PROFESSIONAL DEVELOPMENT: A RURAL SCHOOL DISTRICT’S EXPERIENCE WITH VIDEOCONFERENCING

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Abstract The Rural Advanced Community of Learners (RACOL) project undertook an initiative to develop broadband synchronous and asynchronous technologies to a rural school district in northern Alberta, Canada. Relying on the recently installed Alberta SuperNet (a high-speed broadband network), the Virtual Presence Learning Environment (VPLE) classrooms were built using various digital and videoconferencing technologies. As of September 2003, four full-time teachers were required to teach varying subjects within these VPLE classrooms. Therefore, a professional development team was formed and nine professional development sessions were conceptualized and delivered. A history and unique qualities of the RACOL project, a review of literature pertaining to professional development for educational technologies, an in-depth analysis of the nine sessions that were delivered, as well as the results of some research conducted during the nine sessions will be described within this paper.

Introduction
The Rural Advanced Community of Learners (RACOL) project is an initiative to use broadband synchronous and asynchronous technologies in an effort to bring quality educational programs to a rural school division in northern Alberta, Canada. The Fort Vermilion School Division (FVSD) is one of the northernmost school divisions in Alberta, situated approximately 800 kilometres (479 miles) north of Edmonton, the capital city of Alberta. The FVSD makes up approximately 12% of Alberta’s landmass covering over 50 000 square kilometers (around 310 square miles) (Fort Vermillion School Division, 2003). There are five schools within this division that deliver distance education courses for students enrolled in grades 10 to 12. These five schools are geographically separated; the nearest school is sometimes over 100 km (62.14 miles) away. Some of the schools have a small number of students enrolled and therefore do not have enough qualified teachers to instruct many of the courses that would normally be available to students in other schools within Alberta. As such, the FVSD has a number of challenges in delivering equitable educational programs to all of its students.

In view of these challenges, the FVSD, in conjunction with the University of Alberta and a number of other partners, began to explore potential solutions for delivering courses to multiple locations within the division using broadband networks and other digital technologies (Montgomerie, King, & Dropko, June, 2003). Previously, the division had run a number of classes using audioconferencing, however both the teachers and the students who used the system expressed frustration with the limitations of that particular medium. With the implementation of the Alberta SuperNet (a high-speed broadband network connecting every school within Alberta), RACOL was able to launch the 2003-2004 school year with video classrooms in each of the five schools in the FVSD.

Each RACOL classroom, or Virtual Presence Learning Environment (VPLE) (see Figure 1), is equipped with a variety of digital tools, including a high quality videoconferencing system, audioconferencing system, interactive whiteboard (SMART Board™ 3000i), three computers with high-speed internet access and a Polycom ViaVideo™ camera, a visualizer, VCR, DVD/CD player and a number of other electronic components such as television...
monitors, microphones and audio speakers. Students sit in a U-shape formation around various stations facing the SMART Board™, two television monitors (red boxes in Figure 1), and the teacher’s portable console (situated in the center of Figure 1). These student stations are equipped with a red and a yellow button which allows students to ask questions (red button) or indicate to the teacher that they do not understand what is being presented (yellow button). Using these educational tools and technologies, each VPLE can either send or receive a lesson presentation from any of the other VPLE classrooms within the division.

![Figure 1: VPLE Classroom (RACOL, 2003)](image)

When the system is in operation, each VPLE classroom that is connected, including the one the teacher is in, can see on the various television monitors the teacher presenting the lesson and the other locations that are observing the lesson. Furthermore, any input device that the teacher uses (e.g. the SMART Board™ display or the DVD display) is networked between the various remote locations for interactivity purposes. Teachers also have the option to zoom-in or zoom-out with the classroom cameras on any students at any location to either hear questions or to ensure that classroom behaviour is appropriate.

With all of this educational technology and its various capabilities, working with the teachers to enable them to use the system effectively and productively is one of the major goals of the RACOL project. In light of this, RACOL is fostering a secondary community of learners (in addition to the school students) that consists of the teachers who use the system on a day to day basis. Currently, four teachers teach from four different schools within the division (Fort Vermilion, Rainbow Lake, Rocky Lane and High Level). The students are located in five different rural communities (Fort Vermilion, Rainbow Lake, High Level, La Crete and Rocky Lane).

There are two main methods of support for these teachers. The first method of support is the RACOL web site, which contains a growing list of useful Internet sites and resources for the teachers to use in their daily teaching practices (www.racol.ualberta.ca) as well as a recap of past events and discussions. These resources range from the practical (e.g. software simulations for teachers to use in their labs) to the more theoretical (e.g. tips for creating effective constructivist learning environments) (Rural Advanced Community of Learners, 2003). The second method of support is the ongoing PDET sessions for the teachers that are being delivered several times throughout the 2003-2004 school year. These sessions are coordinated by David Geelan, the professional development supervisor for the RACOL project and an assistant professor of Secondary Education at the University of Alberta.

**How the RACOL Project is Unique**

Unlike other videoconference initiatives, the RACOL project has made a conscious effort to move beyond simple videoconferencing (see Table 1). The RACOL project has tried to foster a more holistic approach to distance education. Rather than focusing solely on network communications and the operating environment, RACOL has sought to incorporate both a variety of teaching and learning models and a more complex teaching and learning environment than is found in most videoconferencing projects.
RACOL’s emphasis on a more holistic teaching and learning environment is evident in the videoconferencing classrooms themselves. The VPLE rooms were created to closely replicate a "natural" teaching environment, while still allowing technology to enable the classes in the different locations to interact. For example, rather than a traditional chalkboard in the rooms, the VPLEs are equipped with a SMARTBoard™ that not only allows students to see what the teacher is writing, but it allows them to interact and be seen by the other students at the other locations in real-time.

<table>
<thead>
<tr>
<th>Traditional Classroom</th>
<th>VPLE Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalk/white board</td>
<td>SMART board</td>
</tr>
<tr>
<td>Classroom computer terminals</td>
<td>VPLE computer terminals</td>
</tr>
<tr>
<td>TV/VCR/DVD</td>
<td>Integrated, system wide VCR/DVD</td>
</tr>
<tr>
<td>CD player</td>
<td>Integrated, system wide CD player</td>
</tr>
<tr>
<td>Overhead projector</td>
<td>Visualizer (with both transparency and non-transparent/object projection capability)</td>
</tr>
<tr>
<td>Computer with screen projector</td>
<td>Teacher laptop and laptop system connection.</td>
</tr>
</tbody>
</table>

Table 1: How VPLES differ from traditional classrooms

In addition to the technology in the classrooms, the VPLEs are equipped with two buttons that were designed to address the pedagogical concerns of the teachers using the videoconferencing system. As already mentioned, the student station has two buttons. The question button (red button) allows the system to zoom-in on individual students who have questions so that they can be heard and seen clearly at all of the other locations. The confusion button (yellow button) allows the teacher to guage how many students are understanding the material presented by observing the computed tally of the pushed yellow buttons. In a traditional classroom, teachers would be aware of a number of nonverbal cues that would indicate that students were feeling lost or confused. These cues would be nearly impossible to detect in a videoconferencing environment, so the confusion buttons were created so that students could indicate to the teacher when they were feeling lost so that the teacher can estimate whether or not to move on to new material.

Finally, RACOL is unique because of its commitment to pedagogy and teaching. Teachers partake in special professional development for educational technologies (PDET) sessions throughout the year to ensure that they are confortable with the technology they use on a day to day basis. In addition to this, a number of best practices video vignettes are being created so that teachers using the system can impart what they have learned to teachers who will use the system in subsequent years.

Professional Development: Literature Review

Professional development for educational technology (PDET) is an opportunity for teachers to acquire new levels of knowledge, skills and technology training. Ideally, PDET should be delivered in a collaborative and constructivist learning environment while portraying the importance and value of the educational technologies being taught (Craft, 2000; Peterman, 1993; Stallings, L. & Koellner-Clark, K., 2003). Furthermore, PDET should provide “hands-on” instruction, orchestrate interactive activities using the educational technologies specific to the participating teachers’
needs and area of expertise, as well as consider the teachers’ learning styles, personal levels of confidence and perceived control (Nisan-Nelson, 2001; Yamagata-Lynch, 2003).

Most information about participating teachers and their specific needs should be obtained prior to the delivery of the PDET through a needs assessment (Roberts & Porter, 1999). A needs assessment is a methodology attempting to obtain and analyze the expressed needs of the participating teachers in order to offer more specific and thus more effective PDET (Larkin, 1999). Within this process, performance and learning objectives for the PDET session or workshop should be conceptualized, detailed and then disseminated to the teachers and any other affected person(s). Participating teachers ought to have a continual voice throughout this process and be treated as an adult learner (Peterman, 1993).

When instructing PDET, there are several guidelines that should be followed (Flick & Bell, 2000; Garofalo et al., 2000; Mason et al., 2000). For instance, the educational technologies being taught should be demonstrated within the context of the teachers’ subject matter. Furthermore, the specific advantages or qualities of the educational technologies being taught should be meaningfully understood by the participating teachers by the end of the PDET in order to make the subject matter more accessible.

Analysis of RACOL’s PDET Sessions

In the first set of professional development for educational technology (PDET) workshops delivered (August 2003), nine sessions were provided over a three day period. Each session averaged two hours in length. The sessions were structured to imitate a typical school day (i.e. 8:30am-3:30pm), a structure to which the participating teachers were accustomed. There were two morning sessions, which were separated by a short mid-morning break. There was one afternoon session commencing after a lunch break. Each one of the nine sessions was carefully constructed around the professional development experience of RACOL’s Professional Development Coordinator, David Geelan, and from the review of literature within the fields of professional development, educational technology, constructivist learning theories, the integration of technology into curriculum and the classroom as well as teaching and learning styles. Each one of these fields of research provides pertinent information that assisted in the conceptualization and delivery of the PDET. The overall PDET objectives were predefined before the PDET workshop and were as follows: to build rapport and instigate teacher interchange; to provide technology instruction and troubleshooting techniques; and to instruct on distance education pedagogy and the ‘Community of Learners’ theory. A learning environment where participants could actively interact with the PDET team and other participants was encouraged throughout all sessions.

During the first session, an overview of the PDET workshop was provided on a hand-out which was reviewed. In addition, the questionnaires developed by Rosen et al (1987), which contained three separate sections, were also handed out. The three sections addressed computer anxiety, thoughts towards computers, and general attitudes towards computers. These three questionnaires were administered to detect if the RACOL teachers had technology or computer-related fears before entering into these PDET sessions. The three questionnaires are broken down to include the computer anxiety rating scale (CARS-C), the computer thoughts survey (CTS-C) and the general attitudes towards technology scale (GATCS-C). The computer anxiety rating scale (CARS-C) contained 20 items that measured technological anxieties on a five-point scale. The computer thoughts survey (CTS-C) also contained 20 items that measured “specific thoughts and cognitions that people have when working with technology or when contemplating working with technology. Items were rated on the same five-point scale as the CARS-C. This measure has been administered to over 12,000 people in the United States and in 22 other countries” (TechnoStress Website). This type of continued use of Rosen et al.’s measure increases the reliability of the results. Finally, the general attitudes towards computers scale (GATCS-C), measured the participant’s general attitudes towards technology. All three questionnaires were administered to assist the RACOL PDET team in assessing the participant’s level of technophobia before the PDET sessions commenced. These questionnaires were complemented by an additional and more informal questionnaire developed by the RACOL PDET team to also assess the teachers’ thoughts, attitudes and anxieties about technology and technology integration but within the specific context of the RACOL project (i.e. more context-specific questions).

The second PDET session was entitled, “Get to know a new technology”, and the teachers had the opportunity to familiarize themselves with a new (information and communication) technology. Ideally the new technologies learned in this session would be integrated into the teacher’s classrooms. Some of the technologies chosen included WebCT, “chat-rooms”, bulletin boards, Internet websites related to their specific teaching area, and Flash/Java animations. With the recent installation of the SuperNet, connectivity problems were virtually eliminated. Each computer then had a 10/5 MB connection allowing the participants to view almost all of the current and future multimedia curricula provided by the Alberta government (Fiege & Schienbein, 2003). The second session provided
the familiarization and the utilization of new technologies to better equip them to integrate it into their respective teaching styles.

Two of the teachers as well as David Geelan had used audiographics (audio teleconferencing with some synchronous and asynchronous web-based elements) during the previous school year, so session three was dedicated to discussion of these past experiences. This sharing process set in motion the process of building a community of learners between the teachers and the PDET team (Brown & Campione, 1994; Scardamalia & Bereiter, 1994). Each teacher was given an opportunity to become an expert (i.e. gain meaningful experience) within one area through the process of reciprocal teaching. Reciprocal teaching in this context means that one teacher taught the other teachers about something within an area of familiarity. For example, one teacher had previously used the SMART Board™ when teaching high school math. This teacher then had the opportunity to share this knowledge with the other teachers within this PDET session through a process of demonstrations, answering questions and providing technical peer assistance. Questions about the SMART Board™ and how it was used in a math setting were then directed to this teacher. It was hoped that this teacher will continue to assist the other teachers throughout the school year with issues surrounding the SMART Board™ or until each teacher feels they are familiar with this particular educational technology. The overall guidance and direction of this process was supervised by the PDET team to ensure its direction. Based on the informal evaluations, the process of reciprocal teaching within a community of learners was very successful and enjoyed by the participants.

The PDET team focused on listening to the participant’s needs in the fourth session. PDET ought to be based on the participant’s needs in order for it to become successful (Larkin, 1999). One teacher commented “because the technology and ‘method of teaching’ which we were about to embark on was so new to us…the best part of the P.D. was to actually use the technology. We needed to learn how the system worked and what it could do for us” (Anonymous, October 11, 2003). Knowing these concerns, the PDET team altered the pre-set schedule to accommodate the teacher’s expressed needs. For instance, the PDET team compiled a WebCT tutorial for the next day of sessions and provided more “hands-on” time using both the VPLE interface and the as per requested.

The aim of sessions five and six was to encourage inter-peer discourse about the challenges surrounding the integration of new technologies into the classroom and curriculum stimulate new ideas about what technologies are available and learn about the various forms of constructivist theories that exist. Bitner and Bitner (2002) list eight considerations when planning successful integration of technology into a classroom. The eight considerations include: fear of change, training of basics, personal use, teaching models, learning based, climate, motivation and support (p. 96). For the first and second considerations, the PDET team provided individualized technology instruction and basic training within the VPLE. For the third consideration, all participants had numerous opportunities to have practice with new technologies and with the VPLE classroom. For the fourth consideration, David Geelan provided a thorough presentation on the various constructivist learning theories that exist (Geelan, 1997). In addition, there was support by of the RACOL project members, such as the principal investigator, T. Craig Montgomerie who managed to take the participant’s questions and address them directly. This type of support for the participants was imperative to the PDET’s success.

The last three sessions addressed the feedback the PDET team had received from the ongoing formative evaluations. The participants expressed a need for continued “hands-on” experience within the VPLE, especially since the new school year began in a week. The PDET team believed that additional practical experience within the VPLE was necessary: “teachers must learn to use technology and must allow it to change their present teaching paradigm” (Bitner & Bitner, 2002, p. 95). To provide more experience within the VPLE, the PDET team requested that each teacher compile a simulated lesson integrating some form of technology within the VPLE and present it to the entire group. Some participants used the laptop for PowerPoint presentations, while other participants used the electronic whiteboard and the visualizer all while controlling the various cameras and microphones. The PDET was deemed successful by all participants as indicated in the evaluations.

**Results**

There was data collected from three qualitative sources: Rosen et al.’s (1987) questionnaires, informal, written evaluations as well as video-recorded interviews. The questionnaires and the video-recorded interviews will be reviewed in this paper. Rosen et al.’s (1987) questionnaires pertaining to a participant’s (i.e. teachers) thoughts, attitudes and anxieties towards technology were given during the beginning of the first session to observe if any teacher had technology or computer-related phobias, anxieties or what their individual thoughts were about technology before entering into the PDET sessions. Each questionnaire contained twenty questions and was rated on a five-point scale (see Table 1). Every question on every questionnaire was answered by every teacher. The results after careful analysis demonstrated a general level of comfort and ease of use with technology expressed by the teachers prior to teaching within the VPLE and prior to the PDET sessions (see Table 1). There was nothing noted in
these three questionnaires that indicated to the PDET team that any teacher had excessive anxiety or negative
feelings or attitudes towards technology or computers.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Not at All</th>
<th>A Little</th>
<th>Fair Amount</th>
<th>Much</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am going to make a mistake</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>This will be fun</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Everyone else knows what they are doing</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I enjoy learning about this</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I like playing on the computer</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I feel stupid</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>People will notice if I make a mistake</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>This will shorten my work</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I am totally confused</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I know what I can do</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>I am willing to give it a try</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>I hate this machine</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I'm afraid I'll wreck the program</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I can get help if I am stuck</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>What if I hit the wrong button?</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>This is really interesting</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I'm too embarrassed to ask for help</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Others have learned this and so can I</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>I feel overwhelmed by how much I don't know</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I won't be able to get the computer to do what I want</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 2: Results of Questionnaire**

Each informal interview lasted between ten and twenty minutes. The interviews were more context and
PDET specific than the questionnaires. The questions were developed by the PDET team and the topic areas ranged
from acquiring information about the teachers’ teaching experience to information about what technologies the
teachers had used, either professionally or personally. The main purpose of the informal interview was to ascertain
the general thoughts and feelings about each session provided within the PDET workshop. For example, some
questions included, “How long have you been teaching? Do you assign work that requires your students to use
technology? What is your overall impression of the PDET with regards to organization, discussions and the PDET
team? Are you comfortable now with the VPLE after having this PDET workshop?” Not all of these answers can be
explored in this paper, but some of the more pertinent ones will.

When asked the question, “What are your anxieties or concerns with integrating technology into your
classroom?” one teacher responded that they were not nervous, “when I have a backup plan…sometimes when I
know that maybe the backup plan is still going to take some time or it's not as good and you're more reliant on that
technology to work… I usually know enough to be able to… somehow make it work” (Anonymous, August 29,
2003). When asked about the most effective aspect of the PDET sessions, one teacher responded, “I think definitely
the experimentation among the teachers” while another teacher responded that “getting on the…SMART Board™
and the whole system… we have a week and a half left and we're going to have to start… getting on there and doing
it.” (Anonymous, August 29, 2003). There was much consensus with all of the teachers that due to the immediate
nature of using the various educational technologies within the VPLE, the most important aspect of the PDET
session was acquiring practical “hands-on” experience with the assistance of the PDET team within a collaborative
learning environment.

There were some unforeseen technical difficulties that arose while delivering the PDET. The various
educational technologies within the VPLE classrooms as well as the Alberta SuperNet were still being installed even
up to the beginning of the 2003-2004 school year. This meant that the videoconference system would shut down or
the Internet connection provided by the Alberta SuperNet was lost in the midst of delivering the PDET to the
teachers. Due to these technical difficulties, it was sometimes frustrating for both the teachers and the PDET team to
remain on schedule and to stay focused. However, the teachers were very understanding of the situation and proved
to be resilient. One teacher stated, “I think that you were sabotaged by the system going down every now and then,
and again, I mean, you recognize things that are within and beyond the control… it was organized…and that was
within your control. Things happened, that was not within your control” (Anonymous, August 29, 2003). Another
teacher stated, “the equipment's been down, because you know techies are working on it, there's been a lot of down
time…maybe a little bit frustrating…it must be frustrating for David because he's got his agenda and he can't do it. I
guess I feel for him a bit” (Anonymous, August 29, 2003). Notably, the teachers were very understanding of the technical difficulties that were encountered. These sorts of unforeseen technical difficulties are sometimes part of delivering PDET and it is often the very nature of technology. However, with an appropriate back-up plan and extra hands-on experience that was provided to the teachers, both the teachers and the PDET team seemed satisfied. Despite the technical difficulties, the objectives of the PDET were met as evident in the informal evaluations and the video-recorded interviews that were conducted.

The PDET for these teachers did not end with this workshop; rather PDET is an ongoing process and commitment spanning the entire 2003-2004 school year. The PDET team holds a videoconference meeting with the RACOL teachers every month and is planning another workshop in the spring of 2004. Working with these teachers, with the Fort Vermilion School Division and its administration has been a fascinating and rewarding experience for everyone involved in the PDET team.

References


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