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New tools for new literacies research: an exploration of usability testing software

Marlene Asselin* and Maryam Moayeri

Department of Language and Literacy Education, University of British Columbia, 2125 Main Mall, Vancouver, British Columbia, V6T1Z4, Canada

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Competency in the new literacies of the Internet is essential for participating in contemporary society. Researchers studying these new literacies are recognizing the limitations of traditional methodological tools and adapting new technologies and new media for use in research. This paper reports our exploration of usability testing software to observe the Internet literacy practices of adolescents during homework tasks. Data consisted of visual screens capturing all activity, including students' faces, and oral think-alouds carried out as students did their homework. Using this software for data collection resulted in a more in-depth view of Internet literacy practices than what could be obtained by traditional methods. Students could work in their own homes and control recordings. Built-in data analyses and presentation components were also beneficial. However, time and cost considerations for the researcher became apparent. Most importantly, new ethical issues arise with the use of new research tools such as privacy and 'incidental data'.

Keywords: computer-assisted research; mixed methods; general statistics

Introduction

New literacies engendered by the Internet (Leu et al. 2004) and the changing literacy practices of today's youth (Ito et al. 2008; Lenhart et al. 2007; Livingstone and Bober 2005; Rowlands and Nicholas 2008) demand changes in research methodologies (Fetterman 2002; Leander 2008). No longer are methodological tools such as self-reports, surveys, and interviews sufficient to study the new literacies of the Internet. New methodological tools are emerging that capture the processes and practices of Internet literacy more naturally, accurately, and comprehensively than the old tools by themselves. These new tools call for new procedures and raise new ethical issues (Ess and Buchanan 2008). However, little research has been done on these new tools that are needed for researchers exploring new literacies. This paper presents our own exploration of usability testing software as a tool for participant observation. Specifically, we employed the software as a tool to examine adolescent Internet practices during homework tasks.

*Corresponding author. Email: marlene.asselin@ubc.ca

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Background

The new literacies of the Internet

Although the focus of this paper is on methodological tools for new literacies research, we first provide a brief review of why the study of adolescent Internet literacy is important for education and society (see Coiro et al. 2008 for an extensive background). Leu et al. (2004) argue that in order for schools to contribute to the development of lifelong learners, a learning society and a knowledge-based economy, 'it becomes essential to prepare students for … the literacies [of the Internet and information and communication technologies (ICT)] because they are central to the use of information and the acquisition of knowledge' (1571). Increasingly, twenty-first century competencies include the use of interactive multimedia for creation, collaboration, and sharing (Jenkins 2006). The proliferation of ICT-related standards in education (American Association of School Librarians 2008; NETS Project and Brook-Young 2007; UNESCO 2008) testifies to the importance of competency in the new literacies of the Internet in contemporary society and the expectation for teachers to provide instructional support through explicit teaching and integration of these new literacies in the curriculum.

As Internet access increases, youth turn to the Internet, not books, for information (Rowlands and Nicholas 2008). At the same time, the amount of information available on the Internet is exploding and the organization of this information is increasingly complex. All of this demands new skills and strategies in finding and using digital information. Competency in the new literacies of the Internet is critical to being able to participate in global, networked societies because 'new literacies allow us to use the Internet and other ICT to identify important questions, locate information, critically evaluate the usefulness of that information, synthesize information to answer those questions, and then communicate the answers to others' (Leu et al. 2004, 1572), and, as noted above, to participate in online communities and create online content.

Youth preference for the Internet does not mean they are fully competent in the new literacies of the Internet. Instead, there is a pressing need for schooling to include instruction in these new literacies as well as more effective and meaningful integration of the Internet in learning (Bilal 2000; Chung and Neumann 2007; Coiro and Dobler 2007). In particular, research shows that today's youth need support in how to effectively search and locate information on the Internet, comprehend hypermediated text, critically evaluate online information and use information in socially and ethically responsible ways (Coiro and Dobler 2007; Lawless, Schrader, and Mayall 2007; Rowlands and Nicholas 2008; Shenton 2007).

Despite the importance of Internet literacy in learning and the central place of the Internet in adolescents' out-of-school lives, Internet usage in schools is comparatively minimal and disconnected from the rich, engaging, multimedia-based ways in which most youth use the Internet in their everyday lives (Ito et al. 2008; Levin and Arafeh 2002; Selwyn 2006). Schools and teachers face multiple challenges in integrating the Internet into teaching, including limited or unreliable access, finding time in an already crowded curriculum, professional development in teachers' own skills, and meaningful ways to integrate technology and administrative support for new ways of teaching (Cuban 2001; Hennessy, Ruthven, and Brindley 2005). Internet-related instruction, when it does occur, is embedded in content learning rather than literacy practices (Leu et al. 2007). These two aspects of Internet usage are inextricably linked and consequently demand equally urgent attention by educators. Our research focuses

on the literacies of the Internet that enable students to maximally use the Internet to both deepen and create knowledge.

Observing Internet literacy practices

In studying the new literacies of the Internet, literacy researchers have used traditional methods such as surveys, interviews, focus groups, field notes and textual documentation, along with participant observation (Guinee, Eagleton, and Hall 2003; Jacobs 2006; Lewis and Fabos 2005; Livingstone and Bober 2005). Observation methods often consist of using video cameras and/or the researcher taking notes while sitting alongside the subject as they performed a task on the Internet. However, findings from these studies are limited for several reasons, including inadequate tools, contrived tasks, and the presence of the researcher. Relying on indirect measures of Internet practices such as the researcher's notes rather than actual recordings of Internet usage meant analyses required much inferencing to interpret the processes and intentions of the subject. Some researchers used the think-aloud method to validate their data about the actual processes that young people use when navigating, reading, and communicating on the Internet (Branch 2000; Damico and Baildon 2007).

Developments such as screen capturing technology now allow researchers to accurately record how subjects locate and use information on the Internet (Coiro and Dobler 2007; Lawless, Schrader, and Mayall 2007; Leander and Lovvorn 2006). Such technology also makes it more possible for subjects to be observed without the presence of the researcher. Unlike video cameras which require careful set-up to clearly record the screen and the subject, screen capturing software is easily turned on and off by participants. As this software records both visual and auditory data, it is possible to gain more direct insight into Internet practices by having participants articulate their actions, decisions, and thinking.

For our research in youth Internet literacy, we considered using video cameras but problems from intrusiveness of the equipment to screen glare and image distortion made us investigate alternatives. We wanted to avoid laboratory settings in favour of as natural a setting as possible. We also wanted to capture actual behaviours and insights into cognitive processes and affective dimensions (views, feelings, and beliefs) of Internet literacy. We wanted both a visual record of behaviours and simultaneous think-aloud recording. For these reasons, capacity for clear auditory recording and clear recording of facial expressions was important. Given these considerations, we were particularly impressed with the potential of usability testing software and explored its advantages and limitations by studying two adolescents as they used the Internet for homework. Usability testing software was originally designed for commercial purposes but is a promising observation tool for educational research. The software often comes with presentation and analysis components which can be used to organize and manage data as well as to create graphs, charts, and other figures.

Authenticity of task was important to us as we wanted to learn how youth use the Internet for a required task (school work) but in a setting where they were least restricted (home). We put no restrictions on what they could access, time spent recording, and their approach to going about homework tasks.

We wanted to gain not only a visual record of our subjects' Internet practices, but insight into cognitive and affective dimensions. Simultaneous visual and auditory capturing allowed us to use think-alouds to learn about participants' objectives,

intentions, and cognitive processing, as well as their feelings and beliefs about what they were doing. After comparing available usability testing software in the light of our needs, we selected TechSmith's Morae software which provides synchronous audio and video to record and observe users as well as components for data analysis and presentation.

Using Morae software to research Internet literacy

Our two participants for exploring the use of Morae software to observe Internet litearcy practices were Darren (male, age 15) and Nicole (female, age 12) (both names are pseudonyms) and both lived in a large urban area in Canada. They each had home access to the Internet and used the Internet in their everyday lives. *Morae* software was used to collect two types of observation data: (1) visual capturing of the students' Internet practices each time they did homework using the Internet over a two-week period, and (2) recorded oral 'think-aloud logs' during each homework session. We also conducted interviews with the participants, their parents and teachers as part of our explorations to extend and triangulate the observation data. However, in this paper, we focus on how we collected and analysed the observation data using *Morae* software.

We trained the students in their homes about how to use the Morae software and how to do a simultaneous think-aloud. They were given ample practice time with us and independently over several weeks. They were to turn on and off the software at the beginning and end of a task in which they would normally use the Internet for any or all parts of the homework. Once comfortable with the process, they were asked to record themselves anytime they did homework using the Internet over two weeks.

Descriptive analyses

Data collected with *Morae* enabled quantitative and qualitative descriptions of participants' Internet literacy. All video data were coded first by homework task. Nicole engaged in five homework tasks for a total time of 23.08 minutes and Darren was online for three tasks for a total of 35.43 minutes. Using the data analysis features of *Morae*, video data were then analysed quantitatively by task to describe students' searching and navigating behaviours: number of searches conducted, number of websites visited, number of internal links selected, average time spent on a web page, and average time spent selecting from a search result list. Tables 1 and 2 summarize the quantitative analyses of students' searching and navigation behaviours of each homework task that was recorded. Note that use of the Internet was not necessarily required by the assignment but rather was a choice by the students.

Think-aloud logs were transcribed, and qualitative analyses were conducted based on data from both the visual recordings and think-alouds. Data about students' cognitive processes as well as feelings and beliefs were obtained from the visual recordings and think-alouds. The think-alouds provided explicit information about feelings (e.g. frustration, satisfaction, confusion) and beliefs (e.g. about what is valid or invalid information). In contrast, the visual recordings could indicate both affective and cognitive aspects of Internet literacy. For example, rapid clicking on multiple irrelevant sites could indicate frustration as a student would try to locate useful information or an inability to evaluate the usefulness of particular websites. Drawing on Leu

Table 1. Tasks, time, and navigation: Student 1 (Nicole).

Session	Task	Time (minutes.seconds)	No. of web pages visited	No. of searches conducted	No. of internal links connected to	Average time on web page (seconds)	Average time spent choosing search result (seconds)
1	Preparing book cover image with Photoshop	4.06	none	none	none	N/A	N/A
2	Finding information about a dog breed	8.11	10	2	5	36.5	1.1
3	Finding information about Cleopatra	1.0	1	1	none	15	6
4	Learning how to do an algebraic equation	3.45	7	2	3	18	4.3
5	Finding information on Operation Bernhard	6.46	3	2	1	115	2.4

Table 2. Tasks, time, and navigation: Student 2 (Darren).

Session	Task	Time (minutes.seconds)	No. of web pages visited	No. of searches conducted	No. of internal links	Average time on web page (seconds)	Average time spent choosing search result (seconds)
1	Write a short biography on Louis Riel	11.5	3	2	1	154	34.4
2	Compare book and film of *To Kill a Mockingbird*	19.43 (approximately 10 minutes 'off task')	18	3	12 (while on task)	41.6	9.3
3	Learn about current electricity	4.58	6	7	none	26.3	3.7

et al.'s (2004, 2007) framework of new literacies, we constructed a description of our participants' Internet literacies in the following categories: (1) focusing and identifying purpose, (2) searching for information, (3) analysing information, and (4) learning from information. The following section ilustrates how the use of new methodological tools, specifically usability testing software, for participant observation can contribute to understanding youth Internet literacy practices, and consequently, provide urgently needed instructional implications.

Focusing/identifying purpose

Nicole did not articulate the focus of her tasks in her think-aloud log, but we used the visual screen capturing data to infer how she focused her task. The visual data allowed us to follow her search strategies, the obtained results, and the processes she used to revise her searches until she either gave up or was satisfied. For example, typing in the words 'ropy' and 'dog', then revising it to 'mop' and 'dog', and then eventually finding the information she was searching for showed us that she was attempting to locate information on the Komondor breed of dog. Unfortunately, we were never able to infer for what purpose she needed this information in relation to homework.

Darren was more articulate with the think-aloud procedure than Nicole, and we had a more informed understanding of how he focused his tasks. For example, he said that he had to 'write a short biography of Louis Riel', 'compare and contrast the differences between mass media sort of things to the book' (*To Kill a Mockingbird*), and 'look up a little bit on current electricity as in the flow of electricity in batteries, just simple, simple information for science class'. Darren also refined the purpose of his task in accordance with the information he found. In the first example, he googled, 'Louis Riel' and after scanning Wikipedia (his first result), he explained that he would change his search to find a site with less information and typed in 'short biography of Louis Riel'. Darren used similar strategies of moving from very broad to more specific searches to better match his task for the electricity topic. For the book–film comparison task, he went directly to a website he knew saying, 'so I'm going to get some background information on actors and all that kind of stuff. I'm going to the Internet movie database (IMDb) which is imdb.com because I know it is a very good resource for movie information.' Here, he indicated his views about valid resources about movies.

Locating information

We gained insight about our participants' practices in locating information with the visual screen capturing data. This data showed that both Nicole and Darren began all but one of their tasks with Google by typing in www.google.com (even though they had a search box on the toolbars). To begin, they typed in only a few keywords of the task topic, using no quotation marks or other search markers, yielding extensive result lists. Both students regularly and rapidly selected the first result (Wikipedia), indicating they did not necessarily read the brief descriptive information provided with each result. Occasionally, they selected the second or third result particularly if it was Wikipedia. When they conducted further searches within each of the tasks, both students also consistently returned to Google by back-clicking to their original results page except for one time when Nicole typed in www.wikipedia.org. Once on the selected result, they continued to focus on the top portion of the pages, deciding rapidly on its

usefulness. Figures 1 (Nicole) and 2 (Darren) were produced with the Morae presentation components and portray the times the students spent selecting web pages to visit from their search results in one of their tasks.

In contrast, Darren visited only three web pages in 11 minutes when he worked on the Louis Riel assignment, indicating his more extended focus on this task.

Other times, the visual capturing data indicated affective aspects of locating information. For example, Nicole persisted in searching for photos of a particular breed of dog and for instructions about an algebra skill. This indicates initial confidence and determination. Figure 3 shows how Nicole's search for help with an algebra problem began with some attention to the website she found and how rapidly she dismissed six others until she quit, indicating frustration.

The think-aloud data revealed additional information about how our participants went about locating information they needed. Both Darren and Nicole appeared to know exactly what they were searching for, rapidly dismissing results until they found what matched their purpose. Both students wanted brief and succinct information. For example, Darren revised his search for information for the Louis Riel assignment when he abandoned his first source (Wikipedia) stating, 'Okay, so there is a lot of information here, and unfortunately I am just doing a short biography, so I've got a couple of points. But it went into great, great detail so I'm going to shorten down my search to make it so that I get more specified information.' Reading the description of the first of a reduced list of results, he noted the text began with 'In the next pages …' and immediately said, 'I don't want pages, I want short. So I'm going to keep looking.' He looked through four of the results and then decided that the second hit 'looks pretty good' and upon viewing it, declared its suitability for his criteria: 'not too, too long'.

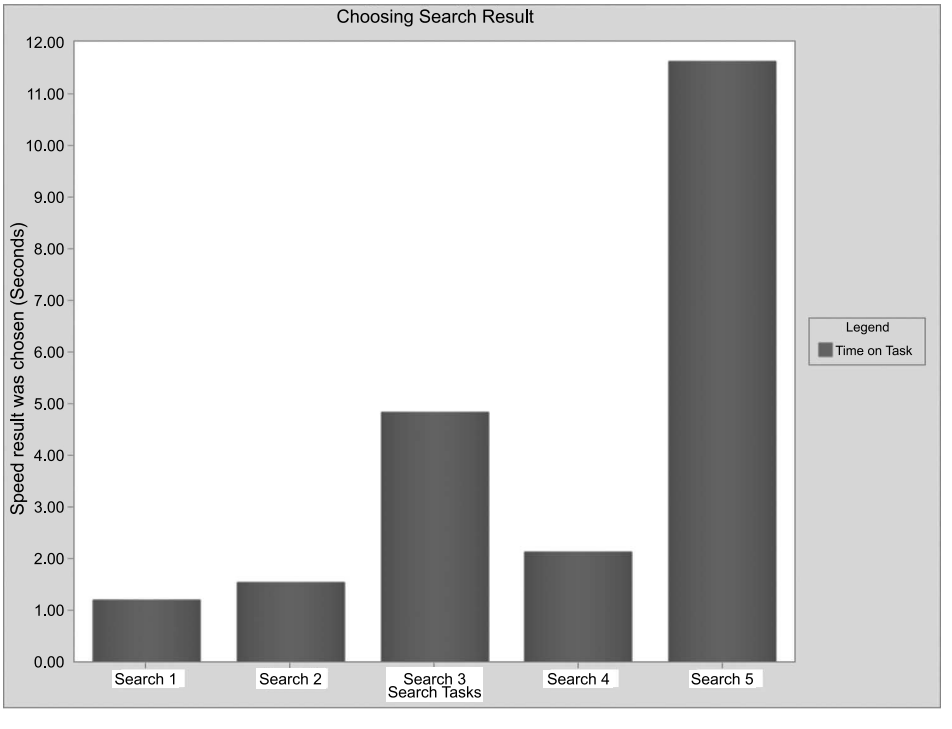

Figure 1. Time choosing search results: Nicole.

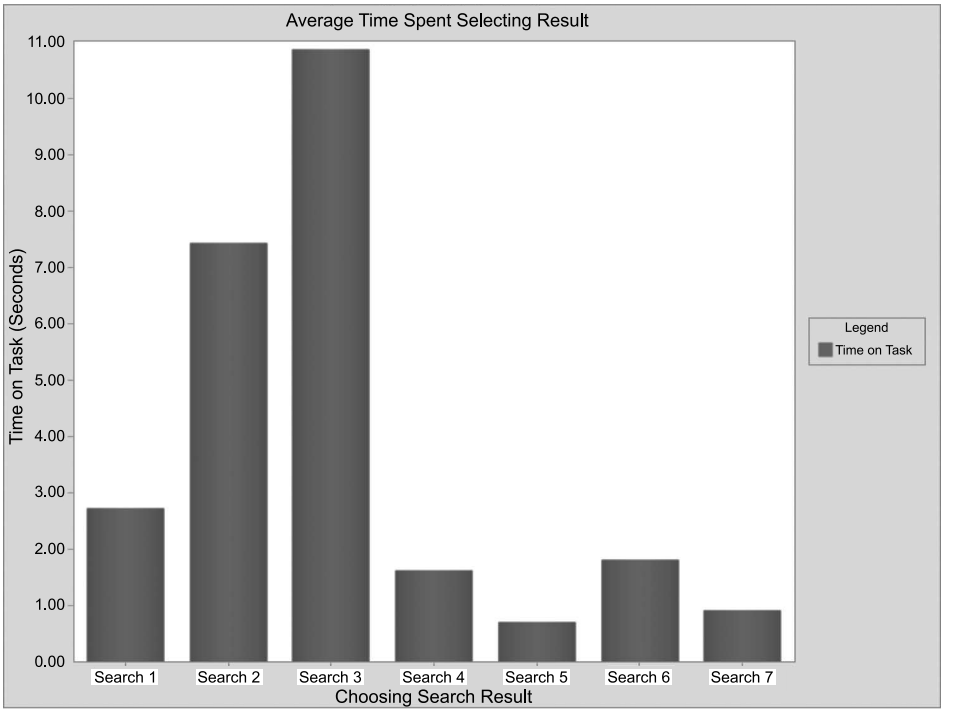

Figure 2. Time choosing search results: Darren.

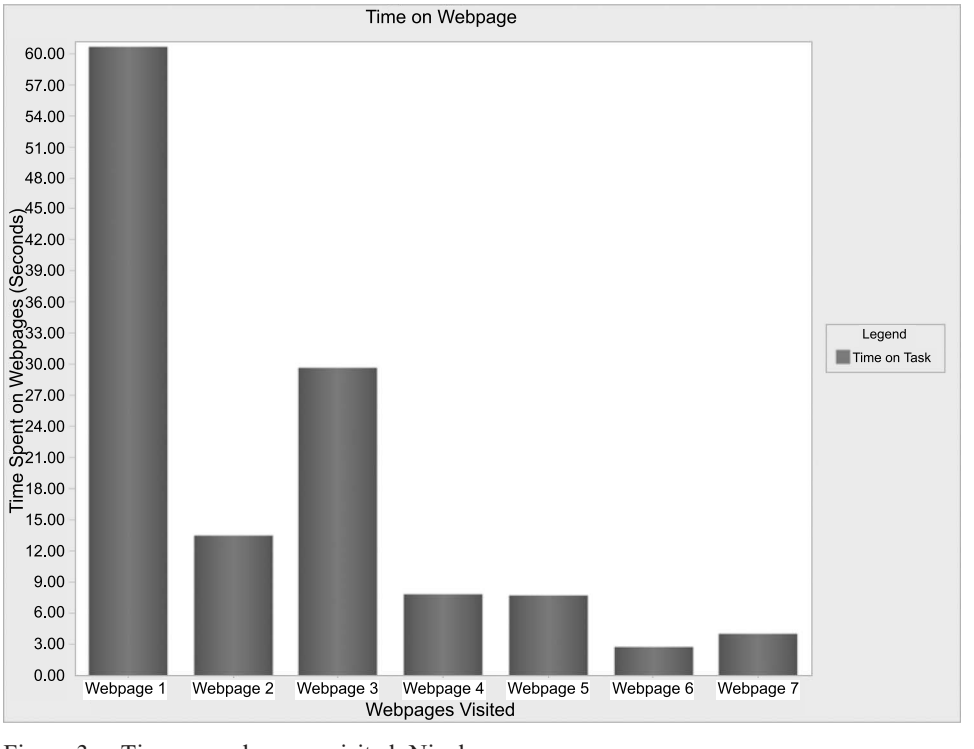

Figure 3. Time on web pages visited: Nicole.

Analysing information

The combined video and think-aloud data showed our students' abilities in analysing information on the Internet. Both Nicole and Darren consistently evaluated the information they found on the basis of its usefulness to their purpose (i.e. their interpretation of the homework task) and whether they could understand it. For example, the think-aloud data revealed how Darren dismissed several pages on current electricity that were either too childish for his use or too complicated for the homework. Based on the think-aloud data, there was no evidence that either student queried accuracy, trustworthiness or author bias, or compared quality of information across websites. They used each information source they found as discrete sources. Neither did they indicate that they noted the domains, authors, or sponsors of websites they selected. They only recognized Wikipedia (both students) and imdb.com movie forum and dictionary.com (Darren). They both regularly selected Wikipedia to find information even though Darren later expressed scepticism about that source in his interview.

Similarly, the two data sources provided insight into affective dimensions of analysing information. Both participants expressed pleasure and satisfaction with useful results and frustration when they could not get the information they could use and/or understand. For example, as described above, Nicole unsuccessfully tried five times to find instructions for an algebra problem. Darren's attempts to find a simple model of electrical circuits began with Wikipedia (from a Google search). When he scrolled down the page at a fairly quick pace, he soon realized that the information was quite in-depth and said, 'this is getting way too deep for what I want to know.' Both students ended these sessions disappointed with too much and too complex information for their purposes.

Learning from information: monitoring comprehension and identifying key information

The video and think-aloud data together enabled us to gain insight into the cognitive processes involved in learning on the Internet, specifically, monitoring comprehension and identifying key information. Learning processes are much less tangible dimension than searching and analysing information. Both students indicated that they monitored their comprehension of the information they had found. When reading about the breed of her pet dog, Nicole commented, 'I didn't know that' and 'that's so true.' Darren was more articulate in his think-alouds than Nicole was as he monitored his understanding. He was familiar with a few online tools to help him during these times. For example, he wrote in his notes 'In 1868 he was back in the Red River area' and then stated that he would normally go to look up what the Red River area is but would not on this occasion because he was already familiar with it as they had discussed it in class. When he jotted down that Riel 'set up a provisional government which would eventually put together the Manitoba Act', he explained that he did not understand the meaning of 'provisional government', opened a new tab in his browser by clicking on the small tab above the page and typed in www.dictionary.com in the URL window. He narrated that 'it turns out to be a very useful source that I use often and for many subjects'. He then switched from the dictionary tab of dictionary.com to the encyclopaedia tab explaining ''cause it seems more of a spot-on thing other than a word'. Next, he took the information that he read and incorporated it with his previous knowledge, saying, 'That makes sense with what I've learnt in class … That was helpful.' However, he did not go back to read any of the other results that the encyclopaedia gave to compare the information with other sources.

Distinguishing important information from less relevant information is part of effective learning and our two sources of data provided evidence of our students' abilities in this area. Darren attempted to distinguish important information, occasionally commenting 'this seems pretty important'. He paid particular attention to information that interested him: 'Louis Riel … is perhaps the most controversial figure in Canadian historiography', saying 'now that seems to strike my attention and I'd like to know why he is the most controversial figure. So I'm not exactly sure so I'm going to keep reading here.' He continued to toggle back and forth between applications to take notes, but his notes never answered the question of what made Riel a controversial figure. He pursued this question in another source and found the answer which he articulated in the think-aloud.

The combined video and think-aloud data also allowed us a glimpse into sociocultural dimensions of Internet literacy, which we will explore further in the next stage of our research programme. Viewing literacy as social practices situated in specific contexts will allow us to learn how adolescents' Internet literacy practices may vary for school and self-selected purposes. The learning tasks that Nicole and Darren undertook appeared to be structured as fact gathering, textbook-based exercises, though we did not have full information about the assignment. In contrast, a growing body of research on youth's informal uses of the Internet, particularly Web 2.0 applications, show their highly interactive, collaborative, participatory, and creative uses in non-school contexts. Except for the times our participants ended up pursuing personal interests during homework tasks (pets for Nicole and movies for Darren), both students seemed to be after just enough information to get by for what they understood to be needed at school (gather the facts). As Darren reported, 'I've pretty much gotten probably not enough but enough for now, enough to bluff my way through class because a lot of times she'll ask us a question or to give a piece of information. Now onto Facebook.'

Discussion

Using a new methodological tool to observe Internet literacy practices has great advantages over traditional tools. *Morae* usability testing software allowed us to gain a much more detailed and in-depth description of our two participants' Internet literacy practices during homework. Data collection with *Morae* was less intrusive than video; enabled us to use a natural setting and authentic tasks; allowed participants a great deal of control and, by shaping the auditory recording as a think-aloud, improved our ability to obtain both cognitive and affective data from multiple sources. *Morae*'s additional features aided in data analysis and increased the effectiveness of presentations. Although there were significant advantages in employing usability testing software in the studies of Internet literacy practices, we also became aware of the possible limitations regarding hardware and software requirements, space demands, and ethical considerations.

The reality of many young people's home computer situation is not ideally compatible with running *Morae*. Nicole worked from an older computer with Linux, an operating system incompatible with *Morae*. Since she and her family had already agreed to participate in the project, we loaned her a laptop to use during the two-week data collection period. Adjustments were made for Darren as well as he had to use his mother's computer in her office instead of his own computer in his room for *Morae* compatibility reasons as well. Thus, due to technology issues, we acknowledged compromises to the authenticity of the working situation for both participants.

New research tools such as *Morae* entail initial investments of time and money. Besides the software, our other expenses included webcams which had to be installed on the different computer systems of participants. New methodological tools require time for the researcher to learn and we had to learn how to work the software for capture, analysis, and presentation purposes, as well as teach participants how to record using the software. Ensuring software is updated and adjusting collected data upon updating are additional responsibilities.

Given the enormous storage demands of video data, we learned that the researcher should provide an external drive to each participant on which to store the video data or the researcher needs to constantly visit the participants and remove the data from their computers. Similarly, the researcher needs to be aware of the space issues on their own computer and take appropriate steps. Each of these limitations affects scalability; however, given the enormous amount of data that is rapidly generated with *Morae*, sample sizes have to be carefully considered. How much data is really needed? On the other hand, advances in open source cloud computing services could resolve current economic, logistical, and storage space challenges associated with scalability in the near future.

Ethical issues ahead

Although we resolved the major technological issues associated with the new tool of usability testing software, we became aware of the ethical considerations we will face in the next stages of our research. Conducting research in the homes of youth – in their bedrooms – removes the safety net of the laboratory or classroom for the privilege of a naturalistic setting. We know from other studies how troublesome this is, particularly for parents, and we anticipate that gaining ethical permission to conduct research about adolescent Internet practices in these circumstances will prove to be difficult.

Another ethical issue concerns unintended participants or what Leander (2008) calls 'incidental data'. Youth spend much time socializing online (Lenhart et al. 2007) and as our research broadens to literacy practices within both school-selected and self-selected activities on the Internet, we face ethical issues in researching with tools that end up involving more than the intended participants and position the researcher as an invisible lurker. Leander and McKim (2003) allowed participants to review and delete portions of the screen capture data that they did not want to share with the researcher; however, the problem of the hidden presence of the researcher remains.

We are currently grappling with these issues as we observe students from diverse backgrounds and classrooms over longer periods of time and in a range of online contexts. A major influence on our research methods is beyond the technological tools and takes into account a new identity of youth emerging from digital culture (Ito et al. 2008). This social shift has implications for the relationship between the adult researcher and youth participant. We are moving towards viewing our youth participants as research collaborators, and as such, we will be giving the youth more control with data collection and communication of findings and using new methodological tools for other parts of our research. As with participant observation, new methodological tools are emerging for interviews and focus groups. For example, to extend and enrich face-to-face semi-structured interview data, we will be conducting focus groups through blogs. Students will contribute to the construction of the questions and talking points. Besides the benefits of digital capturing of data, using online data collection methods situates adolescent participants in familiar (online) environments in which

they are likely to have formed multiple identities. This setting may enable more extensive and complex data than a formal face-to-face session, allow them to respond in their own time and over time, facilitate the use of multimedia, and encourage communication with each other without the obvious presence of the adult researcher.

There are other new tools in the tool box for researching new literacy practices, including the wide world of social software and more sophisticated versions of screen capturing software. These tools will continue to develop as technology does. In this way, altering traditional methodological tools of observation and interviewing is not just a technological matter but, more importantly, a matter of aligning tools with emerging notions of knowledge and learning (Kalantzis, Varnava-Skoura, and Cope 2002; Lankshear and Knobel 2006).

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