

# Unexpected Outcomes: Web 2.0 in the Secondary School Classroom

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This paper presents a small-scale research study into teacher use of Web 2.0 tools and applications in secondary school as a result of teacher participation in a technologically mediated and job-embedded learning program. The authors present data from the Advanced Broadband Enabled Learning (ABEL) 2007 research report that describes how secondary school teachers used such Web 2.0 tools and applications as blogs, wikis, pod casts, RSS feeds and discussion forums either alone or integrated into a learning content management system (Moodle) to create blended learning environments in their classrooms. The paper provides examples of how Web 2.0 and social networking tools have had a positive impact on ESL literacy, shaped student social attitudes, challenged social stereotypes, transformed teacher understanding of their roles and raised new pedagogical issues about student achievement, the nature of literacy, and equity in evaluation practices.

Keywords: Web 2.0, job-embedded learning, secondary school, classroom practice, literacy, evaluation, information communications technology, professional development

## INTRODUCTION

Research into the implementation of information communication technologies (ICT) in the secondary school classroom has shifted radically over the past decade as Web 2.0 tools and applications have become generally available and the complexity of the implementation process has become more apparent. An early investigation into frequency and impact of ICT use in the classroom (Cuban, 2001) has given way to explorations of teacher perceptions about its contribution to learning in the classroom and

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investigations of how teachers create knowledge as they integrate ICT into classroom practice (Deaney, Ruthven, & Brindley, 2006; Mishra & Koehler, 2006; Geijsel & Meijers, 2005). In the same year that Cuban was critiquing the use of ICT in the classroom, Girod and Cavanaugh (2001) speculated that technology-rich classrooms would lead teachers to push new boundaries of knowledge, resources and content by using technology, move teacher belief towards a problem-solving, constructivist view of learning, empower students by providing them with a freedom to learn, explore, and critique knowledge, and create new innovative “learning “communities” in the classroom. Much evidence now exists to prove that in spite of barriers to change inherent in subject disciplines (Sutherland, Armstrong, et al., 2004) and teacher mindsets (Baker and Baker 2004), change does occur in classrooms which are technologically rich when the experience of teaching and learning is intensive, contextual, and relevant to both teacher and learner needs (Swann, et al., 2005). Indeed, teachers who are using ICT in their classrooms are increasingly sharing their perceptions and developing new pedagogical skills. To categorize and investigate emerging teacher knowledge, Mishra et al. (2006) developed theoretical scaffolds, and to ensure teacher reflection and sharing Geijsel et al. (2005) recognized the need to provide opportunities for professional dialogue in interactive professional knowledge communities.

These developments are reflected in the ongoing research into the implementation of the Advanced Broadband Enabled Learning (ABEL) program and its impact on teacher professional growth, conducted by the Institute for Research on Learning Technologies (IRLT) at York University in Toronto, Ontario, Canada. The most recent research (Wideman, 2007) focused on the impact of ABEL’s professional learning program on teacher professional belief, attitude and classroom practice, and provided a series of recommendations for future action. From this investigation there also emerged some compelling outcomes specifically related to the impact of Web 2.0 tools, such as blogs, wikis, and other collaborative tools that ABEL teachers have incorporated directly into classroom lessons either as individual tools, or integrated into Moodle, a learning content management system. This direct impact on classroom practice is a result of their professional learning experiences. More importantly, the research also revealed much that is valuable about unexpected student learning, evolving teacher identity and emerging pedagogical issues. Knowledge of these outcomes has since informed the professional support provided for participants, influenced the content of web-casts delivered throughout the year, shaped face-to-face presentations and discussions at the annual ABEL summer institute, and provided direction for future research into the efficacy of the ABEL program.

ABEL is a proven program that leverages ICT including Web 2.0 tools and applications to develop, design and deliver job-embedded professional learning to teachers and teacher-leaders. Situated in the Office of the Vice President Research and Innovation at York University in Toronto, Ontario, Canada, ABEL uses its networks for knowledge sharing and collaboration and its professional learning program to transform teacher and faculty professional practice. ABEL follows a mandate to build a knowledge sharing and collaborative culture through technology-enhanced learning. The program provides a means for learner collaboration through professional services that advance the sharing of information (content) and expertise (pedagogy) and optimizes the use of communications technology. More specifically, it models the exemplary use of ICT in the delivery of its program as part of a blended learning strategy in the belief that teachers who themselves learn through ICT will appreciate its power to expand the boundaries of learning and engage students and will begin to think of how to use it most effectively in their classrooms. Influenced by Garrison and Kanuka (2004) and Dede (2006), ABEL

now defines blended learning as a thoughtful combination of face-to-face and web-based program delivery so as to improve the learning experience.

ABEL maintains a learning platform that makes use of IP-based videoconferencing and other collaborative applications, delivers a large number of videoconference and video streaming events and activities throughout the year, offers a range of technological tools, support and resources of value to teachers, provides an wide-range of professional learning opportunities including an annual summer institute, maintains an implementation strategy that focuses on change management and innovative practice, and includes a research and evaluation focus for continuous improvement. ABEL is situated at York University in Toronto, Ontario, Canada, where internationally recognized research facilities and professional staff are available to conduct research into its effectiveness, and guide the ongoing implementation of the program. Through York University, ABEL liaises with the IRLT, and many aspects of the ABEL program are guided by the results of the Institute's work.

### **REVIEW OF THE LITERATURE**

Numerous research studies have attempted to describe and quantify the innovative changes that have taken place in the role of the teacher in the classroom, in classroom practice, and in professional learning as a result of the use of ICT. These research studies are increasingly using interviews and case studies to capture rich data and highlight the sophisticated levels of implementation through which teachers who are integrating ICT into classroom practice are passing. The transformation in teacher practice that has occurred over the past ten years among those teachers who have incorporated ICT to achieve blended learning in the classroom is more complex than a shift from direct instruction to coaching and guiding. Taking a psycho-social perspective, Geijsel et al. (2005) suggest that the integration of technology into blended learning classrooms engages teachers in a dynamic confrontation between two paradigms, a direct instruction paradigm that is insufficient for preparing students for the twenty-first century and an alternate paradigm that places the focus much more strongly on student exploration and learning. They view the changes that teachers undergo as a process of social construction that engages them in reflective practice because they cannot fully identify with new situations and exigencies, and they assert that such teachers undertake a journey of personal and professional meaning-making that they call identity learning.

This dynamic confrontation is more concretely defined as a series of constraints and opportunities with which teachers who are integrating ICT into classroom practice constantly deal. In an early study, Deaney, Ruthven, and Hennessy (2005) identify the forces that lead to teacher disequilibrium: lack of confidence and expertise in using ICT, tension between subject content, traditional pedagogical practices and ICT skills, reluctance to integrate ICT into classroom practice in a school culture that is non-collaborative and non-supportive, and the need to conform to external requirements in the form of educational policy and government expectations vis-à-vis curriculum and evaluation. Dealing with the same research data, Hennessy, Ruthven, and Brindley (2006) identify key teacher perceptions about integrating ICT into classroom practice: improved student production and more efficient working processes, increased variety and appeal in classroom activities, broadened access to classroom resources and references, increased student motivation and confidence, greater pupil independence and peer support, and heightened higher-order subject thinking and learning. They document these findings by providing concrete examples from Science, Mathematics, and English Studies in British secondary schools. Clearly these perceived advantages compel

teachers to engage in 'identity learning', and this identity learning directly impacts professional practice.

One valuable and recent research project provides a conceptual framework to view the professional learning of teachers who are integrating ICT into classroom practice. Using their experience at Michigan State University, where they have been involved in a learning-technology-by-design experiment aimed in part at understanding teachers' development toward rich uses of technology in the classroom, Mishra et al. (2006) argue that such teachers create a new type of knowledge generated by the dynamic intersections of technology, content, and pedagogy. Using a Venn diagram, they identify at the very core of the diagram itself, Technological Pedagogical Content Knowledge, or TPACK, as a new product of ICT integration into classroom practice, and suggest that their framework provides a viable conceptual model for interpretation of teacher professional learning, decision making about teacher pre-service and discussion of and future approaches to research into professional growth and classroom practice. This conceptual model suggests that teachers who are integrating ICT into classroom practice are engaged in a journey towards professional growth and clarity at a cognitive level as innovative and exciting as the process of social construction and professional meaning-making that Geijsel et al. (2005) propose.

#### *PURPOSES AND RESEARCH QUESTIONS*

Three common themes, important to the ABEL program, emerge from the research. The first is that the classroom teacher plays a complex role in using Web 2.0 tools and resources to shape the learning experiences of students and move students towards greater engagement with learning and higher achievement. In addition, the subject requirements for courses in the secondary school continue to shape how teachers adapt ICT to their own needs as professionals in charge of student learning. And finally, as teachers develop new pedagogical expertise they are in effect engaged in a transformative process not only in terms of the impact they have on classroom practice and student learning, but also in terms of their own sense of themselves as professionals and their efficacy as teachers.

The most recent research into the use of ABEL tools and resources in classrooms in two large multicultural and multi-racial school districts in Southern Ontario, Canada (Wideman, 2007) explored these themes. The study focused on how participants in the ABEL program had reacted to the ABEL job-embedded learning program that supported effective use of ICT for teaching and learning, how they had responded to the ongoing professional learning program and support offered by ABEL throughout the year, what Web 2.0 tools and resources they had used in their classrooms as a result of their experiences in this professional learning program, and what impact the use of these Web 2.0 tools and resources had had on their classroom practice and student learning. In general the study addressed several questions:

1. Which Web 2.0 tools and resources did ABEL participants use and what were the frequencies and levels of their use?
2. How did the use of these tools and resources alter teacher attitude, influence teacher collaboration, change classroom practice and impact on student learning?

The intent of the study was not only to assess the effectiveness of the current job-embedded professional learning program offered by ABEL, but also to determine future directions for program and support. The data summarized in this paper includes only those results directly related to Web 2.0 tools and applications.

## METHOD

### *PARTICIPANTS*

Forty-five teachers who had used one or more online tools from the ABEL “toolbox” of potential Web 2.0 applications for course management functions and for enabling and facilitating student discussions completed the online survey during the prescribed three month time period. In addition, researchers also interviewed eight secondary school teachers who had been nominated by ABEL program leaders, situated in the districts and the schools, based on their knowledge of member activities and those making the most exemplary use of ABEL tools and resources in their teaching over the 2006-07. The teachers who were interviewed taught computer science and technology, business and co-operative education, social science, physics, English language and literature, French language and literature and the Visual Arts. They reported a great range of technical proficiency with digital technologies because many had participated in the ABEL professional learning program for from one to six years.

All of the teachers were university graduates with one or more degrees and additional educational qualifications approved by the Ontario Ministry of Education, and they had taught for two or more years in grades 9 through 12. They taught in urban and suburban schools where the SES levels ranged from working to upper middle class, and the school populations contained varying numbers of ESL and first generation immigrant students.

### *SURVEY INSTRUMENTS AND SETTINGS*

The study design incorporated two elements: an online survey of teachers active in the ABEL program, and individual interviews conducted by the researchers. The online survey was available at the ABEL portal for completion over a three-month period from March to May 2007. The teachers were interviewed at length by telephone in their schools in May 2007.

### *PROCEDURES*

Survey responses were solicited from approximately one hundred active “ABEL teachers” by means of two separate emails from the ABEL Program Manager and by frequent ABEL community announcements. The online survey used rating scales to gather data from teachers on several factors: teacher background, levels of use of ABEL tools, resources, and services over the 2006-07 school year, changes in teaching practices and technology use as a result of ABEL experiences, changes in teacher collaboration practices as a result of ABEL experiences, perceived benefits of ABEL participation for students – changes in initiative levels, work quality, attitudes, engagement, and any perceptions of other professional impacts.

In the interviews the teachers were asked to describe in detail two ABEL-facilitated teaching projects or activities of the 2006-2007 school year they considered most significant, to discuss the impacts of each, in terms of student outcomes, their own professional growth, and any shift in their teaching the projects brought about, and to review any ABEL-related limitations or problems they had encountered in their described initiatives. They were also asked what they considered ABEL’s greatest strengths were in terms of helping them become better teachers, and what changes or additions could be made to the ABEL program and its tools, services, and professional learning activities to improve its effectiveness. The teachers were provided with the interview questions several days in advance of the interview to give them time to reflect and develop their

responses. The interviews were recorded, transcribed, and then subjected to qualitative coding and analysis with the aid of the *Atlas.ti* qualitative analysis software.

## RESULTS

### STATISTICAL DATA

The data suggest that a substantial majority of teachers surveyed have incorporated more extensive use of constructivist, inquiry-driven, and student-centered strategies in their teaching as a result of the ABEL professional learning program (Table 1), and that these strategies were facilitated by an extensive use of collaborative tools (Table 2).

The statistics from the research also reveal what teachers observed to be the impact of Web 2.0 use on student behavior and academic achievement (Table 3), and the effects of the ABEL professional learning program on teacher collaboration and professional growth (Table 4).

*Table 1. Percentage Changes in Teacher Practice*

<i>Changes in Teacher Practice</i>	<i>Somewhat More Frequently or Much More Frequently</i>
Teachers sought new ways of teaching content.	93%
Teachers rethought some of their ideas about teaching and learning.	91%
Teachers provided more opportunities for students to take the initiative in their learning.	69%
Teachers put more emphasis on engaging students' interest in their academic work.	68%
Teachers had students work collaboratively to develop joint projects and to solve problems.	64%

*Table 2. Frequency of Use of Web 2.0 Tools and Resources*

<i>Tools and Resources</i>	<i>From Once per Week to Once or Twice per Year</i>
Moodle	64%
Blog	56%
Videoconferencing (VSee or Adobe Connect/Breeze)	51 %
Wikis	40%

This last set of statistics is particularly significant when one examines the comments of the eight teachers who were interviewed about their use of Web 2.0 tools and resources in their classrooms in May 2007. When these teachers were asked to describe in detail two ABEL-facilitated teaching projects or activities they considered most significant in terms of student outcomes, their own professional growth, and shifts in their teaching, they selected collaborative student projects using ABEL resources, essentially Web 2.0 tools, blogs, wikis, pod casts and other collaborative tools which they had incorporated as individual tools directly into classroom practice over an extended period of time or integrated into Moodle (the course management system) courses and curriculum activities.

*Table 3. Changes in Student Behavior and Academic Achievement Use*

<i>Student Behavior and Academic Achievement</i>	<i>Agreed or Strongly Agreed</i>
Students tended to be more engaged and on task.	76%
Students engaged in a wider range of learning.	76%
The quality of student work remained constant or was higher overall.	66%
Students took more initiative and demonstrated better self-management.	55%
Less time had to be devoted to classroom management.	40%

*Table 4. Teacher Collaboration and Professional Learning*

<i>Collaboration and Professional Learning</i>	<i>Agreed or Strongly Agreed</i>
Teachers learned from the experiences of other teachers Somewhat more frequently or much more frequently.	80%
The use of Web 2.0 tools and resources made the professional lives of teachers more rewarding.	78%
Teachers collaborated with other teachers to develop teaching strategies somewhat more frequently or much more frequently.	78%
Web 2.0 tools and resources provided unique opportunities for their students to learn that they would otherwise not have received.	76%
The content of lessons was deeper when teachers used Web 2.0 tools and resources in their classrooms.	67%
Teachers collaborated with other teachers to develop new curriculum.	59%
Teachers collaborated with other teachers in planning and carrying out new projects in their classrooms.	56%
The use of Web 2.0 tools and resources had changed teacher perceptions of students and the nature of their achievements.	42%

*ANECDOTAL DATA*

The projects that six teachers choose to highlight in their interviews will serve to reflect the general, constructivist, inquiry-driven and student-centered direction revealed by the statistical data. Sarah used Moodle in a Grade 11 Physics course. She moved course materials and outlines into Moodle, provided links to Discovery Streaming and humorous YouTube videos for students to discuss in an online forum, had students photograph a physics concept as embodied in a phenomenon of their choice, and had her students make extensive use of an online discussion forum. She was particularly pleased that she was able to configure Moodle so that only she could view draft versions of student assignments and post private suggestions for improvement before students posted them in the class forum for peer review.

Carl also used Moodle in a Grade 11 Physics course. When he was made ABEL co-coordinator for his school in the fall of 2006, he set up the course Moodle into which he incorporated discussion forums and student blogs. He discovered that Moodle provided a

major pedagogical advantage over a course web page in that it permitted much greater interactivity by making it possible for students to post and discuss problems and solutions rather than simply access course information and resources.

Val, a teacher of English and French, and an unnamed colleague, took advantage of student interest in iPods by incorporating them into Moodles for Grade 11 and Grade 12 English and French courses. They created French blogs so that students could respond to French songs related to themes in the French novels they were teaching in Grades 11 and 12, and English blogs so that students could answer questions on audio versions of Shakespearean plays they were teaching in their Grade 11 and Grade 12 English classes. They initially viewed the use of the Moodles as a means of promoting the development of self-management skills, but were surprised and pleased by the degree of interactivity and language practice Web 2.0 tools provided.

Lindsay, a social science teacher, created a structured blog as a course management system for a Grade 12 course on psychology, sociology and anthropology, and collaborated with a teacher in New Brunswick, a different province in Canada, on a Grade 11 class-to-class sociology project using Breeze and student wikis. The students in her Grade 12 course had access to the blog both on school time and at home, and used it to make peer comments on documents that they created, in this case biographical summaries and annotated bibliographies. In a class-to-class world religions project in this course, students from Ontario and New Brunswick worked in inter-provincial teams on collaborative projects, doing research on data from Statistics Canada, commenting on posted journal articles, and using the wiki to discuss and construct a survey intended to identify social attitudes and stereotypes.

Vina, a business and computer science teacher also used blogs in five courses throughout the year. In a Grade 11 accounting course she asked her students to respond to questions on case studies and to ask other students about their own responses to the questions. In her Grade 12 computer science course, students had to post their draft presentations on a topic such as network architecture in advance of the presentation date so that they could be reviewed and commented on prior to presenting them, thus allowing for appropriate revision and editing. Vina thought that this peer review helped improve the general quality of the presentations because it generated questions to which students had to respond, and discussions for which new information had to be researched.

Susan, a technology, graphics, video and communications teacher, developed communication technology blogs for all of her junior and senior courses. She posted excerpts from articles that she wanted students to read and respond to, incorporated the time provided for reading and response into the school's daily reading program, used the blogs to post links to interesting exemplars of design and media communication principles, and encouraged students to seek out and post links to interesting exemplars that they could find.

## **DISCUSSION OF ANECDOTAL DATA**

### *UNEXPECTED STUDENT LEARNING*

As teachers who were interviewed integrated Web 2.0 tools into their courses and assessed their impact on student learning and achievement, they all confirmed what the research has already indicated: increased student engagement with subject content, greater responsibility of their own learning, deeper investigations of issues, and improved student assignments. However, those teachers in secondary schools where there were a large ESL students and a substantial number of first-generation immigrants were both



surprised and gratified by the impact of their use of Web 2.0 tools on written literacy and student attitudes to language use.

Susan and Vina discovered that their ESL students, many of whom had real difficulties with oral and written English, responded much more frequently to the postings on her communication technology blogs than they would have done in more conventional class discussions, and that their commentary overall was more carefully thought through and more grammatical in structure. They ascribed this improvement to two factors: the availability of technological translators and a more meaningful sense of audience as students engaged with their peers. Vina was also pleased that the blog afforded her an opportunity to identify ESL difficulties and address them in a sensitive manner when they appeared anonymously in the blogs.

Lindsay and the teacher with whom she collaborated in St Stephen's, New Brunswick discovered that their Grade 11 students were engaged in an unexpected cross-cultural experience as they composed their surveys on social attitudes and stereotypes on the wikis they had set up. Lindsay's Grade 11 class was culturally, religiously, linguistically, and racially diverse, while the class in St. Stephen's, New Brunswick was far more homogeneous in its cultural, religious, linguistic and racial make-up. In both classes students learned the etiquette of communicating with other Canadian citizens from very different backgrounds and discovered that they had to go beyond instant messaging to engage in collaborative dialogue if they were to understand each other and work together effectively. The students realized that they had to think very carefully about appropriate language and correct spelling, and learned that they had to adopt a mature and respectful attitude towards each other and the survey in their interactive work in their wikis.

#### *EVOLVING TEACHER IDENTITY*

The research interviews also reveal that teacher roles in the ABEL classroom have changed in a more complex manner than simply shifting from direct instruction to coaching, guiding or indeed mediating between the technology and the student. Teachers who were interviewed indicated that they had shifted the focus of direct instruction from conveying course content to instructing students on the appropriate use of the new technologies, on etiquette and language, and on expectations for detailed and extended dialogue that promotes higher order thinking in their interactions and their assignments. At the same time, they had also created technologically rich learning environments, virtual spaces within which their students could pursue deep issues, dialogue productively with peers, engage meaningfully with real audiences, and begin to take responsibility for their own learning. Consequently, they have begun to see their roles as teachers shifting: they had become extenders of the boundaries of subject content, crafters of pedagogical strategy as they applied their instructional intelligence to blended learning environments, and refiners of their own expertise in using technology in the classroom.

#### *EMERGING PEDAGOGICAL ISSUES*

Interviews with these teachers also reveal that they are beginning to confront pedagogical issues for which there may as yet be no ready answers. They recognize the need to prompt students to engage in higher order thinking in their postings to blogs and wikis, they welcome the fact that Moodle allows them to extend the boundaries of their courses and the classroom, and they acknowledge the value of the collaborative dialogue that these Web 2.0 tools and applications provide. However, a close reading of their comments uncovers concerns about how to establish academic expectations in general,

about how to identify specific expectations for written literacy and about how to assess and evaluate student work. Many of the teachers interviewed pointed out that students need instruction on the appropriate and effective use of wikis, blogs, and course management systems if they are to use these tools for deep learning, and effective self-management. All of the teachers in the survey expressed concern by direct comment or by inference about ensuring the quality of student interactions and about the quality of the artifacts they generated. They spoke about the need to define the role the blog or wiki might play in a course, and about the high level of sensitivity that students from different backgrounds must bring to their interaction with peers. They expressed a need to convince students that using the discussion forum in a Moodle could produce more complete solutions to curriculum problems, solutions from which all could benefit, than mere text messaging could provide.

Susan, in particular, began to reflect upon what level of English usage was acceptable in the communication technology blogs she set up in all of her courses. She has begun to wrestle with one consequence of her use of this Web 2.0 tool: the use of text-messaging syntax and writing style (She refers to this as “text speak”) in student blog comments. As an educator, her concern about student literacy conflicted with her desire to have her students participate and add their voices to the blogs she set up because she was very much aware that her students use truncated syntax, abbreviations and letter substitutions in text messaging in social intercourse outside the classroom. Her difficulty was undoubtedly exacerbated because her ESL students were posting grammatically correct and well thought through comments that were superior to the oral and written comments they made in class, while her first-language English students were posting what she called “text-speak” to her blogs while using far more academic language in their written assignments.

Val and her colleague have begun to think about the implications for student evaluation of their use of Web 2.0 tools in their French and English classes. Both teachers have puzzled over how to evaluate student responses in blogs and discussion forums. To date they have evaluated the effort and insight that individual students have demonstrated as they have responded to posted questions, and made comments in blogs and discussion forums. The issue of student evaluation may loom larger for them, however. The Ontario Ministry of Education, the provincial authority governing all education in the province, provides very specific curriculum expectations for all of its accredited secondary school courses, and has created a common Ontario student report card that may not yet adequately reflect the learning that students engage in as they use collaborative Web 2.0 tools and applications.

## **SUMMARY OF RESULTS**

ABEL provides teachers with a job-embedded learning program that leverages Web 2.0 tools to deliver a blended professional learning program. As teachers engage in a program that models the effective use of ICT and Web 2.0 tools and supports them with ongoing opportunities to share concerns and suggest new strategies, the data shows that they appreciate, value, and use these twenty-first century teaching and learning tools and develop new instructional strategies. The statistical data in this study reveal that teacher use of Web 2.0 tools and resources has expanded teacher collaboration, changed classroom practice, and increased student engagement in learning. In addition the anecdotal data in the study reveal that secondary school teachers in the ABEL learning program have begun to articulate what Mishra et al. (2006) identify as new forms of technological, content and pedagogical knowledge, confront what Deaney et al. (2005) identify as curriculum constraints, and struggle with deep pedagogical issues as they

adapt Web 2.0 tools and resources to their own needs as professionals in charge of student learning. And the unexpected outcomes indicate that ABEL's technologically mediated job-embedded professional learning program has had a significant impact on teacher role as they adapt these tools and resources to subject disciplines and observe student behavior and student learning. Teachers who are using Web 2.0 tools and resources in their classrooms appear to be engaging in a complex process of socialization in which they forge new identities as professional teachers (Geijsel et al., 2005).

### *IMPLICATIONS*

We suspect that there is a strong correlation between the job-embedded blended strategy that ABEL has adopted towards professional learning and teachers' use of Web 2.0 tools and resources as a classroom instructional strategy. These results have prompted ABEL to explore the correlation between its technologically mediated professional learning mode of delivery and the significant adoption of Web 2.0 tools and resources in further research in 2008. They have caused ABEL to ask a new question as the professional learning program evolves: What elements of blended learning should it focus on more fully in order to address the needs of its teachers as they move increasingly to more sophisticated uses of Web 2.0 tools and resources that support student engagement and achievement?

#### *THE NEED TO PROVIDE ONGOING SUPPORT THROUGH SHARING AND COLLABORATION*

As the anecdotal data from the study indicate, for teachers to implement Web 2.0 technologies effectively into classroom practice they must have opportunities to articulate concerns, share experiences, and discuss classroom practices on a daily basis. This need is being addressed through local collaborative learning communities focused on the use of specific Web 2.0 tools and resources (school teams of teachers using the same Web 2.0 tools and resources in different classrooms), virtual communities of professional practice at the ABEL portal (chat rooms and forums that allow teachers to share expertise across schools and across boards), and pedagogical workshops at annual Summer Institutes (face-to-face facilitated planning and design sessions focused on the classroom use of Web 2.0 tools). Such communities of professional practice (real and virtual, ongoing and time-bound) not only increase skills and knowledge; they provide support for teachers who are essentially undergoing professional transformations and redefining what they are doing in the classroom.

#### *THE NEED TO MODEL EXEMPLARY WEB 2.0 USE THROUGH INFORMAL LEADERSHIP*

While formal leadership in professional learning programs is absolutely necessary to ensure vision and effective implementation, the study also documents the emergence of potential leaders in the ABEL Community who are using Web 2.0 tools and resources in a reflective and highly professional manner. Such informal leaders are important because they are exemplary users of Web 2.0 tools and resources who intuitively understand the transformative impact that the use of these tools has on teacher identity, teacher practice, and teacher efficacy. ABEL ensures that they are instrumental in the support and extension of Web 2.0 use in schools that ABEL serves - as knowledgeable mentors to other teachers in schools, as influential voices in blogs and chat rooms, and as presenters

in annual institutes that deepen professional knowledge, increase technological skills, and provide encouragement and support.

#### *THE NEED TO PROVIDE CONTEXT-SPECIFIC EXAMPLES OF WEB 2.0 USE*

The anecdotal data also demonstrate just how focused on their own classrooms and concerned about the achievement of all of their students teachers in the ABEL program are in their use of Web 2.0 tools and resources. As they develop new technological, content and pedagogical knowledge in a wide range of subject disciplines they have an increased need to know how other teachers in the same subject disciplines are using Web 2.0 tools and resources and shaping them to achieve student outcomes in class-specific contexts for local students. While ABEL addresses this through the collaboration achieved in real and virtual learning communities, and interaction with exemplary leaders, it also addresses the needs through focused Webinars that deal with pedagogical and content issues, and video-streaming pieces that capture classroom practice and are available to members at the ABEL portal. This just-in-time access to professional learning and expertise not only models the effective use of Web 2.0 tools as part of a professional learning program; it provides learning based on individual needs and does so in accordance with the principles of adult learning. We suspect that this format for professional learning has a significant impact on teacher adoption of Web 2.0 tools and resources.

#### *THE NEED FOR FURTHER RESEARCH INTO TEACHER ISSUES AND STUDENT OUTCOMES*

The most surprising anecdotal data from the study reveal that there are emerging pedagogical issues and unexpected student outcomes that result from the use of Web 2.0 tools and resources. These include the recognition by teachers that they must incorporate into classroom practice specific forms of direct instruction to ensure effective use of Web 2.0 tools and resources, and that they must deal with the evaluation of student engagement in learning and of student artifacts in ways not recognized by provincially mandated evaluation formats. There are also unexpected outcomes in individual classes that cause them to observe English language use more closely, to reflect upon their assumptions about student language use, to reconsider their concepts of literacy, and to reflect about how they evaluate students. As the statistical data cited above indicate, the use of Web 2.0 tools and resources is changing teacher perceptions of student learning and student achievement. However, this anecdotal data is limited at the present time, and no firm conclusions can be made about these issues and outcomes without further research.

If indeed these unexpected outcomes prove to be valid across a larger data set, then organizations promoting the use of Web 2.0 tools and resources in secondary school classrooms may have to address tensions between classroom experiences and centrally mandated learning expectations. More specifically, changes in teacher perceptions of student achievement and of their understanding of literacy also suggest tensions between teacher experience and current concepts of literacy, both digital and print, and these tensions might prompt further research. In addition, teacher experiences with student learning and achievement and centrally mandated curriculum expectations and evaluation schema suggest that important and relevant educational outcomes are being overlooked. We suspect that these issues will become more significant as teachers everywhere become increasingly sophisticated in their use of Web 2.0 tools and resources. We also believe that these issues merit further investigation and action.

## CONCLUSION

Although the participant group for these oral interviews was small, the manner in which the participants have integrated Web 2.0 tools and applications to create blended learning environments and the resulting emergence of these issues and unexpected outcomes provides interesting directions for further research. Since this study ABEL has continued to offer a blended professional learning program that models the effective use of ICT and Web 2.0 tools, and has increased the number and range of resources available to secondary school teachers in order to address their specific concerns and local needs. In early spring of 2008, the annual ABEL research study, conducted by the IRLT, posed questions about the correlation between the mode of delivery of the ABEL program and the significant adoption of Web 2.0 tools and resources, about the extent of collaboration in the professional learning community. In addition, the IRLT completed a number of case studies by interviewing selected ABEL members on their use of Web 2.0 tools and the impact of their use on teacher professional growth, on their classroom practice, and on student learning and achievement. The study focused more deliberately on identifying pedagogical issues that emerge from teacher use of Web.20 tools and resources, and on unexpected student outcomes. The results of this study will be published in a report in the fall of 2008, and will continue to inform ongoing efforts to support and extend the use of Web 2.0 tools and resources in ABEL secondary schools.

The general challenges faced by ABEL in promoting the use of Web 2.0 will be immediately recognizable to other organizations that deliver technologically mediated professional learning programs. These include institutional and technical constraints that impact the access to and implementation of ICT for teaching and learning. From the perspective of implementation, firewall protocols in participating school districts continue to limit the access to blogs and wikis, acceptable use guidelines and subject disciplines continue to shape how Web 2.0 tools are or are not incorporated into curriculum, and issues of how to ensure secure talk and privacy continue to shape policy. Furthermore, maintaining the technology and providing ongoing support for teachers occupy much time and energy in the ABEL Office at York University. From the perspective of professional growth and classroom practice teachers in the ABEL community continue to express a strong need to know how other teachers in their own and other subject areas are using the Web 2.0 tools and applications, and speak about the importance of belonging to a professional learning community where they can share their new understanding and receive assurance and validation as well. In addition, they have begun to query how they might make use of completed blogs and wikis as resources for students about to enter their courses, and are beginning to struggle with complex issues of evaluation and reporting.

The data provided in this study re-enforce ABEL's belief that teachers play a strategic and truly significant role in the innovative use of Web 2.0 tools and resources, and that the blended strategy for professional learning it has been using is effective. We know that curricular knowledge and pedagogical expertise increased when teachers engaged in professional learning that leveraged Web 2.0 tools to provide a blended learning experience. Their participation in the blended learning environments provided by ABEL led them to replicate these environments for students and had a profound impact on how they perceived students, understood their role as teachers, and shaped instruction. Within this transformed role they began to resolve important pedagogical issues, and recognize student outcomes that deserved further research and attention. The research study conducted by IRLT in the spring of 2008 is intended to help ABEL

improve its professional learning program and continue to promote the use of Web 2.0 tools and resources to support student achievement in secondary school classrooms.

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