

TECHNOLOGY IN TEACHING: AN ANALYSIS OF ONE SCHOOL STAFF'S
EXPERIENCE IN DEVELOPING PERSONAL COMPUTER SKILLS THROUGH
THE IMPLEMENTATION OF THE ALBERTA ICT CURRICULUM

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ABSTRACT

A policy of curricular technology integration has been initiated in all Alberta schools through huge investments in technological and human resources. Educators have been mandated by the government to provide technology-based learning opportunities, but are teachers truly in a position to deliver on those expectations? This project will examine teacher technology skill development at an Alberta school during the course of 1 year. This issue will be examined from a program improvement point of view with the recognition that technology program planning is more than an ordered shopping list; it involves the beliefs, skills, and attitudes of those who will be implementing the program. Success relative to long-term goals of curriculum integration depends far less on high-tech equipment than it does on the people using the equipment. This project lends itself to both anecdotal and empirical investigation and both components will be incorporated into the evaluation design. Through pre-/post-surveys, a better understanding will emerge regarding teacher technology skill development at the school level. This new understanding will be critical in future planning of teacher professional development and support.

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CHAPTER 1: INTRODUCTION

The use of technology in schools is ever expanding and with that use has been the corresponding rise in expectations for teacher expertise in the use of technology. Generally this expertise has been gained through individuals pursuing professional development outside the workplace. Workshops, courses, and institutes have been effective instruments in helping teachers to become computer literate. The Alberta Information and Communication Technology (ICT) curriculum demands that all teachers reach a certain level of computer literacy and for many teachers doing outside PD is proving daunting.

Background

Woodlands School is an elementary school located in the southwest corner of the city of Calgary. It has a student population of approximately 400 children and a staff of 18 teachers. Early in the year 2000 the staff identified improving technology learning as a primary goal in the school enhancement plan. This goal dealt with both enhancing student learning and staff development in the area of infusing computer use in the core curriculum. The school technology also reflected this goal as it sought to provide support in acquisitions and teacher professional development.

Over the next 2 years technology learning was a cornerstone of school professional development activities. Professional development (PD) days, workshops, partnered learning, school visits, and formal instruction were all incorporated as strategies for skill development. In January of 2002 the staff dedicated a staff development day to pursue individual learning in the area of technology. Each staff member was invited to set a small, specific goal related to his or her own skill level. The

goal needed to be achievable within this school year and staff members would be invited to assess their success in the late spring. Support was provided through peer mentoring, specialist assistance, and substitute funding.

The process began with teachers meeting with School Board specialists to determine what direction professional development might take over the January to June period of the school year. Teachers were able to discuss the realities of their classroom situation and expressed frustration over the lack of time in developing their own skills with technology. Substitute teacher time was offered and the beginning of a plan to allow for peer mentoring was outlined.

This peer mentoring was centered on the idea of “tech buddies.” A tech buddy would be someone who the professional was comfortable working with and who possessed the skills that the professional was seeking to develop. A large poster was created and set up in the staff lounge and covered with “Ask me about” notes. These notes indicated which person would be willing to share specific expertise in particular areas, the idea being that teachers could then choose both the skill and the person in order to work on their skill development.

These “Ask me about” notes ran the full range of computer use and everyone was encouraged to be seen as an expert in some area. Examples of “Ask me about” notes can be seen in Appendix A.

During this meeting teachers were also encouraged to set small specific goals for their own learning. The idea was to put into practice the use of technology inside each teacher’s own practice. The goals were personal and really only related to the individual who set them. They weren’t to be used as a public measure, and the only one who would

gauge their success was the individual teacher. Each teacher was able to develop a goal and they were sealed inside a “Dear Me” envelope which was also posted on the staff room poster. Teachers set out their goals, placed them in the envelope and they were to be opened during June when the school year was complete.

With teachers engaged in professional development around technology arose the opportunity for the collection of some data in regards to technology use. The School Board specialists were doing this work as part of an Alberta Incentive for School Improvement (AISI) project. They were interested in collecting data on what impact this learning would have on ICT implementation at the school level. To that end, they had provided the staff with a survey that asked teachers to reflect on the use of technology in the classroom. This survey was first distributed during the 2000/2001 school year.

In January of 2002, in addition to that instrument would be the skill survey that is the basis of this paper. The results of the survey would be used in the evaluation of the school enhancement plan at the end of the school year. Technology skill development for both teachers and students was a key goal for the school improvement plan and the survey would provide the data needed to determine whether efforts at the school were having an impact with teachers.

Over the next 6 months teachers were engaged in a variety of pursuits towards the attainment of their goal. Some chose to work with grade partners as students engaged in creating projects using technology. Still others used preparation time to visit colleagues’ classrooms to see technology in action or worked after school in partnership with a colleague to try and expand skills with particular software, hardware, or peripherals. Teachers were also asking for time to be set aside during a PD day so they could have

more focused time to pursue their learning. A day was set aside for teachers to work towards their goal, and time, equipment, and people were all made available for teachers' use. The agenda of that PD day can be found in Appendix B. Teachers were invited to participate in the post reflection phase of both surveys and the results of the AISI survey can be found in Appendix C.

Rationale

The time has come to monitor and reflect on the technology infusion process. The crunch of getting a program up and running in a short period of time has, up until now, precluded the opportunity for real in-depth planning and reflection. There has been an Alberta Learning mandate to provide integrated technological opportunities for students and yet it is not clear whether teachers are in a position to deliver on those expectations.

Schools have been acquiring computers and other information technology tools for more than a decade. Yet many teachers are still unable to use computers to help students learn more effectively. Information technology is quickly changing the world around us and demands are being placed on the school system to prepare students to participate in an information-based society. New skills are being demanded of teachers in order to be effective agents of these changes.

This initiative was centred on the individual practitioner and was designed for a variety of needs to be met by the specific teacher. The school also is in need of measuring the success of professional development in technology, as it does form a core goal for both the school enhancement and technology plans. This need is the impetus for the development of this project.

Process

By looking at this question from a program improvement point of view I hope to help the technology program best meet the needs of both the students and staff of Woodlands School. A pre-/post-skill inventory will be used to examine changes in teachers' own perceptions of their skill set. The teachers were given a survey in early January 2002 that attempts to gauge their skill level in the use of computer-related technologies. These technologies include but are not limited to e-mail, word processing, image processing, and the Internet.

The follow-up to this initial survey was in the spring, after the participants have had an opportunity to work with their classes in technology integration. Thus emerged a picture of what teachers believe they gained from the process. If teacher learning is the gauge of an effective professional development model then the measurement of that learning should be an indicator of success for that model.

Questions and Definitions

For the purposes of this research, the hypothesis is "A "job-embedded" model of professional development will prove to be an effective strategy in assisting teachers in technology skill development." The null hypothesis is "Other professional development opportunities will prove to be more effective in assisting teachers in technology skill development."

Variables. The following independent and dependent variables will be used to provide a foundation for evaluating the project:

- Independent variable: The teacher develops skills in technology through other means than through school-based opportunities.

- **Dependent variable:** The teacher demonstrates growth in technology skills through work done with students, colleagues, and technology specialists.

Defined terms. The following terms used throughout this project are defined as follows:

- **Job-embedded learning:** Job-embedded learning is learning by doing, reflecting on the experience, and then generating and sharing new insights and learning with oneself and others (Wood & McQuarrie, 1999).
- **Professional development:** A process by which professionals engage in learning to enhance, expand, and develop their professional practice.
- **Effectiveness:** Through the use of some measuring instrument there will be some evidence that teachers will have acquired new skills and understandings in the use of computer technology.
- **Technology skills:** In this context, technology skills refer to the skills necessary to use computers to fulfill the expectations of the Alberta ICT outcomes.

CHAPTER 2: LITERATURE REVIEW

The purpose of my study was to examine the effectiveness of a particular professional development model. Specifically it is to determine whether or not a site-based model of professional development in technology now being undertaken at Woodlands School is meeting the needs of teachers. There are a variety of ways teachers can develop their practice in technology and this literature review will begin to outline the current thinking on professional development at the school level. In examining PD models I began by reading O'Haire and Thomas's (1988) overview of the models typically being pursued in schools today.

For O'Haire and Thomas (1988), the purpose of PD is "... the maintenance and improvement of teaching practice" (p. 7). Within the traditional models this goal is not always met and thus we meet several PD leaders who embody these various views of staff development. The ringmaster, the travel agent, and the toddler are all examples of the kind of school-based PD that usually occurs. The toddler, for example, is the model where there has been continuity of people involved in planning for PD so a "new" person is charged with the responsibility of leading the PD committee. With the year ahead to plan for and no idea how to do it, this "toddler" is forced to plan for the minimum, a survivalist approach of "Let's get through the year, we'll be better at it next time."

The authors describe this kind of PD as technical professional development. What is needed for PD to become truly meaningful is a shift from technical to critical professional development. A critical model is not based on a few events through the school year but is instead centred around critical self-reflection and questioning. It is long-term in nature and takes a different commitment from the traditional views.

Another limiting factor to the success of PD in schools can be the unique constraints that teaching in schools presents. Timetabling, class loads, and a lack of non-teaching time can be barriers to any kind of professional development, especially to the time-intensive needs of technology training.

Abdal-Haqq (1996) cites one of the main structural impediments to teacher professional development--time. He begins by identifying what characteristics good PD should include, with some of these being that it is ongoing, school based, collaborative, supportive of teacher initiatives, accessible, and inclusive. The author then points out that according to "Prisoners of Time" (National Education Commission on Time and Learning [NECTL], 1994) teachers and students are ". . . victims of inflexible and counterproductive school schedules" (p. 2). These schedules prevent good professional development and collaboration because teachers are forced to pursue their own development outside the school day. This means that teachers must use their own personal time, summers, before and after school, and limited PD days to work on their own professional development.

This situation has resulted because professional development has not been widely seen as an intrinsic part of making teachers more adept and productive in the classroom. This lack of recognition is then translated into a belief that teachers should always be spending their time in schools in front of students. Collaboration, observation, research, curriculum development, or new skill practice are not viewed as worthwhile activities.

The author recognizes that there are barriers to the use of teacher time in this way. The community may have issues with more time being used for PD and not for instruction. The use of some the time strategies can be a negative for parents as they try

to organize child care, vacations etc. In these days of accountability and cutbacks it may prove to be a very difficult task to free teachers from their daily instructional roles.

The primary constraint to providing teacher time for PD may be just this kind of attitude which “. . . does not place a premium on teacher learning and in which decisions about professional development needs are not made by teachers but by state, district and building administrator” (NECTL, 1994, p. 3). If there is no value placed on PD then there will be no impetus to provide the kind of resources needed to truly make it effective for teachers.

In discussions with teachers about PD, the topic of time invariably comes up. Teachers are often willing to pursue PD but they are increasingly unable to balance the demands of the daily needs of teaching with anything other than their own lives away from the classroom. In Calgary we have found ourselves losing, not gaining, time for professional development. Where once there were funds for supported activities, these monies have been taken away. With more jobs being done by fewer people, the opportunities for sharing the load are fewer and we are not able to be as creative with our time as we once were.

Jackson (1992) attempts to frame what he believes to be the variety of ways teacher development and change can be undertaken. His focus is on those ways teacher development is actively pursued as opposed to changes that occur as a matter of aging or career cycle. Jackson believes that there are four ways to assist teachers develop in their practice. These categories include telling teachers how to teach better, improving conditions under which they work, helping them deal with the psychological demands of the job, and pursuing what Jackson (1992) initially just calls the “fourth category”

(pp. 64-66). For Jackson this fourth category eludes definition and is instead illustrated through description and anecdote. He does equate this last category with art in that our exposure to the specific examples or experiences will have individual impacts depending on our own individual experiences and beliefs. It is through a process of personal reflection and self-examination that we as humans truly undergo growth and change. For Jackson (1992), this “. . . deeper, broader understanding of what we do” (p. 67) is really what teacher development is all about.

Thus a technical understanding of how to “do” technology has to be accompanied with a development of an understanding of how those skills can fit into the teachers’ larger, more global understanding of curriculum and instruction. This becomes even clearer in Apple and Jungk’s (1992) review of a technology PD model that didn’t meet the needs of the teachers involved.

The authors provide a vision of teaching in which autonomy and control has been taken away from the teacher in order to better provide for accountability and the appeasement of conservative ideologies. This trend is seen as an underlying rationale for an increased emphasis on standardized tests and a curriculum that is “increasingly planned, systemized, and standardized at a central level” (Apple & Jungk, 1992, p. 24). Coupled with this loss of teacher autonomy is a developing intensification of the job that has meant getting things done has replaced getting things done well.

The authors are able to exemplify these pressures in their description of the implementation of a new computer curriculum. This “curriculum on a cart” (Apple & Jungk, 1992, p. 29) approach results in a unit of study in which literally a teacher is not required. A pre-packaged, commercially developed program is utilized for instruction and

teacher; student and program needs are subjugated to the limitations of time, space, and schedule. The intensification of teaching and its relationship to gender is seen as a further pressure that is felt particularly by women teachers. This results in even more dependence on outside sources for expertise and a continued “de-skilling” of their jobs (Apple & Jungk, 1992, p. 39).

This article helps to illustrate the difficulties associated with the development and implementation of innovation in schools. What on the surface appears to be a positive and engaging process actually results in further loss of voice and authority for teachers. The situation that teachers find themselves to in today is one of spiralling demands on their time and abilities. Teachers are torn between wanting to have a say in their own professional development and keeping balance in the rest of their lives.

For me what is beginning to emerge through descriptions of programs like this is that the process of professional development cannot be outside/in in its orientation but rather it has to be the reverse. If all the teachers in this program had been involved in the development, creation, and implementation of this computer curriculum, I believe there would have been far greater ownership for the program. Developing a set of activities in which the teacher was not necessary was an attempt to ease the burden of teaching life. What resulted was that the teacher was literally removed from the act of teaching and the conditions that forced this kind of disassociation were left untouched. Thus emerges for me the necessity to examine the reality within which professional development occurs rather than focusing on ‘fixing’ the emergent issues of the day. Clark (1992) indicates that research has shown teachers as being “. . . more active than passive, more ready to

learn than resistant, more wise and knowledgeable than deficient, and more diverse and unique than they are homogeneous” (pp. 76-77).

Predicated on these qualities, Clark (1992) believes that teachers can and must take responsibility for their own professional development. Three reasons are given for this position: (1) adults are voluntary learners, (2) teachers have individual needs, and (3) that is the way of the best teachers already operate.

Professional development programs should be supportive, not prescriptive, and Clark (1992) offers seven principles of PD design that he sees as key for teachers developing their own plans. These seven principles include writing a personal credo of teaching, starting with strengths, making a 5-year plan, looking in your own back yard, asking for support, going first-class, and blowing your own trumpet. Clark offers these principles not as solutions but rather as catalysts of further thought and inspiration. He does not outline a specific plan for teachers, for he rightly points out that his words will have different effects based on those who read them.

Clark’s words struck me in a number of different ways. First, and perhaps most importantly, I was made to reflect upon my own views of teaching and teachers. In working on PD committees there is a trap of thinking that we are “responsible” for our whole group’s development. We work to create three events per year and we are often hurt when these events are not always unanimously cheered by all involved. When I think about why I got involved in PD planning it was because I wanted to ensure that my own PD needs were met.

Wood and McQuarrie (1999) put forward the idea that for professional development to be effective it must be directly connected to the work that is being done

by the teacher. Further, the authors contend, “Probably the greatest opportunity for job-embedded learning to affect instruction is facilitated through team planning and team teaching” (p. 12). It is this contention that is at the heart of what I hope to discover in my study. I thus needed to find material dealing with individual experiences with technology professional development in a team setting.

In Nicol (1999) there is an anecdotal account of a teacher’s struggle to integrate a new technology into his class. However Mike’s conversion to calculators is more than a story of how to integrate new technology into a classroom. This story puts into perspective the reality and the challenges of professional development. Many articles discuss the need for individual reflection and buy-in as necessary precursors to authentic change. As Mike demonstrates, there can be many impediments to change that have nothing to do with what people believe to be true or correct.

Fear of failure and/or a lack of confidence can be more powerful impediments to teacher change than a lack of time or other structural barriers to change. I am often asked how I found the time to develop some of the skills I have developed in technology. I enjoy working in the area of technology and I recognize its value. However, more than that outlook, I do not fear the prospect of not being the expert. I work with many teachers who will not take their classes into the computer lab until they are totally proficient with the technology. They never have the time to develop that kind of proficiency so they continue to balk at working with computers.

What is needed is a model for professional development that allows these teachers the kind of explorations and learnings that occur in this setting. Perhaps if teachers can see peers make mistakes, fumble with new software, and allow kids to be the experts,

they can be encouraged to take new risks in their own practice. If this kind of peer mentoring and collegial site-based learning was to be the model pursued with teachers at Woodlands School.

Whether or not this process was successful is the subject of my study and I am cognizant of some of the studies that have been done in the past and the inherent complexity that such a task entails. Barker (1996) points out the many variables that must be taken into account when looking at tech learning at a system level, and the North Central Regional Educational Laboratory (NCREL, 1996) review has a variety of indicators, including student performance, that could be considered in the evaluation of technology professional development. Given the limitations of time and resources I will only touch on one aspect of teacher professional development, that being the technology skill acquisition of teachers.

CHAPTER 3: METHODOLOGICAL OVERVIEW

“Understanding and using data about school and student performance are fundamental to improving schools. . . .Data are the fuel of reform”
(Killian & Bellamy, 1999, p. 27).

Rationale for Choice of Research, Tradition, Strategies, and Techniques

This research project is rooted in the tradition of educational action research. O’Brien (1998) describes educational action research as having a “focus on development of curriculum, professional development, and applying learning in a social context” (p. 1). This is an opportunity for an examination of a school staff’s professional development program in a rigorous and reflective way. It will have an impact on future programming and staffing decisions at the school level. This research structure falls in line with what Calhoun (1994) refers to as the “action research cycle” (p. 3). This cycle is seen as having five phases which include selecting an area of interest, collecting, organizing and interpreting data, and then taking some action based on that data (Calhoun, 1994, p. 3).

My research instrument will allow for an examination of the school professional development plan, insofar as the plan deals with teacher computer skill development through the lens of a “Critical Reflective Inquiry Orientation” (Mrazek, 1999, p. 1). In this way I hope to develop a better understanding of how technology professional development is being perceived in my school.

What that means in the development of a research instrument can be summed up in the following:

Knowing the world situationally-interpretively is different than knowing the world empirically-analytically. The two paradigms are different and pursue different sorts of questions; however, this does not mean that they are opposed to each other. Different can also be complementary. (Mrazek, 1999, p. 4)

Change in how technology learning is being approached in schools has occurred in a very short period of time. New skills in technology are being demanded of teachers as we enter a new era in education. This is exemplified by the inclusion of technology understandings in the new teaching quality standard (TQS) and student information communication technology (ICT) outcomes developed by Alberta Learning. In some cases teachers are faced with having to develop a whole new skill set in order to remain current in their practice.

These skills can be developed in a variety of ways and through a variety of sources. In an effort to support professional development in this area, Woodlands School is providing for teacher learning through peer mentoring and job-based PD opportunities. What I hope to do is develop an understanding of how these skills are being developed and if attitudes towards technology have changed as a result of the work done with teachers.

I began with the idea that this project would be qualitative in nature, as I wanted to examine individual skills and attitudes. Working through the research process has helped me see that a quantitative instrument would also be appropriate in helping me understand the effectiveness of the professional development activities. Specifically, a skill/attitude inventory with a pre-/post-strategy would be appropriate for gauging both program need and success.

Method and Data Sources

Data sources. All certified teaching staff within the school were invited to take part. This means that there were people who work in the school with students who are not included in the survey, and the inclusion of support staff in future evaluations would likely be a valuable addition. The survey was limited to teachers because it is the teachers who have had opportunities to participate in professional workshops, and have the responsibility for incorporating ICT into classroom practice. The staff of the school were fully supportive of this project and had no issues with the administration of any appropriate research instruments.

Method. I have struggled with how to create an evaluative instrument that would capture the learning that teachers have experienced and do it in a way that was not overwhelming for both the surveyor and respondent. Frey (1989) indicates that face-to-face interviews provide more opportunity for interviewer effect than impersonal methods (in this case telephone interviews). While this may be true, there is still a place for interview data to help deepen my understanding of the learning process undergone by teachers. The survey instruments will guide my selection process of interview participants, as the results will identify significant changes in skill and/or attitude. It may also be valuable to interview participants who do not indicate any change.

I decided that a survey instrument would be the best possible strategy to gather the information I needed. Surveys can be time-friendly in both the undertaking and administration of the instrument, have less potential for error (standardized questions), are a familiar format for teachers, and lend themselves to a variety of methods of analysis.

For the skill survey I have adapted, with permission, the computer skill survey that is being used for ED 5510 with Dr. Rick Mrazek. I have made this decision for two reasons: firstly, the items on the survey are directly connected to the ICT outcomes that have been set by Alberta Learning, and secondly, the Likert scale that is being used in the survey allows teachers to select their skill level from a pre-selected range, thus allowing for some self-reflection as they conduct the survey. Having done this survey on a couple of occasions for courses I recognize the value of this instrument as an evaluative tool and I did not see the need to reinvent a new one.

The survey was distributed twice and responses were compared to each other to see what, if any, changes exist between the two versions. Comparisons were then made at an individual and group level to determine skill and attitude changes over the course of the school year. It was hoped that those surveys that indicate a significant change would be followed up with an interview. The end of the school year precluded interviews at this time but could certainly be incorporated in any follow-up to this project as part of ongoing school enhancement planning.

Output/deliverables. The stakeholders for this project will be the staff as a whole, but it will be of particular interest to the administration. Both the administration and staff have been very supportive of efforts in teacher learning in technology as evidenced by the inclusion of technology-related goals in teacher professional growth plans. This project is directly connected to the school enhancement plan and the results of the project will be reported to the staff. It will also be used in helping to guide planning for future professional and staff development.

Time frame and budget. This information was developed in the 2001/2002 school year with the surveys distributed in January and June of 2002. The resources required to complete the evaluation will be minimal, with photocopying being the largest expense. This expense will be borne by the school. It would have been preferable to have made this survey in an on-line format; however, the cost of putting the instrument on-line proved too prohibitive.

Project management. I was the sole facilitator for the collection of any and all data from the surveys and questionnaire. I was able to complete the surveys during professional development time set aside on designated days. The information was collected as part of our own school enhancement plan assessment and as part of a district AISI project. Permission was given by the principal to access this data (see Appendix D).

Problems with Methodology

The data and analysis need to be considered in light of the following considerations.

Data collection. Has the sample been large enough and have I had input from all the staff that need to be considered in this study? Is the data reliable or has been corrupted because of factors I have not taken into account? These concerns are certainly real and I have tried to address them through the following:

1. Staff are identified by name and so I will be able to track all the surveys to ensure that they are returned. The project is school-based so I need only include members of my school community.

2. In looking at this survey I know that it connects to the real world of teachers and that they will be able to respond from the experiences they have undergone this year.
3. This is a non-evaluative tool and is only to be used for program evaluation. This fact was made explicitly clear to all respondents to avoid a false higher response on the skill survey.

Instrument. The instrument has been used in a variety of university-level courses and with a variety of respondents including teachers, undergrads, and graduate students. I was confident that it would garner the results I sought. I did find that there were some problems with the language of the instrument and some teachers struggled with a few of the technical terms used in the descriptors.

Question 2 proved particularly problematic, as many teachers were unfamiliar with the term “Boolean.” I described what a Boolean search was to the group and many commented that they used that search strategy but they didn’t realize it had a particular name. I don’t believe that defining that term for the group invalidates the question as what I was seeking was the comfort level with skill itself, not necessarily the knowledge of the associated term.

Another area of difficulty proved to be the Likert scale and its associated descriptors. Questions 8 and 10 did not automatically connect to the 0-4 scale as described in the survey (see Table 1). I advised respondents to treat the 0-4 scale as a Rubric as it related to these questions with “0” being a low score and “4” being a high response. In dealing with the results of these questions I will treat “0” as a strongly disagree response and “4” as strongly agree. If I used this instrument again I would

provide an individual scale for these questions that did not fall into the pattern of the rest of the survey design.

Table 1

Skill Survey Scale

0	Completely unfamiliar with skills
1	Have seen skills used
2	Have used skills but need help
3	Comfortable with skills
5	Can teach described skills

One problem I had not anticipated was that some teachers did not respond to all the questions. After administering the second survey one teacher remarked that she had not realized that there was a second page until she completed the post survey. One other teacher simply marked several items as N/A and others just simply left some areas blank. In looking at individual results this clearly has an impact on the validity of the survey but when the results are examined as a group the missed responses have little impact.

The timing of the post-test in June meant that teachers had the benefit of the whole school year in which to improve skills. Unfortunately the late administration of the survey meant that they were unavailable for a post-survey interview. Some of the results were surprising and an interview may have led to additional understanding in regards to their responses. These discussions will have to wait until the next school year and could form the basis for a follow-up to this project.

One last area of issue that appeared was the phenomenon of lower responses in June from January. I don't believe these are an indicator of a drop in skill level but are

probably as a result of slightly different interpretations of the survey scale between the two administrations. Some teachers in fact asked to see their January instruments before completing the June version. I did not make them available and so some teachers that were struggling to decide between two numbers likely chose the lower one in June. Looking at the results in June, it may have been useful for teachers to have had access to the original survey in making decisions about the growth in their learning during the intervening months.

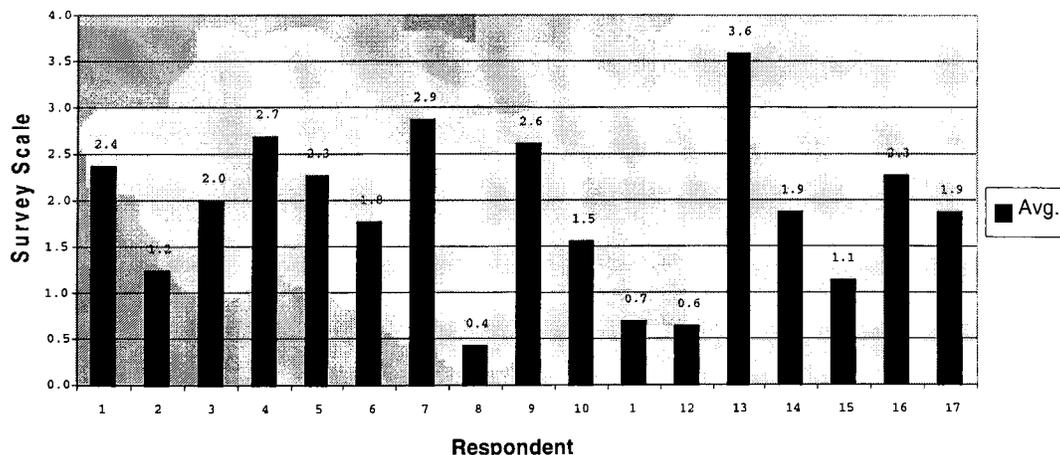
CHAPTER 4: RESULTS AND ANALYSIS

Results

The surveys were administered to all professional staff during professional development time that is set aside each Thursday afternoon. The first survey was given in January and the second in June of 2002. The rationale and purpose for the survey was explained and it was done on a voluntary basis. Teachers worked through each of the questions on the survey with some support on those questions already identified. Teachers used their names on the surveys but they were used for identification purposes only and appear as letters in the results table. The items on the survey were numbered 1 through 11 with sub sets of indicators for questions 6 through 11. For the purposes of the graphs the questions appear as data points 1 through 22.

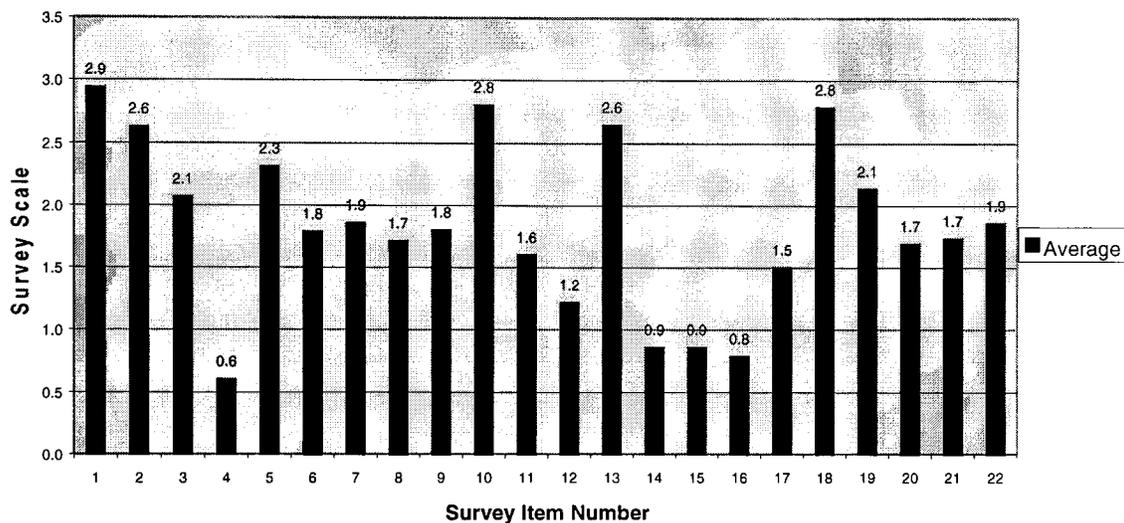
Table F1 clearly shows the diversity of experiences and skills that make up the school staff. Some teachers are very comfortable with all aspects of technology and some have a very limited sense of their own skill level. There is a range of 0.4 to 3.6 when all responses are averaged. The diversity becomes clear when seen in Figure 1 where the wide range of skills is clearly shown.

Figure 1
January Results by Individual



The diversity exhibited by the staff was also reflected in the responses to individual survey items. Here again depending on the question or area the responses were widely varied, as there was a range of 0.6 for question 4 to a high of 2.9 for question 1. This range can be clearly seen in Figure 2.

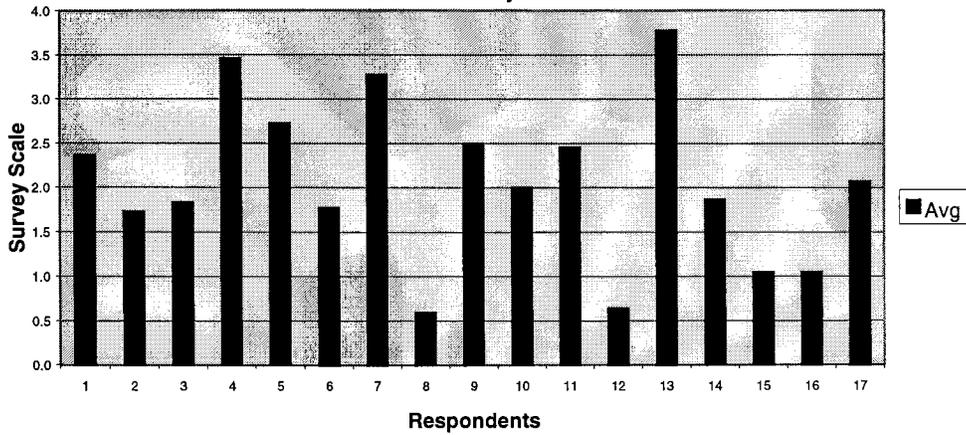
Figure 2
January Survey Results by Item



The follow-up survey, which was conducted in June, indicates that the diversity displayed in January in terms of teachers' perceived skill level still exists. The range has not significantly narrowed, with individuals reporting averages between 0.6 and 3.8 for the whole survey (see Figure 3).

While looking at this pooled data in terms of how teachers have responded to the questions, it is probably of greater benefit to look at the individual items. The survey covers a wide gamut of technology-based skills so each item is really addressing significantly different skill sets. What has changed is the response to individual items and the analysis of that change will be reviewed in the following section of this paper.

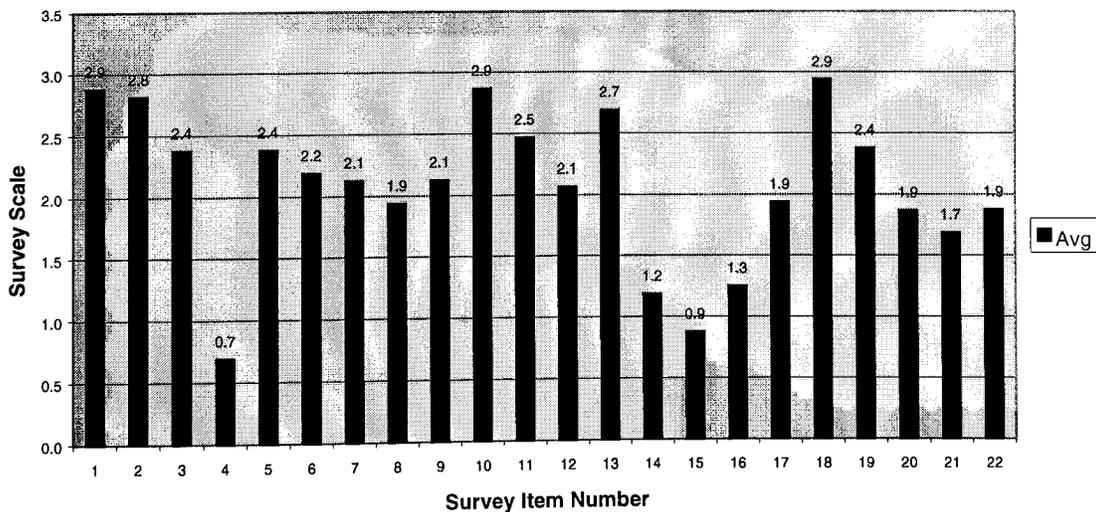
Figure 3
June Results by Individual



There is change from the January survey in the responses to individual items.

Several questions have seen dramatic increases in the level of response and it is clear that some learning has taken place during the period of this survey. Figure 4 clearly shows that all items except 4 and 15 are now averaging over 1.0 with most responses (18/22) approaching or surpassing 2.0 which means that for most areas on the survey the staff as a group have at least used the skills described.

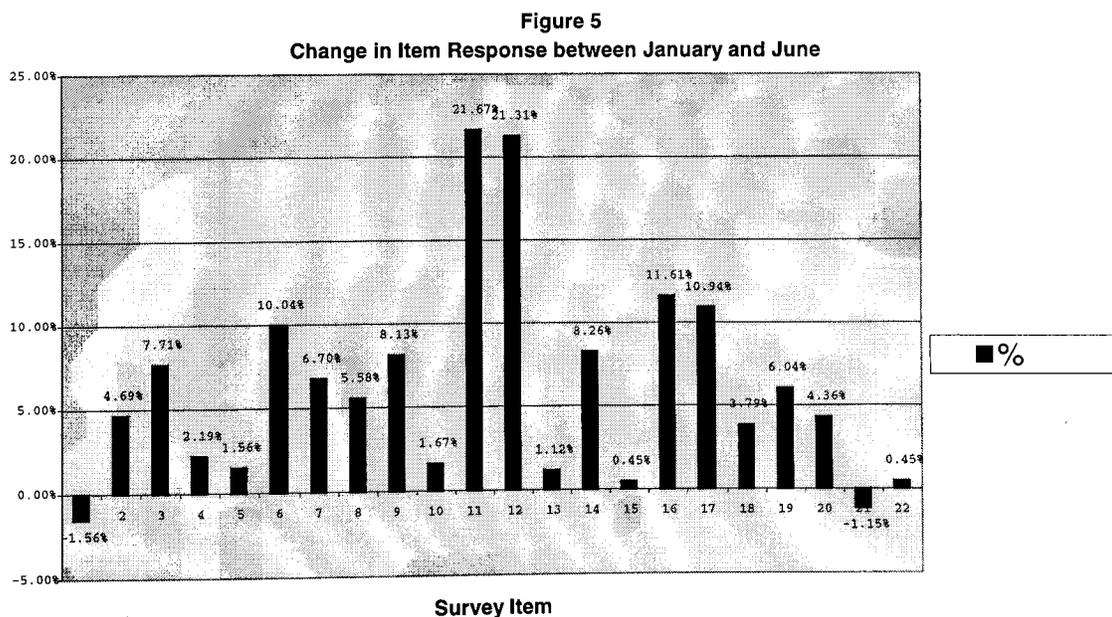
Figure 4
June Survey Items Results by Item



Analysis

The purpose of this survey was to see if change had occurred over time in teacher perceptions of their own computer skills. The pre- and post-tests appeared to indicate that some change had occurred. The next step in determining the level of change was to directly compare the results between the two surveys. Appendix D is a compilation of the two surveys and compares and contrasts the results from each survey. It notes the ranking of each items average result as well as the percent of change from January to June.

In Figure 5 it is clear that some computer skills were significantly developed during the survey period. Data points 11 and 12 stand out as having increased over 21% between surveys. These two items both deal with printing and scanning images into the computer (Items 7a & 7b on survey). This was a specific skill that was taught during PD days, after work sessions, and in one-on-one mentoring sessions throughout the term. Teachers had identified it as an area in which they wanted more expertise and they were able to develop that expertise within the PD plan of the school.



Data points 16 and 17 also saw a significant increase of approximately 11%. These correlate with survey items 9c and 9d. Specifically these deal with the use of video and clip art. The desire to work with video and digital images was expressed by many members of the staff and here again it is clear that they were able to pursue this learning during the term. In fact, many teachers took on video projects with their students--so many in fact that the school server's hard drive was filled by early June and additional storage solutions had to be developed to handle the volume of video and digital projects being created in the classroom.

Equally as interesting as the large changes were the areas that saw little or no growth. In fact, two data points in Figure 5 indicate that responses in June were below those in January. Specifically, questions 1 and 11c on the survey saw a small drop of approximately 1%. Item 1 deals with Internet use and was ranked as the highest skill area in January and as the second highest in June. The drop can probably be explained through slightly inconsistent responses between the two surveys. Item 21 dealt with presentation software and can be explained the same way.

Low change was also noted in survey items 4, 5, 7a, 8, 9b, and 11d (data points 4, 5, 10, 13, 15, and 22 on Figure 5). Items 5, 7a, and 8 had strong results in January so these were not areas in which teachers had identified as areas for growth. Using e-mail (Item 5), printing images (Item 7a), and the use of technology in the classroom (Item 8) were already seen as areas in which teachers felt confident so it is not surprising to see little change between surveys. One has to also factor in that question 8 was asked as a Rubric and needs to be interpreted as an Agree/Disagree rubric and with an average result of 2.7 in June it is clear that teachers are making an effort to incorporate technology into daily practice.

Items 4, 9b and 11d did not score high results in either survey. Item 4 deals with web design and is clearly an area that teachers did not expand in expertise or experience. When looking at the goals set out by teachers for this period (see Appendix B), web design is not listed so it is not surprising that this skill was not developed. A school web page is planned for the 2002/2003 school year so there may be more interest in web creation as teachers will be able to apply this skill with their students.

Item 9b asks about proficiency using animation and again its use was not a priority for teachers. Animation is generally involved when accessing educational software (e.g., Reader Rabbit, Wiggleworks) where animated characters appear interacting with students as they engage in whatever the software's learning is about. I think teachers interpreted this question in terms of creating animations and not just using them so that may explain the low scoring. It might be a good area to follow up with in interviews or in subsequent skill surveys.

There are low results, both in perceived proficiency and in change, for item 11d. This question deals with the use of software like Hyperstudio and scored 1.9 in both January and June. This is a program that is installed on every computer in the school. It is a staple program for Division II students in creating research reports or presentations and as such I would not be surprised to see significant differences between Division I and II teachers on this question. The responses were not sorted in this way but it might make an interesting analysis at a later date. I also believe that some teachers may have been thinking only of Hyperstudio when answering the question and forgetting the work they have already done with KidPics, iMovie, or PowerPoint.

Survey items 8 and 10 deal with teacher attitudes towards technology and, as already noted, teachers responded within the 0-4 Rubric on an Agree/Disagree basis. Question 8 asks if teachers attempt to incorporate technology where appropriate (see Appendix E) and, with an average score of 2.9, the staff as a whole is in agreement with technology use in the classroom. Item 10 asks if teachers think the use of graphics, video sound, and animation can impact classroom teaching and again the June average was 2.7. The positive response in these areas may help to explain why there was success in many areas of skill development. With teachers being positively disposed to using technology and seeing the value in terms of its impact it would be a natural outcome that teachers would want to expand their skills in an area seen as valuable. In fact, by June only one teacher had a score below 2 in answering question 8 (Table F2) which would appear to suggest that technology in some form is used in all classrooms of the school.

CHAPTER 5: CONCLUSION

This project began with the hypothesis that a “job-embedded” model of professional development will prove to be an effective strategy in assisting teachers in technology skill development. The data and analysis serve to confirm that teachers were engaged in learning over the course of the school year. Thus the beginning hypothesis can be seen as correct; however, beyond that conclusion there are a variety of implications that this data indicates. These implications need to be considered in light of the findings in this project.

A school is a collection of professionals who bring with them a wealth of different talents and gifts. The idea that one could design a professional development plan based on workshops and simplistic “one size fits all” programming is not supported by either the current research or by the data collected in this survey. Activities that would be overwhelming for some would be of little value to others. Figure 3 clearly indicates that the staff is in different places in terms of their own learning. Efforts to support skill development need to be tailored to individual needs, skill levels, and temperaments. This means that professional development needs to be multi-faceted in its planning and implementation in order to meet these diverse needs.

When looking at the individual responses to the two surveys it appears that most teachers saw change in their own skill level with technology. There was an overall increase of nearly 5% between the two surveys in overall average. This figure misses the fact that some teachers see their skill level as very low and did not experience a great deal of change in their perceived skill level throughout this period. Two teachers that indicated

their skill level below 1 in January continued to be below 1 in June. It would appear that in the case of these teachers the professional development plan did not meet their needs. There needs to be more work in bringing these professionals up to the level where they feel comfortable in implementing and using technology in their practice. Of equal interest are those teachers who have identified themselves as experts in technology.

How to maintain skill levels and interest is important for these people as well. Many times someone who is good at using technology becomes the “tech specialist” for the school in an official capacity or not. This role can be daunting as their colleagues pull these teachers in a variety of directions and their own skill development can be limited by their constant attention to others. Those who are already working at a high level in technology must be given opportunities for growth and challenge as well. Professional development needs to be seen beyond the deficit perspective in which areas of need are identified but also from one that would seek to identify opportunities for all involved.

In reviewing the data from this project there were still areas that need to be addressed in terms of teachers’ own skills. The most striking is the need for more opportunities to work in web design. Teachers were very strong in the use of the Internet, and having the capacity to not only use but also contribute to the World Wide Web would open a world of possibilities for both teachers and students. There needs to be a real application for this skill and the creation of the school web site would be an excellent vehicle through which teachers could apply and expand their skills in web design.

It was opportune that there was an effort to collect data on ICT implementation at the same time as this skill survey was being conducted. The survey results that show that growth in teacher skill level is correlative with the findings that technology use has

grown as well. The ICT review indicates an 8% rise in teacher use and an 18% rise in student tech use over the same period last year (see Appendix C). This rise is in conjunction with the identified rise in teacher skill perception. There is not enough evidence to suggest teacher skill acquisition is causal to the change in ICT implementation; however, it is at a minimum complementary. There needs to be further work done to determine a more direct link between the two phenomena but it would be a reasonable assumption that as teacher confidence grows with the use of technology, so too will their willingness to use it inside their practice.

The Calgary Board of Education (CBE, 2002) has initiated a School Quality Review program for all schools. This program asks to schools to examine its current practices in terms of a variety of school characteristics, including “. . . student achievement, school culture, learning and teaching, and school development” (CBE, 2002, p. 9). The data collected as part of this project will form the beginning of the process for Woodlands School in the area of school development, specifically in technology.

The School Quality Review is described as a process of continuous critical inquiry that can be defined as “. . . a way of deliberately connecting knowledge and action to transform practice in schools” (CBE, 2002, p. 5). This process can be summed up in the following: “Schools gather data, create meaning through dialogue, articulate assessments, and deliberately connect knowledge and action. Continuous critical inquiry relies on clear criteria, credible evidence and open, appropriate questioning of practice” (CBE, 2002, p. 5).

The work done in assessing teacher skill in technology can be seen as part of this cycle of critical inquiry. It is ongoing and cannot be seen as an isolated activity that we have now “finished” and can then be put aside as one would put aside the latest educational journal. This work forms the basis of what we do in schools and has raised questions along the way about how teachers do their work with children and how they engage in professional learning. It has confirmed that professional development does have an impact on what happens in schools. It is not a futile, time-consuming exercise but is rather a fundamental agent of renewal and change.

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APPENDIX A

Examples of “Ask Me About” Notes and “Dear Me” Goals from Woodlands Staff

Ask Me

- Ask me how to install smart board software to use smart board in your class.
- Ask me how to use the pens and highlighter on the smart board.
- Ask me about PowerPoint.
- Ask me about Boolean searches.
- Ask me about how you access dollars to expand the tech. Resources you have to expand learning resources for kids. Tell me about how we can ‘spotlight’ your student’s ICT celebrations at the 20th day party.
- Ask me about Hyperstudio, smart board (event board, using the Internet, smart notebook).
- Ask me about how to log on and use the school’s server.
- Ask me about how to connect the digital camera to the I-Mac and use I-movie to produce a motion picture.
- Ask me about when to use various output types on the office scanner.
- Ask me about how to take stills/video on our digital camera.
- Ask me about downloading pictures onto the server.
- Ask me about how to set up the smart board equipment.
- Ask me about how to scan a photograph and where to save it.
- Ask me about how to copy from the Internet and save it to the smart notebook.
- Ask me about how to use Kai’s Photo Shop, the new scanner, and how to save to a server file.
- Ask me about how to scan Wetland’s poetry and then e-mail to Docutech, or put on web page per student.
- Ask me how to use I-movie to create Alien presentations.
- Ask me about sharing folders on the server.
- Ask me about using image-editing software.
- Ask me about scanning.
- Ask me about I-movie.
- Ask me about smart notebook.
- Ask me about MS office.
- Ask me about how to file pictures.
- Ask me about I-movie.

Dear Me

- I'd like to use a PowerPoint approach to have students do a language arts presentation.
 - Resources: Power Point installed on all machines. Other teachers to help me learn how to do/use Power Point.
- Kids take digital pictures of themselves, in science, displaying their building things creations. They will import these pictures into writing about their building--what simple machines are used and how.
 - Resources: Digital camera, download.
- With a group of students and their teachers provide a video log of how the process and project evolution of a project progressed, then share the project video graphically.
 - Resources: Video camera and students, video software and the technology. Teachers who want to share their talent in constructing the shape and results. Inspiration, sound software and microphone.
- Internet research re topics: Science: Wetlands, Electricity
Social: Native Indian tribes, Herons, Iroquois, Algonquians
- I will work to have students' K-6 record 'Musical' memories on a CD.
- I-Movie of the Science Fair. Book page for yearbook of Greek characters and write-up.
 - Resources: Pictures, camera, picture-scan, grade 6 team and staff members to help.
- Create a class book on their mythological creatures and make them available for web pages.
- Use smart board for L.A.
- Learn to use digital camera.
- Get my staff folder up and running so students can e-mail files.
- Mathematics...integrating 'Operations' unit with technology.
 - Resources: Spreadsheets, Internet.
- Smart board...classroom learning too!
 - Resources: Smart board, health, and language arts.
- Students use email to send me assignments and write a "persuasive letter" and send it to an "appropriate" reader (example: Mayor Bronconnier).
 - Resources: Set up e-pals for classroom.
- We'll do the evening news. It was already part of the plan.
 - Resources: I-movie.
- Make a school CD, audio, could it also be video? I-movie?
 - Resources: People to produce, resources to make/ produce.
- Work with grade 5 buddy class to do word processing and downloading a picture: Me, My Buddy, and I.
 - Resources: colleagues.

- Retell a fairy tale: word processing.
- To have students use the 'stills' and video footage taken at Heritage Park to share their learning through technology.
 - Resources: Slide show (Hyperstudio), Video show (I-movie), colleagues.
- To use the digital camera and scanned images to produce a slide show using Kid Pix
 - Resources: Time to play, Sony digital camera, new scanner, Kid Pix Deluxe.
- Use the digital camera and produce a slide show using Kid Pix or PowerPoint.
 - Resources: 2 copies of Kid Pix deluxe, digital camera, colleagues for help with digital camera and downloading.
- Create book /slideshow – I-movie or PowerPoint/ 1page per child. Fairytales /me unit.
 - Resources: Scanner, colleagues.
- Students create an integrated multimedia package that celebrates the learning in the classroom. E.g.: KD project.
 - Resources: Time with students, I-movie, I-Mac, Wes software/ Hyperlink resources.

APPENDIX B

Agenda for January 2002 Woodlands School PD Day

Woodlands PD Day # 2

Jan 21 2002

Focus on SEP Goal #3

Inclusion of Technology in Core Curriculum- Goal: Continue to be a leader in providing technology learning opportunities for students

Background –In our SEP we set technology learning as a one of our actions. In support of that action we have designed a day that will afford us all an opportunity to utilize that most precious of all resources...Time! Today is to be a day for teachers to pursue their own learning, in their own way, with topics and resources of their own choosing.

In the interests of logistics, specific times have been set aside so we can have support for certain tools and resources available. You are not limited to these choices and you are free to pursue that learning which will help in the achieving of our goal of technological literacy for staff and students.

You could:

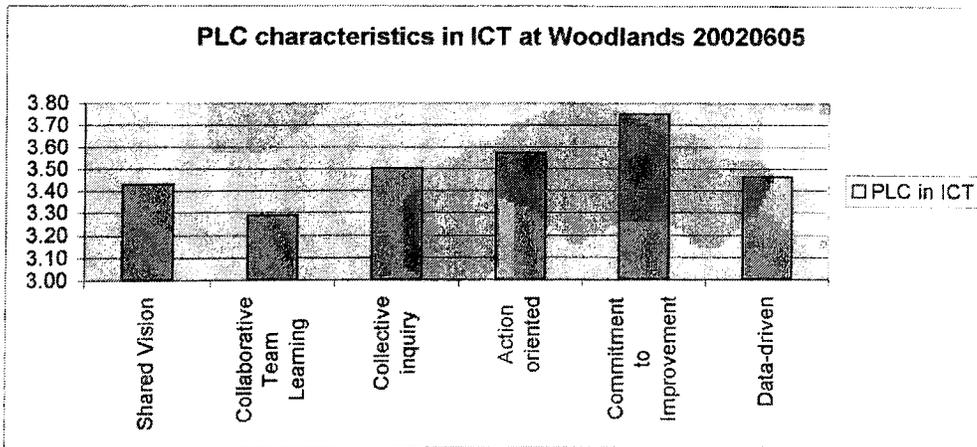
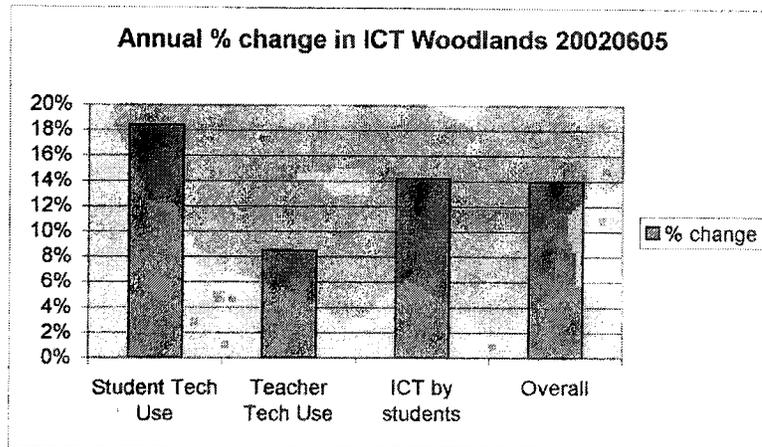
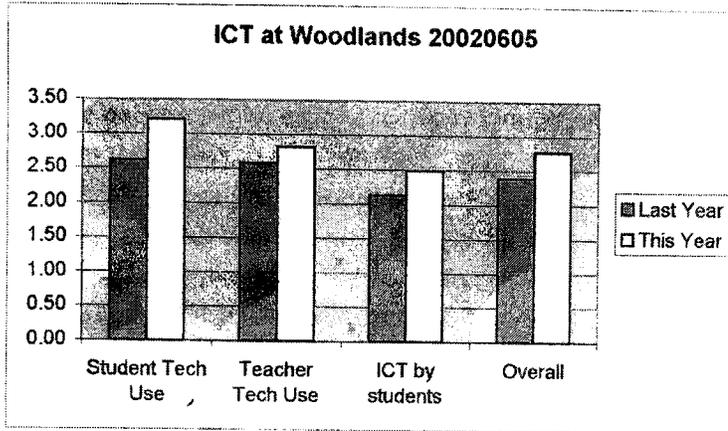
- Take the video camera for a spin and then star in your own iMovie!
- Take some digital pictures and then use those images in some of our software applications
- Learn about our server possibilities
- Get to know that classroom computer
- Rummage through our software collection for ESL, Curriculum or Research Resources and then try them out!
- Create a Web Page
- Plan a Web Quest
- Try out the new scanner
- Smarten up with the Smart Board
- Explore some “productivity” (a techie buzzword!) software like Microsoft Office(Word, Excel, PowerPoint) or Appleworks
- Try out the many possibilities inside Outlook Email
- Check out the many resources available via the Web

The day is set up for individual, group and staff learning. Find a “Tech” buddy and work towards developing some new understandings that will impact your practice. What could you do in the next 5 months to impact your students learning and expand your own set as well?

Keep it Simple and Relevant!

APPENDIX C

ICT Survey Results



APPENDIX D

Principal's Permission for use of Survey Data

Dear Carol:

I am conducting a study of teacher professional development at our school, specifically in the area of technology. The purpose of this study is to develop an understanding of how these skills are being developed by teachers. I anticipate that we all will benefit from participation in this study in that future PD planning in technology can be designed to better meet individual needs. I would like your permission to use and analyze data collected during our Jan 21 PD Day. The purpose of that data collection was to contribute towards the planning of our School Enhancement and Technology plans. I believe this project will be directly applicable to those plans. In conjunction with the teacher skill survey I would also like to use the data collected on our school by Nancy Brown in her AISI project. The responses teachers gave to ICT integration would provide context for the skill survey results.

Please note that all information will be handled in a confidential and professional manner. When responses are released, they will be reported in summary form only. Further, all names, locations, and any other identifying information will *not* be included in any discussion of the results. The data will be reported as pooled results rather than as individual. You also have the right to withdraw your permission for the use of this data from the study without prejudice at any time.

If you choose to do so, please indicate your permission by signing this letter in the space provided below, and return the letter to me.

I very much appreciate your assistance in this study. If you have any questions please feel free to speak to me directly or email me at agwilson@cbe.ab.ca. Also feel free to contact the supervisor of my study (Dr. Rick Mrazek, 403-329-2452, mrazek@uleth.ca) and/or the chair of the Faculty of Education Human Subject Research Committee if you wish additional information. The chairperson of the committee is Dr. Keith Roscoe (403-329-2446, keith.roscoe@uleth.ca).

Sincerely,

Alastair Wilson
Assistant Principal
Woodlands School
403-777-8640/agwilson@cbe.ab.ca

Name of Research Project: **Woodlands School Technology: A Job Embedded Model of Professional Development**

Name of Investigator: **Alastair Wilson**

I agree to allow the release of the PD survey results to be used in the manner described in this letter.

Carol Dauphinee
Principal
Woodlands School

Signature: _____ Date: _____

APPENDIX E

Computer Skills Survey of Woodlands School Staff

The following is a Pre-/Post-survey, which I will use to help me evaluate the work that is being done this year in the area of technology skill development. I want to see what, if any, impact your own professional development has on your practice in the area of technology.

Please answer the questions honestly. Your name is required only to ensure that I have received a response from all members of staff and to relate the pre- and post-test responses. It will be removed from the results of the data analysis to ensure complete confidentiality.

Your Name: _____

(Pre/Post) Section A**Technology Skills**

Part A has been adapted with permission from a U of L Computer Skill Survey

For these questions, you are asked to place yourself on a scale of comfort. The scale is as follows:

- 0 - I am completely unfamiliar with any of the described skills.
- 1 - I have seen someone use the described skills.
- 2 - I have used the described skills, but usually have to get help.
- 3 - I am comfortable with the described skills.
- 4 - I teach others the described skills.

For the following skills, please provide your comfort level.

1. I know how to open up an Internet browser and navigate between pages using the hyperlinks. **Select 0 1 2 3 4**
2. I know how to perform an Internet search using different search engines, and implementing basic Boolean search strategies to help narrow my searches to better find what I am looking for. **Select 0 1 2 3 4**
3. I use the Internet to help find resources for my lessons, as well as to exchange information with other teachers and schools to help broaden the audience that my students' work receives. **Select 0 1 2 3 4**
4. I can make a simple web page using either Netscape Composer or a similar web page editor that has graphics, text and links to other sites for my students. **Select 0 1 2 3 4**
5. I can send and receive e-mail to other teachers along with sending and decoding graphics and attachments. **Select 0 1 2 3 4**

6. I know how to:
 - download graphics. **Select 0 1 2 3 4**
 - resize graphics. **Select 0 1 2 3 4**
 - alter graphics. **Select 0 1 2 3 4**
 - use a graphic within a project. **Select 0 1 2 3 4**

7. I know how to:
 - print images. **Select 0 1 2 3 4**
 - scan images. **Select 0 1 2 3 4**
 - import digital images into a computer. **Select 0 1 2 3 4**

8. I attempt to incorporate technology into my lessons whenever appropriate. **Select 0 1 2 3 4**

9. I am proficient in using:
 - sound clips. **Select 0 1 2 3 4**
 - animation. **Select 0 1 2 3 4**
 - video clips in presentations. **Select 0 1 2 3 4**
 - clip art to help augment my classroom teaching. **Select 0 1 2 3 4**

10. I think that the use of graphics, video, sound, and animation can change the impact of teaching material, or be used to enhance it. **Select 0 1 2 3 4**

11. Please rate your proficiency with the following software:
 - Spreadsheets (e.g., Claris, Excel). **Select 0 1 2 3 4**
 - Databases (e.g., Claris, Filemaker Pro, Access). **Select 0 1 2 3 4**
 - Presentation Software (e.g., PowerPoint). **Select 0 1 2 3 4**
 - Multimedia authoring software (e.g., Hyperstudio). **Select 0 1 2 3 4**

APPENDIX F

Staff Skills Survey Results

Table F1
January Skills Survey Results

Name	Q1	Q2	Q3	Q4	Q5	Q6a	Q6b	Q6c	Q6d	Q7a	Q7b	Q7c	Q8	Q9a	Q9b	Q9c	Q9d	Q10	Q11a	Q11b	Q11c	Q11d	Avg
A	3	3	3	0	2	3	3	3	3	3	3	3	3	1	1	1	3	2	1	3	3	2	2.4
B	2	2	1	0	1	2	2	1	1	2	1	1	2	0	0	0	0	3	3	1	1	1	1.2
C	4	3	3	0	0																		2.0
D	3	4	4	3	4	3	3	3	3	4	1	1	3	1	1	1	3	3	3	3	3	2	2.7
E	4	4	3	0	4	3	2	2	2	4	2	1	4	1	0	0	2	3	3	1	2	3	2.3
F	3	3	3	1	2	1	1	1	1	3	2	0	2	1	1	1	1	4	2	2	2	2	1.8
G	4	3	3	0	4	3	4	3	4	4	2	3	3	1	3	2	3	3	4	1	3	3	2.9
H	1	1	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	4	0	0	0	0	0.4
I	4	4	3	1	3				3	3	3	2	3	2	2	2	2	3	3		2	2	2.6
J	3	2	2	0	2	1	2	2	1	2	1	1	2	1	0	0	2	2	2	2	2	2	1.5
K	2	1	1	0	2	0	0	0	0	0	0	0	1	0	0	0	0	3	1	1	1	2	0.7
L	1	1	0	0	1	1	1	1	1	3	1	0	2	0	0	0	0	0	0	0	0	1	0.5
M	4	4	4	3	4	4	4	4	4	4	3	4	4	3	3	3	4	4	4	3	2	3	3.6
N	4	4	1	1	2	1	1	1	1	4	2	1	3	1	1	1	1	3	2	2	2	2	1.9
O	2	0	0	0	3	1	1	1	1	3	1	0	3	0	0	0	0	2	2	3	1	1	1.1
P	3	3			2	2	2	2	2	3	2								2		2		2.3
Average	2.9	2.6	2.1	0.6	2.3	1.8	1.9	1.7	1.8	2.8	1.6	1.2	2.6	0.9	0.9	0.8	1.5	2.8	2.1	1.7	1.7	1.9	1.9

Table F2
June Skills Survey Results

Name	Q1	Q2	Q3	Q4	Q5	Q6a	Q6b	Q6c	Q6d	Q7a	Q7b	Q7c	Q8	Q9a	Q9b	Q9c	Q9d	Q10	Q11a	Q11b	Q11c	Q11d	Avg	
A	2	2	2	0	2	3	3	3	3	3	3	3	3	2	2	2	3	3	2	3	3	0	2.4	
B	2	3	2	0	2	2	2	2	2	2	2	2	2	1	1	1	1	3	2	2	1	1	1.7	
C	3	3	4	0	0	3	2	2	3				3	0	0	0	1	2	3		0	4	1.8	
D	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	3	4	4	3	3	3	2	3.5	
E	4	4	3	0	4	2	3	2	3	4	3	2	4	2	0	1	4	4	4	2	2	3	2.7	
F	3	3	3	1	2	1	1	1	1	3	2	0	2	1	1	1	1	4	2	2	2	2	1.8	
G	4	3	3	0	4	4	4	3	4	4	4	4	4	2	0	4	4	4	4	1	4	4	3.3	
H	0	1	0	0	1	1	1	1	1	1	1	0	3	0	0	0	0	3	0	0	0	0	0.6	
I	3	3	3	1	3	3	3	3	3	3	3	3	3	1	1	1	3	3	3	2	2	2	2.5	
J	4	2	2	1	3	3	2	2	2	2	2	2	2	1	1	1	2	1	3	2	1	3	2.0	
K	3	4	3	0	2	2	2	2	2	3	3	3	0	3	2	2	2	4	3	3	3	3	2.5	
L	1	1	0	0	1	1	1	1	1	3	1	0	2	0	0	0	0	0	0	0	0	0	1	0.6
M	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	3	3	3	3.8	
N	4	4	1	1	2	1	1	1	1	4	2	1	3	1	1	1	1	3	2	2	2	2	1.9	
O	3	2	1	0	2	0	0	0	2	2	2	2	2	0	0	0	1	4	1	1	0	0	1.0	
P	2	2	3	0	3	1	1	0	0	1	1	1	2	0	0	0	0	1	2	2	2	1	0	1.0
Average	2.9	2.8	2.4	0.7	2.4	2.2	2.1	1.9	2.1	2.9	2.5	2.1	2.7	1.2	0.9	1.3	1.9	2.9	2.4	1.9	1.7	1.9	2.1	

APPENDIX G

Ranking and Percent Change of January and June Survey Items

	Q1	Q2	Q3	Q4	Q5	Q6a	Q6b	Q6c	Q6d	Q7a	Q7b	Q7c	Q8	Q8a	Q8b	Q8c	Q8d	Q9d	Q10	Q11a	Q11b	Q11c	Q11d	Over-all
Jan. (Avg.)	2.93	2.63	2.07	0.6	2.31	1.79	1.85	1.71	1.8	2.8	1.6	1.21	2.64	0.86	0.86	0.79	1.5	2.79	2.13	1.69	2.3	1.73	1.86	1.87
Jan. Ranking	1	5	8	22	6	12	9	14	11	2	16	18	4	19	19	21	17	3	7	15	13	9		
June	2.87	2.81	2.38	0.69	2.38	2.19	2.13	1.94	2.13	2.87	2.47	2.07	2.69	1.19	0.88	1.25	1.94	2.94	2.38	1.86	1.69	1.88	2.07	
June Ranking	2	4	7	22	7	10	11	14	11	3	6	13	5	20	21	19	14	1	7	17	18	16		
June/Jan. Diff.	-0.06	0.19	0.31	0.09	0.06	0.40	0.27	0.22	0.33	0.07	0.87	0.85	0.04	0.33	0.02	0.46	0.44	0.15	0.24	0.17	-0.05	0.018	0.20	
% Change	-1.56	4.69	7.71	2.19	1.56	10.04	6.70	5.58	8.13	1.67	21.67	21.31	1.12	8.26	0.45	11.6	10.94	3.79	6.04	4.36	-1.15	0.45	4.89	
Change (Ranked)	22	12	8	15	17	5	9	11	7	16	1	2	18	6	19	3	4	14	10	13	21	20		