Digital Technologies, New Literacies and 21st Century Skills

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ABSTRACT

The research described in this paper was conducted in action research collaboration between a university and local school district. The questions explored by teachers and university researcher (the author) include: What is the impact of the information and communication technologies on teaching and learning in classrooms? Do the educational trends and pedagogical mandates of new literacies and 21st century skills complement one another or do they increase teacher stress by pulling pedagogy in different directions? Data demonstrate the productive relationship among information and communication technologies (ICTs), new literacies, and 21st century skills.

Keywords: 21st century learning, ICT, technology infusion, new literacies, K-12 education, teacher research, classroom inquiry

INTRODUCTION

In K-to-12 schools, teachers are being challenged to change their pedagogical practice to accommodate three trends: the increasing availability and popularity of information and communication technologies (ICTs), expanded and changing notions of literacy, and the advocacy of 21st century skills and learning. These changing pedagogical practices raise research questions: What is the impact of the information and communication technologies on teaching and learning in their classrooms? Do these various education trends and pedagogical mandates complement one another or do they increase teacher stress by pulling pedagogy in different directions? I intend to draw on my recent research with teachers to explore these questions.

THE PEDAGOGICAL CONTEXT: NEW LITERACIES

New literacies are conceptualized within a sociocultural perspective which accentuates literacies as contextualized practices [1]. Official curriculum has increasingly emphasized authentic literacy practices within real world contexts and experiences [See, for example, 2]. Current literacy curriculum in Newfoundland and Labrador has expanded to include viewing, representing, speaking and listening with traditionally emphasized literacies of reading and writing. These strands of literacy are intertwined, so that students interact with and produce texts that are often multimodal. As well, a critical lens is highlighted in current curriculum.

Lankshear and Knobel [3] describe literacies as "socially recognized ways of generating, communicating and negotiating meaningful content through the medium of encoded texts within contexts of participation in discourse" (p. 64). They add that *new* literacies are characterized by new technologies and new *ethos* – participatory, collaborative, and distributed. This latter concept – new ethos – is particularly important in Web 2.0, where communities of users contribute to and create texts and sites, and where mash-ups, remix, re-creation and collaborative writing are facilitated by available onsite technologies. Lankshear and Knobel [4] also emphasize that new literacies involve "using language (reading, writing, speaking, listening), gestures and other semiotics (images, sounds, graphics, signs, codes) to communicate" (p. 3). Thus multimodality is another aspect of new literacies. Composing with sound, image, text and gesture is facilitated in Web 2.0 though application programming interfaces (APIs) and multimedia production tools.

Teachers who often worked within an autonomous model of literacy, whereby literacy was viewed as individual, de-contextualized skills [1], have found that digital technologies and Web 2.0 resources have facilitated a change to a sociocultural model in which social, cultural and historical contexts of literacy are acknowledged.

Leu et. al. [5] offer the following description of new literacies:

> "The new literacies of the Internet and other ICTs include the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world and influence all areas of our personal and professional lives. These new literacies allow us to use the Internet and other ICTs 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." (¶8)

In the view of Leu et al., new literacies are digital literacies, dependent on Internet and other ICTs, but their use is contextualized within social practices and personal, professional and political contexts. Teachers go beyond information literacy (locating and evaluating information) to participation in communities, both local and global, and working toward, according to Evans [6] "[u]nderstanding ... technology as something that embodies a complex set of actions, behaviors, discourses, assumptions and ideologies...." (p. 5)

Web 2.0 provides a wealth of digital tools and resources that can either be downloaded or used online. Many of the available resources are ideal for student and school use, and are, in fact, set up with classrooms in mind. Three such Web 2.0 resources used by teachers in this are Kidblog, Ning, and Glogster. Kidblog offers K-12 teachers class sets of blogs so that students may blog and respond to one another within a collaborative space that may or may not be open to a wider audience. Ning, once free but now available for a small yearly fee, allows teachers to set up a social network for class interaction. Each student has a member page, a blog, and potential for threaded asynchronous discussion and synchronous chat, as well as possibilities for sharing images and other texts. Glogster, also once free, offers classroom accounts to teachers so that students may create and display electronic posters. The posters, which are displayed on the Glogster site, may include images, linguistic text, audio and video files, and decorative art. Teachers can determine the level of privacy for the site. These are three of a myriad of sites where users can create and display comics, animations, podcasts, presentations (e.g., Prezi), stories, and photo essays. In addition, teachers may download digital

tools to record and edit audio, create digital movies (digital storytelling), screen capture, and create and edit images and photos. Teachers in the study are exploring the potential of these tools, as well as some of the collaborative sites that encourage communication with schools globally.

21st CENTURY SKILLS

Beginning with Metiri Group and Partnership for 21st Century Skills and spreading to and through many other educational organizations, 21st century skills emphasize the knowledge, attitudes and abilities students need for current and future success in globalized landscapes and economies. These skills include digital-age literacies, effective communication, inventive thinking, and high productivity [7]. Similarly, Partnership for 21st Century Skills [8] envision a comprehensive program of [traditional] core subjects; 21st century content, like global awareness, entrepreneurial literacy, civic knowledge, and health and wellness awareness; and learning and thinking skills that include critical-thinking and problem-solving skills, communication skills, creativity and innovation skills, collaboration skills, contextual learning skills, and information and media literacy skills; ICT literacy; life skills such as personal productivity and social responsibility, and 21st century assessments. These concepts of 21st century learning have been included in all recent professional development sessions in local schools and districts in Newfoundland and Labrador.

Much of the current published literature on 21st century skills falls into the advocacy realm [9]; descriptions of programs [10]; discussion of assessment challenges [11]; implications for teacher education [12]; links with gaming [13]; critiques of the concept and programs [14]; and exploration of applications to a variety of fields, like nursing [15] and higher education [16]. There is a dearth of concrete evidence of successful learning related to 21st century skills and new literacies (as opposed to advocacy literature). This research attempts to provide research-based evidence of enhanced learning.

RESEARCH CONTEXT

This action research partnership is being carried out within a school-university collaboration in which teachers receive technological (limited) and research support as they investigate their practice and explore ways to enhance their pedagogy with digital technologies and implement new literacies.[1] As a professor of education and a researcher, the author offers professional development to teachers in the form of workshops and one-on-one support to facilitate integration of new technologies. Teachers, as pedagogical and curriculum experts, plan activities and learning opportunities to engage all students in inclusive classrooms. As reflective practitioners, they employ classroom inquiry to construct their "knowledge *of* practice" [17] as they integrate ICTs to accomplish their classroom learning outcomes along with their own professional development goals. They pose their own research questions and collect data to explore them in on-going iterative cycles.

Such classroom inquiry or teacher-as-researcher practice is well supported in research literature [See, for example, 18, 19, and 20]. Stenhouse [21] claimed: "the refinement of professional skills is generally achieved by the gradual elimination of failings through systematic study of one's own teaching" (p. 39). At the

core of practitioner research is an action-knowledge interaction – a reflective, cyclical process that enhances understanding of the teaching-learning process and other educational activities, by acting, observing, and constructing knowledge in situ. Classroom inquiry is systematic research, with data gathering, analysis and interpretation as part of the process [20].

In the study described here, both teachers and university researcher are collecting data, with teachers in ten K-12 classrooms writing reports of their research and sharing knowledge with one another and colleagues in general. The author's data collection is primarily in the form interviews with teachers, the teacher-as-researcher reports, and archived student texts, such as blogs, social networking site postings and digital movies. These data, compiled with and from teachers, were analyzed for common themes and insights [20]. At this point, analysis has been preliminary and exploratory. Additional data analysis by multiple researchers is contemplated to establish inter-rater reliability. Often this is accomplished through research meetings with groups of teachers who share their own data for peer input as well as develop common themes between data sets.

FINDINGS

The research question explored in the research related to the impact of digital technologies on teaching and learning. As data analysis progresses, it became apparent to teachers and researchers that data categories related to new literacies and 21st century skills. This paper contends that these work together in productive synergy, as do collaborations between universities and schools and between teacher-researchers and university-based researchers in supportive roles. Using the frame of 21st century skills this paper will describe and quote illustrative details of these themes from students' multimodal texts, posted on blogs, nings, and other Web 2.0 sites, and from teachers' reflective reports and interviews. The model of 21st century skills released by NCREL/Metiri Group [22] will serve as the organizing structure; its major categories are Digital-Age Literacy, Inventive Thinking, Effective Communication, and High Productivity. This model, like others, ties these skill categories to content area learning.

Digital-Age Literacy

For teachers and their students, technological or digital literacy is an important outcome. Teacher researchers in this project began with some trepidation about their technological abilities. Vera described it this way: "One of the challenges I faced with the blogging was the time I had to invest in learning how to actually set up the blog as well as figuring out how to make postings and embed pictures and videos."

Edna also commented that she was unsure about her technological skills, but she was ready to learn from and with her students: "I didn't know what I had in store, [but] I was ready to jump into the deep end thinking they'll help me along with whatever." However, she learned that the students were not experts in all aspects of computer use, so her classes became sites of reciprocal learning:

> "And I did learn a lot from them, but what I also learned in my surprise was that when it came to using Word, the very simplest of things, they didn't understand what the squiggly lines were about, they didn't know how to check for a spelling mistake or fix a grammatical error, they didn't know how to find the thesaurus online to look up words, right in the Word document. They didn't know how to do referencing or footnoting, so this was all stuff that came out

as I was doing projects with them through the year, and they showed me some other things like how to work the WordArt and inserting different things that I wasn't clear on."

Students (9th graders, in this case) also commented on their technological experiences. Students, who were required to make a digital movie, selected the software that best fit their purposes. In most cases, they were unfamiliar with the programs and learned how to use them as they created their projects. Often, persistence and troubleshooting were required, but these led to learning and sense of accomplishment. Sample comments are:

"We found photostory easy to use after we learned how to work it."

"We have experimented with all the programs and we have made a decision that windows movie maker is the easier, faster and more efficient format."

Digital-age literacies also include visual and media literacies. In commenting about her grade one students experience making a video about patterning, Vera explains:

"Being able to construct new media teaches literacy and job skills that are highly valued in a digital society. Constructing media also plays an important role in the development of media literacy. If students are able to construct their own media, then they will be able to recognize and evaluate more effectively the techniques that the media uses to persuade them into buying things and know how they can take control of this in their own lives."

Laura, in her interview, catalogued many of the skills her students had acquired: "how to copy and paste, how to save in different programs, how to upload and download, change font, how to add dialogue to pictures – how movies are actually made." She added, "It was a brand new experience – really exciting to them."

The author acknowledges that there are additional competencies under the rubric of Digital-Age Literacy. Although there is no data to support their inclusion here, teachers in the local school district are turning their attention to such learnings as multicultural literacy, global awareness, and scientific literacy. A science teacher has just joined the team of teacher-researchers.

Inventive Thinking

The enGauge model of 21st century thinking skills includes such skills as: Adaptability, Managing Complexity, and Self-Direction; Curiosity, Creativity and Risk taking; and Higher-Order Thinking and Sound Reasoning. A priority in our school district is critical thinking, both in the sense of higher order thinking and sound reasoning and critical literacy, whereby issues of power, equity and social justice are recognized and critiqued in texts. All of these skills were considered by teachers and researcher to be evident in the research data analyzed in this project.

Connections among creativity, collaboration, and learning have been argued within a variety of contexts. Both Web 2.0 and 21st century classrooms provide spaces for social discourse, collaboration, interactivity and intertextuality – and for creativity in the context of new literacies. The 9th graders the author observed made these connections themselves; they recognized that their collaborative digital compositions - mashups and remixes of others' creative works from a wide

variety of contexts – are creative in that they generated new knowledge about the play in the social milieux of Web 2.0 resources and the classroom. For example, the group Jangly Janitors created a Photo Story comprised of black and white photos found on various Internet sites, a song soundtrack, and screens displaying quotations form *Romeo and Juliet*. Their classmates commented:

"This is great, the black and white show more emotion i think, like between good and dark, my personal take but great project, …very emotional and music's just epic."

"Wow, this is a great project. The black and white makes it so intense and epic. I love how deep all your pictures are, you definitely read into Romeo and Juliet in ways I never would've thought of!"

"I'm really impressed by the black and white photography project, it's really intelligent the way they thought about the tones of the play and other expressions of the play (i.e. movies, old and new). I really like this project because i get to see how other people think and learn more about my thinking. Representing Romeo and Juliet in other forms is hard, but creative and fun. Even though reading the play was fun in itself, being able to play and manipulate it using technology that we know best really helped me understand the play more."

The comments of the fellow students indicate their recognition that the digital movie conveyed the emotion of the play in unexpected and innovative ways and that Jangly Janitors "read into" the play through different perspectives and with divergent thinking.

Grade 7 students using Kidblog to post their original poems received peer feedback on their poems. For example, one student wrote to her classmate: "This poem is very heart felt it talks about life and death and it's very truthful it makes me think about how we should cherish the people in our lives and enjoy every second together. I really liked this poem!" Such feedback shows not only interpersonal skills, but also demonstrates peer assessment. Teachers are keen to encourage peer and self assessment, to help students develop their own criteria for evaluating multimodal texts and acquire a language of critique that is supportive and effective.

Edna commented on the process of developing these skills with grade 9 students constructing digital movies in groups of two or three about a novel they had studied as a class:

"Also for the most part we learned, and I learned at that point, that if they watched the videos as a class while they were in the process of finishing them, before they did the end product, then they could get some really useful critiques of each others' work: 'that was too dark;' 'I don't think that music matches;' 'I don't think it shows what you're trying to portray; why don't you put this in a paint program and put the words there for that and make that a slide so that the picture is separate.'"

In her digital movie account of her research, Lenora described how her 5th-grade students composed digital multimodal responses to the novels they studied in literature circles. They used pictures and narratives to create a movie about the novel – a task that Lenora describes as risk-taking for both herself and her students. She concludes, "Sometimes taking a risk can be very rewarding for both me and my students."

Teachers are becoming more mindful of thinking skills and the various forms that may take in the classroom as they observe students and read students blogs and other posts about their composing processes and responses to classmates' compositions. Students, too, can be encouraged to be metacognitive - to think about their own thinking processes.

Effective Communication

Teachers in the study, mostly English Language Arts teachers, noted that ICTs increased the quantity and quality of their students' writing, and the enthusiasm with which they approached it.

Vera studied blogging in two studies: in her grade one classroom and while home-schooling her son during a temporary family resettlement to Singapore. In observing her son's progress, she noted:

> "My son was always a reluctant writer, but because he had the freedom to write what he wanted on his blog coupled with the fact that his work was more made public and accessible through the blog, he became much more motivated to write. Through blogging the quality of his writing also improved. He knew from the comments that he received that others were reading it and because of this the pressure to produce high quality work increased. Contrary to what many people think, students need to be able to write more effectively than ever in today's digital age. They need to think and write clearly and precisely if they are to be effective contributors of the web. Blog writing helps with prioritization, conciseness and clarity."

Vera also notes,

> "Last fall in my grade one class, we decided to create our own blog page. Having explored several grade one blogs on the internet, the students were very excited about starting their own. The students began blogging by making a comment on their own photograph, as well as a classmate's photo. Because I set up the blog to allow for 'real-time' participation and feedback, students were motivated to make additional responses as their ideas were still fresh in their heads."

One of the sub-skills noted in Effective Communication is interactive communication and another is interpersonal skills. Most teachers in the study noted that 'conversations' among classmates increased greatly, with collaboration turning to other school tasks as well. Jane explained about the rules for the Ning she created:

> "I told them what is was about and described it in relation to Facebook, except I told them that it would be academically related only. They did socialize about their academics, which was very refreshing and they took it upon themselves not just during computer lab time here at school but at home on their own time as well. Many times at night I would go in and see that if there were things that I needed to give approval for, and I could see that they are [writing] back and forth even for other courses, or they had a test or something about notes. It was strictly academically related, socially and academically."

Vera also says,

> "It is interesting to note, that the students were conversing with each other outside of school time. Blogging is a wonderful way to help bridge the gap between home and

school experiences. Blogging can also be very beneficial for those students whom are very shy or intimidated to speak in a classroom setting. This is a space where students can freely express themselves and get feedback from their peers."

Vera adds,

> "Blogging is also an excellent tool to help parents become involved in their children's schooling. Parents can participate in the blogs by making comments to postings or simply being the viewer of a blog. In either case, the information on the blog brings with it an awareness of the learning that is occurring in the classroom and through students' responses, parents can see the various levels of progress."

Laura noted that her grade 5 students continued writing blogs after the year ended and told their next grade teacher about their blogs, encouraging her to continue blogging in her class.

As MOO, a 9th grader, concluded,

> "Blogging lets you get your ideas out there, and lets you share what you know. Blogging also helps you make new connections with other bloggers, and through comments and new posts, you can create a virtual world of innovative thinking."

High Productivity

Working individually and in groups on digital projects demands a commitment on the part of student composers to prioritize, plan and manage for results, to make effective use of real-world tools, and to produce relevant high-quality products [20]. Teachers all commented on the engagement of their students in the task. Edna noted:

> "I had a group of grade eight and most of the class has difficulty in English, and even engaging them is difficult. So I asked them to do a PhotoStory for me on a novel that we had done together and they were to work in pairs or groups of three, and what I enjoyed watching was the engagement. They were automatically into the task, now admittedly the first thing they wanted to do was pick out the music. But at least it got them talking, and they were searching together, and they were sort of constructing ideas through their conversations so it was really good social process. Then as they watched each other, the people next to them working and they'd hear me going on and then it sort of made them want to do better than the other group."

Grade 9 students using a Ning to plan, comment on, and display multimodal projects on *Romeo and Juliet* commented:

> "After our experience with the project, we are finally accustomed with the ning and have truly realized how useful it really was. It was a great idea to use a specific website for this project. The ning was a fantastic way to organize your ideas and learn from fellow students, either from their comments, opinions, questions or ideas."

Emma shared these observations about her use of a Ning for novel study (Lois Lowry's *The Giver*):

> "On average grades improved 14-16% over other novel assignments submitted throughout the year; students demonstrated a greater understanding of the novel that they had demonstrated with any other work this year.

Assignment motivation among Ning participants was awesome, and class and hallway discussion of Ning experiences was prolific."

As the teachers observed, using digital technologies engages students and motivates them to complete projects, produce their best work, and strive to interest and provide pleasure for their classmates.

Content Area Learning

Models of 21st century skills like Partnership for 21st Century Skills [8] and Metiri Group [20] emphasize that the skills are employed in learning the authorized curriculum and promoting academic achievement. Infusion of ICTs and digital technologies has that same goal. In their research, teachers observed not just the acquisition of technological literacies and demonstration of skills, but also learning of content.

Vera's grade one class also the students created a video about patterning, which they posted on the blog. The students were very excited to show their video to other classes as well as friends and relatives at home. Vera argues, "Through the making of the video and the repeated viewings of the final production, the students gained a much stronger understanding of the concept of patterning and it became more meaningful to them."

Edna explained than her students, through their ning activities of blogging and threaded discussions were preparing for the criterion reference tests (CRTs) administered by the Province at the end of grade 9:

"So they were constantly practicing for this demand aspect of the CRT, so when they wrote the other day their writing had been elevated to such a point where I was amazed at what they did. And I totally give credit to the use of the Ning because they had so much practice writing, and developing a voice, and knowing they had an audience meant that they were going to make that voice much more interesting and appealing."

Laura, teaching her grade 5 students about setting in novels, decided to have them construct models of the novel's settings in art class. Working in small groups, they created the settings important in 2 or 3 assigned chapters. Laura then used a digital camera to photograph the models and asked the groups to write summaries of the events in their chapters. Combining the pictures with audio-recordings of the summaries, they created digital movie clips that could then be combined into a digital movie of the entire movie. Laura described this as an excellent learning experience for students about setting and characters. She concluded that they learned much more about setting than ever before, and became more critical of their efforts making the models. If they could do it over, she said, they would be more careful of the details.

These, and the examples in other 21st century skill categories, are just a few of the illustrations selected from the collective data to demonstrate the importance of technology infusion in literacy teaching and learning. As the research continues, the team hopes to build resources for other teachers in the district, sharing their "knowledge of practice" [17] widely.

CONCLUSION

While not finely analyzed and interpreted at this stage, the data produced in these studies indicate that there is a productive relationship among information and communication technologies (ICTs), new literacies, and 21st century skills.

Teachers taking up technologies and infusing them in their literacy teaching and learning are excited about the engagement of their students, the possibilities for connecting with all learners and implementing differentiated instruction, and their own learning of multimodality. As we continue our collaboration, we will continue to gather data on these themes and 21st century skills, as well as sharing ideas about assessing multimodal projects. Interviews with teachers also illustrate that well-functioning computers, computer room availability, IT support and trouble shooting, and their own technological professional development are issues that still exist and problems that need solution. However, this research also indicates that the efforts to solve them are well worthwhile.

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