

Only one student really understood the play on words:

Netiquette is net etiquette. It's a fancy way of saying politeness on the Net. It's the opposite of flaming. (C. Test, P, Emily)

Tech talk at Queen's. Laura didn't prepare a test to check student vocabulary nor did she actively encourage her students to use the jargon in their journal writing. She let the students use the terms as they pleased. Dan used technological vocabulary on a regular basis, both orally and written (in handouts). He explained terms such as *modem*, *Web browser*, *URL* and *html* as the students worked on relevant activities. The students were rarely asked, however, to explain the terms in their own words. If they did write about a term in their journals and were confused or mistaken, it wasn't brought to their attention. Generally, the students at Queens used the technological jargon with less success than their counterparts at St. Laurent Elementary and Plateau School.

The students were given a lesson on emoticons. Dan prepared a handout of sample emoticons such as d:) *kid with a baseball cap* and <G> *grin*.

When the students were asked to come up with their own emoticons they seemed to miss the point. Most of their emoticons looked like secret codes:

<IAVHTDTA> . *I am very happy to do this activity*(QJrnl., Shawnette)

<IAGTNY> . *I am going to New York*(QJrnl., Ricky)

<ILMB> . *I love my brother*(QJrnl., Charmaine)

It wasn't explained *again* to the students that emoticons are short forms of everyday expressions or emotions. Because Laura and Dan didn't read the student journals they missed out on an opportunity to correct their misunderstanding. Other items left unnoticed were comments like the following journal entry:

What is netiquette?
-is a car. (QJrnl., Charmaine)

Many students at Queens did have the right idea about netiquette:
Netiquette is the polite rules of cyberspace! (QJrnl., Daniel)

Netiquette is to be polite to people and to write with respect on the Net. (QJml., Mark)

Besides *emoticons* and *netiquette*, however, very few technical terms were used by the students to describe the activities of the project. The jargon might have been understood when used by Lynn and Dan, but it was rarely incorporated into student writing or speech.

Conclusion and Some Speculation on the Problematic Nature of Technological Literacy in Classrooms

The technological literacy of the students and teachers involved in the project, although varied, did improve over the eight-week period. From growing familiar with the technology and developing troubleshooting skills, to using new vocabulary, the students' ability to access, analyze, discuss and produce media messages became more sophisticated. Approaches to teaching and learning the technological aspects of the project encouraged more egalitarian role relationships and cooperative learning. Teachers and students were able to model their learning strategies and students shared in their moments of illumination. The technology in this project was used advantageously as a tool for research and construction, as a medium of communication, as a source for critical evaluation *and* as an impetus for student-centered learning.

Some of our experiences in this project confirm positive benefits of the computer/SMARTboard/list-serv combination of instructional delivery - benefits that have been described in other studies of the use of new technologies in learning. (e.g., Gregoire Inc., Bracewell and Laferriere, 1996). Clearly the main advantage the technology provided is the one of being able to examine as a (large) class group the resources of the Internet and the responses of other groups of students to similar experiences. In doing so, the students and teachers, gained access to content that would not normally have been at their immediate disposal. The size of the board enabled the large group to observe operations of computer use and Internet access protocols, to comment and ask questions to both their teachers and their fellow students regarding these operations and, thus, to develop their own understanding of the functions of the hardware and software. There is some clear evidence that the technological literacy of both students and teachers was developed as a result of the mere presence of the new technology. However, implementation has raised some interesting questions and challenges.

Teacher Expertise and Ideology

First concerns the attitude of the teachers to technology and the issue of teacher training. Despite the initial training sessions in the use of the three technologies, the availability of the school board's technical specialists and the generally positive orientation of the teachers themselves, their initial anxieties about using the new equipment were palpable. We have to wonder why. What is it about the way technological devices were perceived by these teachers that engendered the anxiety? Clearly it is not because these teachers don't know anything about computer technology or operations. Recall Lynn's comment regarding her own expertise _ "I am the computer expert here...", and yet at the beginning there

was considerable uncertainty and frustration at a perceived lack of expertise: "I was unsure about my knowledge of computers and I had nobody here to help me." Perhaps this is normal teacher anxiety or perhaps Lynn's comments reflect a deeper-seated ideology concerning the mystery of technique and the authority (and power) of expertise. Perhaps such an ideology renders the teacher incapable of seeing herself as someone who can successfully master technique. If this is indeed the case, addressing considerations of ideology may be significant. Rather than merely providing information/instruction on technique, which has been the tack of much in-service and pre-service education of teachers, we should give serious attention to teachers' own ideas about their relationship to technology and their confidence to make sense of it. Interestingly, two conditions occurred that seem to mitigate the anxieties of the three teachers in the study. First, Laura and Melissa had colleagues in the classroom with whom they were able to talk, pool resources and information, and resolve technical problems. Second, all three teachers shared their problems and anxieties, i.e., their power with the students, who, in a number of cases, actually solved difficulties in technique, thereby teaching their fellow students and the teachers. Thus, the effects of the ideology are mitigated by collaborative, democratic activity; and they occur in situ.

Technological Determinism?

Second, there has been a tendency to interpret collaboration, empowerment and problem-solving synergy as educational outcomes of the technology itself, i.e., the notion that computer use, for example, empowers students. We see nothing inherent in the technologies themselves to warrant such thinking. Indeed it was the teachers who empowered the students by turning over to them the responsibility for solving technical problems that affected the class group as a whole. The regular use of students to program the SMARTboard, to access the list-serv and World Wide Web, and to report and explain their research to their classmates and students in the other participating schools are generic protocols to an Interpretive model of teaching (See Barnes, 1992, 1976). Such a model of teaching believes knowledge to exist in the learner's ability to organize thought and action. It values the learner's commitment to interpreting reality, so that the criteria of teaching and learning arise as much from the learner as from the teacher. It perceives the teacher's task to be the setting up of a dialogue in which the learner can reshape knowledge through interaction with others. It views the learner as already possessing systematic and relevant knowledge, and the means of reshaping that knowledge. A teaching environment that includes audio-visual equipment and computers is incidental to such a model. It is the approach to teaching and learning which drives the democratic style of collaboration and joint problem solving, not the equipment.

Furthermore, the occasions when students were given time to practice using the technology to generate their own information and insights to share with the class seemed to engender greater genuine production. This observation, combined with those made earlier regarding sharing power in solving problems arising from using the new equipment suggest that we ought to seriously reconsider teachers' traditional roles of conveying content to students. What is problematic about such reconsideration is the extent to which

it is professionally responsible to allow students to negotiate with teachers the agenda and the nature and content of learning in the classroom. Then what is the teacher's contribution? In a field that relies heavily on an "expert systems" notion of education and assumes a high degree of teacher control in establishing needs of learners and organizing highly structured experiences for them, this question seems especially pertinent.

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