# OECD/CERI ICT PROGRAMME

## A Case Study of ICT and School Improvement at Lakeview Regional Secondary School

## Developing Intrinsic Motivation and Life-long Learners through Authentic, Relevant Projects Using ICT in the Only Secondary School in Its Division

## Overview

Lakeview Regional Secondary School (LRSS), an academic/vocational school of 704 students, developed extensive and unprecedented use of computers to complete real projects for the community. The Socratic method used individually in conferencing put students in charge of their own learning. The following is an example of authentic, relevant projects using ICT in action.

1. The teacher gave the following assignment: Design a canoe/mountain bike trailer.
2. The teacher gave a brief introduction to the computer application..
3. *Our assignment for CAD is the canoe and bike trailer that they are building. ... two students ... are working together ... they have to produce the manual on how to build this.* [1]
4. The teacher taught students on a 'need to know' basis.
5. The students proceeded independently.
6. The students researched on computer and in books.
7. *They do the three-dimensional ones (drawings) on Illustrator.*[2]
8. Students worked in pairs sporadically. It depended on the project, because usually they worked alone. In one case a second student developed the schematic for welding and followed through to complete the project.
9. The teacher and students negotiated the completeness and accuracy of the project.
10. When completed, the trailer was to be sold to the staff member who founded the Mountain Bike Club.

The innovative teachers used new pedagogy in three ways:

The teaching was individualized. This was only possible because of the 325 computers. 175 were in labs where 80% of the teaching was individualized. In the technology labs when students finished a course they might move ahead. Some fast students might finish two courses in one semester. The teachers called it 'independent self-paced study.'[3] The removal of time constraints produced a 'no failure' situation for the students.
*Through all of this the teacher is seen as facilitator:*

*Assists students as they navigate through the information made available through information technology and other sources.*
*Directs students as they gather, organize, analyse, and present their findings,*
*Helps students develop, focus, refine, consolidate and extend their abilities.*[4]

1. The innovative teachers assigned authentic, relevant projects in which the teachers connected the students to the business community. Technology, technical English,[5] Canadian Law, ecology, mathematics, geography, science, and visual arts were areas that were developing project-based work using ICT. Examples of the projects were videos, graphic designs, logos, resumes, menus, a grant proposal, store inventories, maps for a lumbering company, a colouring book for the Wheat Marketing Board, a trailer for mountain bikes and canoes. One girl developed a Website for her municipality and has become the information co-ordinator. She will design the site, and take it to the technical English students to research different areas that the municipal offices want to cover in the site. Then she will organize it. The projects were dependent on ICT. By the number of requests, the community valued the high quality work.[6] Parents felt ICT skills were highly important.[7]

1. Conferencing played the third and vital role in teaching and learning. The innovation teachers moved about dialoguing with individual students. When a student needed help the teacher or another classmate was there. During the dialogue the teacher would offer suggestions, use reflective speech, ask questions, and only offer information when necessary. One of the school's goals was to have students take more responsibilities for their own learning. This was achieved through conferencing. During a conference I observed a teacher read a student's computer screen, offer the student a compliment, and pose four questions about his work. The student suggested the direction for the follow-up.[8] This conference showed the teacher and student as partners in the learning process.

The glue that binds this innovative school was:

- the chain of support: administrators, teachers, parents, and community moving the critical mass toward its common goal, relevant learning as a life-long pursuit,
- the strong community partnerships with industry, which provided generous funding, and
- the adequate supply of ICT that allowed students to pursue individualized project-based learning and allowed teachers to conference with students as partners in learning.

## The Past

LRSS was built in 1972 in small town in an agricultural valley in a central Province of Canada. In 1991 the provincial government presented a thrust to have students learn electronics through a 'Hub' programme Mr. G, a physics teacher, now retired, had been teaching good physics students for a long time, but these students did not become motivated through traditional teaching. Mr. G talked with his supportive administration. The response came back,
*How can we help you?*[9]
The principal was very pro-technology so he and this physics teacher decided to modify the 'Hub' to become an electronic and technology programme where every student would progress at his/her own rate. Mr. G, noticed that the students gravitated toward the computers so he started with what the students wanted. His principal permitted him to teach physics half time and for the other half-day he was free to invite students to participate with what materials were then available: a robotic arm, some electronic equipment, six computers and some computer programming. The students continued to choose technology. In one year the teacher built the programme to over 100 students with 36 computers. They were always short of computers; they had to put students all over the school, but things always got better. If it was desktop publishing, the student had to produce an appropriate project. Second and third level courses were more personalized where the teacher interviewed the student as to career goals and this dictated the course of studies. It was highly individualized, and focussed on broad-based technology. Students were nurtured and they became highly excited about learning. The teacher stayed in the classroom over lunch so the students could work. If students finished one tech course early, they could go on to another course. Some completed two courses in one term; others needed more time.[10]
In this individualized project-based classroom learning became a collaborative affair; roles were reversed. The students

took charge of their learning. To have the ability to give students the opportunity for intrinsic motivation was a very exciting process.[11]

Gradually this computer-based information technology programme took on a new dimension. The students' projects reached out to the business community and this stimulated multiple educational partnerships. The students gained marketable skills. They looked at long term goals, at time management, and how to help others who were having difficulties. For evaluation the students brought in their work; together it was graded on a page. At report card time the students handed in their pages. There was negotiation because Mr. G treated the students as adults. Student assessment expanded to portfolios and exhibitions.

The physics teacher experienced no resistance to the innovation. His principal, the teachers, the superintendent, the local Board of Education, and parents shepherded the programme through the fragile period. The hardest thing for this innovation was the fact that nothing was laid out; there was no history for this type of teaching. One was always learning new programmes; and there was always a need for more computers, which were critical for successful operation. The infrastructure was altered as new windows were added internally to the classrooms to improve supervision. Students' desks were replaced with computer workstations. Technicians were hired. Fewer textbooks were ordered. The leadership was extremely resourceful raising funds through partnerships. Mr. G had time (three years '96-'99) to mentor a young teacher, to carry on his vision of active learning, using ICT for the purpose of intrinsically motivating students towards lifelong learning. They were given freedom to fail and with that came the opportunity to innovate. The stakeholders applauded the innovation and the innovation produced amazing results. The visionary teacher was learning along with his students. This modelling, the relevance and authenticity of the projects, the alterations to the infrastructure, generous funding from partnerships, flexible pacing of assignments, student choice of project topics were all factors that led to marketable projects, whose quality may be highly evaluated because they were used by the business community.

## The Present

## Modelling

Modelling productive learning habits played a serious role in learning at LRSS, a high school of 40 teachers, 3 administrators, and 704 students of diverse cultural backgrounds. About one quarter of the students were aboriginal and this number was constantly increasing. Seventy-five of these were from reserves and some were 'home-placement' students who lived in town during the week and went home on weekends. Forty of the 704 were over the age of twenty-one. Most of these students took their courses off-campus. To expand the idea of modelling, five junior feeder schools brought their students for visits to LRSS, and enrichment students came as part of their programme. This heightened the enthusiasm the junior students had to graduate into LRSS.

Teachers considered themselves 'self-taught' in the use of ICT.
*Most of my training has been hands on and by myself.*[12]
It was common for the teachers to express the view that they
*... can't know everything about everything...*[13]
and from another view point:
*by the time the Auto CAD kids are done for example, they know more about Auto CAD than I do.*[14]
The students saw their teachers open to learning and willing to accept the notion that there was much more to learn. This modelling prevailed throughout the learning environment.

Before classes, the daily staff meeting updated teachers with critical information about students. Teachers were more responsive to students than is generally expected. Classes were so arranged that students could have the same homeroom teacher throughout their high school years. If a student wanted to quit school, the student's teacher, the principal, the student and his/her parents met at the school where much accommodation was offered to encourage that student to remain in school. There were no discipline problems in the innovative classrooms.
*We don't really deal with discipline. We don't have to. Somebody asked me where the referral sheet was for the office and I said, "I don't know what you're talking about".*[15]

Of the one hundred and twenty students who graduate each year, twenty percent went to university, fifteen percent went to college or technical school and most of the remaining students entered the workforce or started their own business.[16] The school hired former students in the technology area. These students demonstrated positive modelling with ICT.

The principal took a strong stand for a student-centred school to promote individualized, active, project-based learning realized through ICT. He stated most of the teaching practices had 'arrived'.[17] The research observations would prove this to be true. The same was true that thirteen of the school's fourteen goals had been realized.[18] The principal's personal opinion statement was confident, supportive of the innovation, and totally respectful of his staff's ability to choose what was best for themselves and their students. It was a dynamic example of leadership and respect.

## Technology and Its Uses

The school was richly equipped with technology. There was one computer for every two students. Computers were employed in a wide range of other classrooms besides the two technology labs. The Technical English, Canadian Law, Skills for Independent Living, and mathematics courses were fully-equipped. Approximately 175 computers were in labs and 40 were accessible in the library. The other 110 computers were distributed among the classrooms. These computers were available to students from 8 a.m. to 8 p.m. daily with supervision. There was no filter on the system so the students were trusted.

Bill, the senior technician, told us he was going to a nearby city to train two technicians for a new call help desk being set-up in the server room upstairs. They will work in shifts covering 8 a.m. to 8 p.m. or so. They will support LRSS teachers plus the 8 feeder schools as well as the Internet service provider that Bill headed up for customers on the community ISP that was based in the school. A few years ago no one would provide Internet link-up. This service was then brought into the community by the school. It was hoped that the data based call centre, created by Bill in Access to log and track problems, would solve some of the lack of communication. Only 25 of the 430 modems in his ISP's modem pool could be handled at the same time by the telephone company's central switching office, which was probably due to the new competition. The phone company itself was now offering ISP service via a new T1 line. Bill was implementing plans for a high-speed point-to-point wireless Internet access with sixteen megabits. Three hundred community names were on the waiting list for this service. [19]

The school maintains a 300-station network with Internet connections, a worldwide two-way interactive video project, which allowed students and staff opportunities to interact far beyond the boundaries of the school. The school via the ITV interactive system offered numerous university courses. At present sixty-eight students were taking online courses.

The infrastructure had been altered to accommodate all of the labs. Parts of the interior classroom walls had been replaced with large windows allowing the two teachers to have a complete view of each other's classrooms. The layout of one of these labs is shown in Appendix A. It was an internal room approximately 30 ft. by 30 ft. with 20 banks of fluorescent lights. There were twenty-one computers in clusters of four plus the teacher's computer, his laptop, and two printers. In addition the room was networked to a colour laser printer across the hall.

LRSS was equipped with TV monitors in every classroom and a satellite delivery system, Youth News Network (YNN), for free in return for being allowed to show newscasts every day with ads in them. (At present this service was on hold due to a dispute about the advertisement.) The principal felt the programmes were well done with current relevant topics: school violence, homelessness, bulimia, etc.[20]

The superintendent commented in an interview that technology had completely reformed the teaching of mathematics. He went on to say that the Department of Education had contributed to a new way teachers teach using technology; they were strongly encouraging it as another tool. Teachers at LRSS chose topics from the provincial guidelines.
*People talk about technology in teaching....Critics would say this is a much less personal approach, but if you go into the classroom and look at where ICT is integrated the way it needs to be, what you see is more personal, more interactive encounters; they are partners.*[21]
This superintendent reported that he was in the school practically every day. He felt that the most innovative feature of LRSS was the teen-parent programme that teaches unwed mothers to be good parents as they obtain their high school diploma. Third year students took turns for three weeks staffing the nursery. They observed that teenagers were too young to be parents.

**The Store**

The school provided a general store where students had the opportunity to learn sales, invoicing, stock-taking, and market analysis with ICT. The business department was putting into place a new marketing curriculum.

Graphing calculators that could be downloaded into the computer were used in the applied math labs. *Virtually everyone bought one.*[22]

The Physical Education department used heart-rate monitors that stored hours of data that were then uploaded to computer and analyzed to see the most efficient exercise of choice. This was motivating to students to pay attention to their health and diet.[23] LRSS was extremely successful in sports. During our visit, the senior boys' volleyball team, the Tigers, won the provincial championship. In the Life Skills course, Bridges, plus a wealth of information on careers were used. Complex equipment and a mobile computer were available for a blind student. Special Education students received extras individualized ICT support.

Other areas used ICT including the visual communications programme and geography. A key tool for geography was Geography Information Systems (GIS), including Geography Plotting Systems (GPS). The music programme used such programmes as CakeWalk, Band in a Box, and Sibelius. One of the school's goals was to develop a sound recording studio. This would lead to further integration of subject disciplines and community projects recording local music groups. In the music lab after a video entitled, Understanding Midi, we observed four students start to work on their projects.

ICT at times can be tedious and time consuming. For example:

*After video, kids start work on their projects. I watch one boy who has plugged a drum machine into an amp in the teacher's office/minilab and is experimenting with different drum sounds and rhythms, playing electric guitar along with them. He improvises on guitar, and appears to have considerable skill. He uses Sound forge software to record guitar tracks digitally, then he plans on adding a drum track, but he is not sure how to do this. He showed me how he played some music into Sound Forge and how it automatically transcribed it into a score.*
*He realizes he needs a memory card for the drum machine to record his rhythm track, but it doesn't have one, so he will have to record the drum track on the computer. After several minutes of trying different rhythms the teacher suggests that he try recording something to see if it works, to learn the process; she seems to feel he is 'dawdling' a bit. He asks her if he can play guitar right into the Sibelius software and get a score transcription. She tells him that she thinks so, that her predecessor told her it could take the analogue signal. He opens up Sibelius. Despite being connected from guitar to amp and then from amp to computer he is not getting any sound coming into the computer. The teacher helps him correct a patch cabling problem – they needed a different cord between the amp and the computer as the old one was faulty. Now the guitar can be heard out of the computer speakers. He starts Sound Fusion to record the drums. It isn't clear why he is using 2 pieces of music software at the same time. He doesn't get too far with recording the drums. The teacher suggests he should look at the software manual.*[24]

The Director of Research and Technology told us that both ICT and learning goals are set and measured twice yearly. One goal was to offer virtual courses in the future. At present it was a priority to expand online courses beyond English Tech Communications and History 30. The online students in these courses e-mailed their teacher every Friday to list their accomplishments. There was an online form for this, designed by one of the online teachers.

*My own personal view is taking it a little more online where students can access it from outside the school building, and then be able to come in from time to time to do up-dates and things like that, and I think we could open it up and grow the area a lot more by doing that.*[25]

As an adjunct to the high school programmes, sixty-eight students were taking online university courses through LRSS's interactive video/television system. Each course has three hours of class time a week and because the modem was only 56K there was no video conferencing, only data sharing. Audio was two-way with microphones for students to ask

questions. They could see the professor's computer screen on the big monitor.

Another of the school's goals was to expand the use of GradeView, a computer-based reporting system that facilitated easy reporting to parents by e-mail every second Friday. For students lagging in an assignment, a Friday weekly report went home. Feedback from both parents and teachers had been positive. The school was planning to offer a space-science option in 2002.

## Class Management and Pedagogy

Several classes at LRSS could be called innovative in that students worked independently with technology, pursuing projects that were highly personalized; e.g. The Canadian Law class observation also the Technical English class observation.[26] In both classes whole-class input did not exceed five to ten minutes. Students operated the twenty plus computers with quiet collaborations. Teachers dialogued with students regarding their work. Students moved about freely within the room and beyond.

In the Tech English classroom the teacher assigned the overall topic chosen from the provincial curriculum: 'Design and Implement a Personal Portfolio.' The students were working on this topic for several weeks. They were going over preparations for their interviews at the district offices next week. Volunteer-parents acting as a pseudo-hiring committee were to interview them. The teacher discussed the things that they needed to do to prepare before, during, and after the interview. They brainstormed and then they returned to independent work on their portfolios.

In the Canadian Law class we observed evidence of short, whole-group instruction and long periods of individualized project work. The students were very focused on their projects and when the teacher left the room for five minutes, behaviour was good.[27]

The fastest computers, 700 MHz, were found in the technology labs. Different courses were offered here to four grade levels of students in a competency-based model. This was the first year that the Grade 9 students were able to take Basic Technology Applications (BTA). In one timetable block, a technology classroom offered five courses to fourteen students who were at four different grade levels. The five courses were Photo Shop, Illustrator, Flash, Page Maker, and Dreamweaver.
*Most of the students have Power Point when they come*[28]
to school, the tech teacher reported. The other tech teacher had 21 students working on 9 different courses at four grade levels. As well as Basic Technology Applications, he had CAD, including advanced CAD, a Web Page design course, Multimedia, Authorware, Premiere, Flash, Corel Draw or Illustrator, Desktop Publishing, Advanced Desktop Publishing, and Robotics.

Both technology teachers thought that what was innovative about their programmes was that they connected the students to the business community to create real purposes for the students' projects.[29]The teachers agreed that this introduced students to adults beyond academics, resulting in highly motivated students.

Many of the courses were ongoing in the room at the same time. Some students were from different grade levels (9-12). There would be a short tutorial for the Introductory course and occasionally a small group would be withdrawn to receive some instruction but generally the students worked independently. There was evidence of team-teaching in the tech labs. They were highly collaborative and often conferred about the evaluation of a student's project. If a student disagreed with an assigned grade, the teacher would recommend getting a second opinion from the other tech teacher. Teachers played multiple roles within the school in addition to teaching their assigned subjects, e.g. hockey coach, soccer coach, volleyball coach organizing a school trip, directing the school musical and mountain bike club director. The extracurricular activities were demanding. One teacher said that teaching in the tech lab was an easier way of teaching. This allowed him to have some energy as hockey coach early in the morning.

During a technology lab observation eleven boys and one girl worked on projects at their own computer. One boy struggled to download a $MP_3$ music file to include with a short digitized video that he was working on. He wanted to convert it so that Adobe Premiere would be able to play it. He solicited the help of the teacher who could not get it to play either. A second student overheard the discussion. He told the teacher that the $MP_3$ file was not a music file but a Playlist

file used by Winamp. They eventually found the right $MP_3$ file but the conversion process crashed the computer. The teacher was able to open it with the Authorware software, and posted it on the server. The boy with the video project (a ski jump over a short ramp with exploding fire) played the clip with music. Later on we saw this student work with a video overlay by using a blue screen. Later observations showed he was going to video a group of kids lip-synching the Moffats doing a version of 'O Canada'. He wanted to overlay the sound. He discussed it with his teacher who suggested a secondary window in the corner of the main video using Premiere. The student was enthused.

*One boy is building a set of pages for a web site tutorial on fire fighting and has gathered the research. He is using Photo Shop to create. The actual Website was being generated using Authorware...He started in September and has been spending about an hour a day on it*
*Once you click on the link, getting what you want to stay and what you want to go away,— that's the hard part, he mentions. The teacher explains to the student what he has done incorrectly and how to correct it.*[30]

**Trailer Welder / Autosketch Designer**

Trailer Welder and Autosketch Designer
In the labs students played an active role in their learning and contributed to the design, direction and evaluation of their projects. Here was a new role for most students to play. This 'carrot' provided considerable intrinsic motivation. There was a noticeable difference between the attention-to-task in the classrooms where students were individually engaged in pursuing their own tasks, and those where the students were attending to teachers offering instructions or lecturing. It was an expectation that a third tech lab will need to be added in the fall. Students were recognizing that they had a responsibility to pursue something in school that would prepare them for a career, and they understood that the school could provide this service. Small group collaboration was spontaneous. Heterogeneous groupings occurred in the project-based classrooms but these groupings were selected by the students themselves. One team of two students designed and constructed a trailer to carry two canoes and two mountain bikes. This trailer was to be sold to a teacher on staff when completed. One student took us down to the shop to see where the metal would be welded. The designer and welder negotiated with the teacher as to where the joints would best take the stress that a trailer might endure. The co-operation illustrated the true integration of ICT in student projects.

In an interview with one of the innovative technology teachers he described his pedagogy.
*Typically the method of instruction is they (the students) will do a tutorial and then they'll do a canned assignment. It's sort of like a test at the end of the tutorial and it covers in the skills that they've done learning, the tutorials and the assignments that we assign them; then they always get a choice project using that software. And that's where their own initiative comes in. They're for doing it themselves and picking something that they want to do and really taking ownership over their assignments.*[31]

Another technology teacher responded:
*I would say getting students involved with the community and having people come in and say,' I need this done. Can you make me some posters for our curling bonspiel?' or 'Can you make me some programmes for the hockey tournament?' And I say,' Yes, we can do that but you have to talk directly to the student'. And I just oversee it and the student actually makes the phone calls and 'Can you give me information on this' and this. And they come in and chat with the student and the student gets to talk to real people, not just to me.*[32]

*Sometimes we evolve the projects, because the kids think they're done lots of times; and we say, ' This is okay but it could be better if you did this.' And they learn that right off, and we say, 'You're almost done. And this, this, and this needs to be done, and you'll get a nine when you do that out of ten and this you'll only get a five and I won't accept it, so you have to*

*do it.' And they just do it any ways because they want to do better.* [33]

**Ecology Classroom**

The Ecology programme also became highly involved in business partnerships. These relationships provided authentic reasons to do good work. In a small community such as Swan River the social contacts broadened the students' knowledge of the enterprise system, and gave them numerous opportunities for leadership as they met adults in real careers. The wide array of personnel helped students to direct their own career planning, making the curriculum more meaningful, and instilling a sense of responsibility and citizenship

## Professional Development

Teachers were generously supported in professional development. Upon request they could have a consultant in their classroom for one week. Attending conferences gave teachers new ideas and increased energy. For the past three years the technology teachers had gone to the Rural Forum in Brandon. Their school was paid $5000 to produce a CD for the Rural Forum. One technology teacher organized 15 students to make the multimedia production which was 'excellent'. [34] The innovative teachers offered ICT workshops that recovered much of the professional development expenses; e.g., $1500 from a Toronto ICT conference.

In an interview with the principal, he mentioned that his philosophy is 'academic freedom'; he saw teachers as the experts in the classroom. He left much of the control in their hands. Here his freedom and trust were in action. Little funding was coming through the regular routes. But much was gained from networking with industry, i.e. Northwest Soil Management, Louisiana Pacific, Spruce Products, Ducks Unlimited, to mention only a few. Most teacher professional development for integrating ICT was acquired through mentoring, Just-in-Time mini-workshops, self-teaching, some professional development offered by a hired consultant, and some opportunities for teachers to attend ICT conferences. The principal's goal was
*... help students set the vision for where they are going.* [35]
He led a community school with real life projects.

## Funding

The principal revealed high priority for ICT. The following covered the spending over the past two years:

- Hardware $340,000,
- Software $40,000,
- Staff Development (ICT) $40,000,
- Maintenance $160,000,
- Staff Salaries ICT $180,000[36]

Of these funds in one school year, $255,000 had been grants, mainly from industry —a phenomenal amount. Some of the ICT projects included the development of online courses. Human resource grants and others, such as, Career Start have been helpful. The tech courses, visual communications, ecology, auto mechanics and food services were considered vocational. In these courses the school was given higher grants per student. The principal told us that we would be 'blown away' by their budget and we were.

The main problems with the innovation were as follows:

- Funding the innovation and technology, (The leaders seem to have overcome this.)
- Maintaining the innovation and technology, (It was running smoothly at present and more technicians were being hired.)
- Professional Development for teachers for the innovation and technology, (This was adequate.)
- Professional Development for teacher-student dialogue. (The teachers managed very well in this area, However,

there was always room for improvement.)

- Unanswered questions,

1. Did conversation and innovation work simultaneously or was conversation the antecedent to acting upon innovation?
2. Did teacher-student language change when the teaching practice was altered?
3. How will the innovation be modified further?
4. What will be the impact of online teaching?
5. Does this approach meet the needs of all students?

## Main Hypothesis

## 1. Role of technology in educational innovation and improvement

The driving-force behind the innovation at LRSS was not technology, but rather it was the dream of an experienced physics teacher to intrinsically motivate his students to want to learn. He felt no matter how well-prepared he was for his lessons, something was missing. His students seemed to be waiting for him to quit talking. An interesting phenomenon occurred. At this time the provincial government was promoting a 'hub' for electronics. The physics teacher with the support of the principal was liberated half-time to pursue this thrust. Since he was not competent in electronics, six computers were introduced as part of the innovation. He saw the students gravitated toward the technology. He remained in his room at lunch and the students worked over their noon-hour. The intrinsic motivation seemed to be catching hold. The programme expanded to 36 computers. A key point in this scenario was that the new teacher taking the physics teacher's place told us that his mentor never raised his voice and moved quietly about the room collaborating and assisting the students.[37]

The limited number of computers did create some problems at first, but the administration focussed on solving this need by increasing the number of computers at every opportunity. It was the teacher's strong desire to invite the students into relevant life-long learning. The present programme could not exist without adequate ICT. In the beginning, little pressure was placed upon a staff member to join the innovation. A laptop was only given to any teacher who asked to have one. The innovation moved forward from staff and student demand.

## 2. Diffusion of the innovation

The diffusion of the innovation followed the traditional patterns for the innovations, as outlined by Rogers.[38]Certain characteristics lessened the resistance to change.
LRSS was the only secondary school in the school division. In this way a precedent was not set and the school would not pose a threat to other schools.
The small community wished to retain its young people, so much effort was behind staying current.
The school has enjoyed a strong student-centred leadership that has radiated throughout the school. The leadership has sustained and attracted teachers of like-mind. [39]
The administration was extremely resourceful in securing an important level of funding to promote and maintain the innovation including the ICT that allows it.

1. The teachers were given generous professional development funds. The technology teachers gained $5000 for each of three years by producing a CD. They also gave workshops and were reimbursed. The administration encouraged professional development.
2. The school gained extra funding because it was both a vocational school and an academic one.

## 3. ICT implementation outcomes

Successful implementation of ICT has depended mostly upon the school leadership and the resourcefulness of the critical mass.

*A few years ago we developed a critical mass of people who had embraced technology as a learning tool and once you've embraced that you can't turn back even if you want to.*[40]
One step cannot be overlooked. The dreamweaver of this innovation was given half-time release-time by the principal to pursue his dream. He worked out the problems. A team came together to raise funds to expand the innovation, and school structures were significantly modified,—Internet hook-ups, new windows, desk removals, ICT work stations were added, etc. Successful implementation of ICT depended on staff competence to work together. The innovators half-time teaching load gave the dream-weaver time to crystallize and develop his vision.

## 4. Differentials in academic performance

All students have equal access to computers, but not all students are passionate about using them. In an interview with the two technology teachers they concurred that one or two students in each class seemed to lag behind in ICT, but by the end of the semester they were usually 'on board'. The homes are middle to lower income, some small town and rural, with a large aboriginal enrolment (20%). A Sapotaweyah Cree student won a computer plus a $1,000.00 award for her essay on "Why is Information Technology Important in Education and Career Aspirations?"[41] During a interview a parent reported that she saw,
*a confidence and a willingness to try new things in the technology area ... Technology is changing constantly, but I think we're preparing them for change ... they're very comfortable and confident with it.*[42]

It was difficult to say if ICT was widening the gap between advantaged and less advantaged students. It would seem obvious that the gap would be increased between those who can function with independent learning and those who need to be constantly directed. The atmosphere in the school indicated that the students felt they were being offered something that would be useful for them as they moved forward. They demonstrated a refreshing variety in topics for their projects. Technology offered them a window from which to fly.

## 5. Academic standards

Successful implementation of ICT will lead to the same or higher academic standards in spite of the low quality of many ICT materials. At LRSS no expense had been spared to provide the highest quality software to accompany the 325 computers that were constantly being updated. The technology director was aware that the hardware and software were consumable products and funds must be available to keep the innovation functioning. The quality of the students' work was exciting. The fact that evaluation now rested more upon portfolios and exhibitions and less upon examinations was an invitation for students to try their best. It was interesting to note how often in the interviews we heard that some of the students knew more than their teachers. Perhaps most impressive was the intensity with which the students worked, and the fact that, there were no discipline problems in any of the individualized project-based classrooms. These students appeared to be intrinsically motivated with a desire for critical, relevant learning. The quality of their projects manifested their commitment. Both technology teachers thought that what was innovative was that they connected students to adults in real careers resulting in highly motivated students. The fact that their projects were used by the business community spoke to their quality. Modelling, administrative support, authenticity, accessible, high quality ICT in functional rooms, skilled conferencing, and ownership of the projects all led to high academic standards.

## Projection to the Future

## Sustainability

At present the infrastructure was operating smoothly at LRSS. The physical school alterations of adding windows, etc., made working together more effective. Funding, through the resourcefulness of the staff seemed to be adequate to maintain both the innovations and ICT. The key teachers were young and most likely to remain for some time to secure the programme and to train subsequent teachers if the programme developed as has been predicted. The principal is the key player. He will be approaching retirement in three to five years, but the Board of Education was well aware and most supportive of the direction the school was headed. It would seem obvious that a person from within the school, i.e. the

vice-principal and technology director, might be principal-elect. He was a dynamic, creative force within the school, driving the innovation.

The teachers seemed to be one hundred percent behind the innovation. Equity of funds for staff was not a problem. Even in the Teacher B interview, where concerns regarding excellence being a higher priority than the innovation and ICT, there was a strong and definite statement of deep respect for the direction the innovation was taking. The hesitation here was not an indication of an unresolved problem, but rather an overture to evaluate the innovation to see to what extent the standards were altered.

The school technology goals placed a responsibility upon each teacher to develop his/her own goals for technology use. Although two-thirds of the teachers rated their ICT ability as good, some of the teachers had not moved beyond simple ICT communication skills. Their positive outlook indicated that most of the teachers were comfortable with ICT; however, the analysis[43] revealed that they would need extensive in-servicing to be equipped for an expansion of the innovation to a broader range of classrooms. The visionary's dream of intrinsically motivating students had been embraced by the 'critical mass'. The programmes that have evolved here reflected the growth in co-op programmes. In 18 years there has been a 20% increase.[44] These have enhanced the breadth and relevancy of curricula. Lakeview's diverse, multi-ethnic community has thrived on exposure to a wider array of realistic career possibilities. The innovation at LRSS was a highly valued programme in the community. The community approved of the educational thrust, trusting one's children to manage their own learning, giving students freedoms and controls. Because this high school was the only one in the division, it did not pose a threat to other schools. One critical variable was that the visionary who set this innovation into motion also trained a young teacher to take his place. The former's great skills cannot be measured.

## Transferability

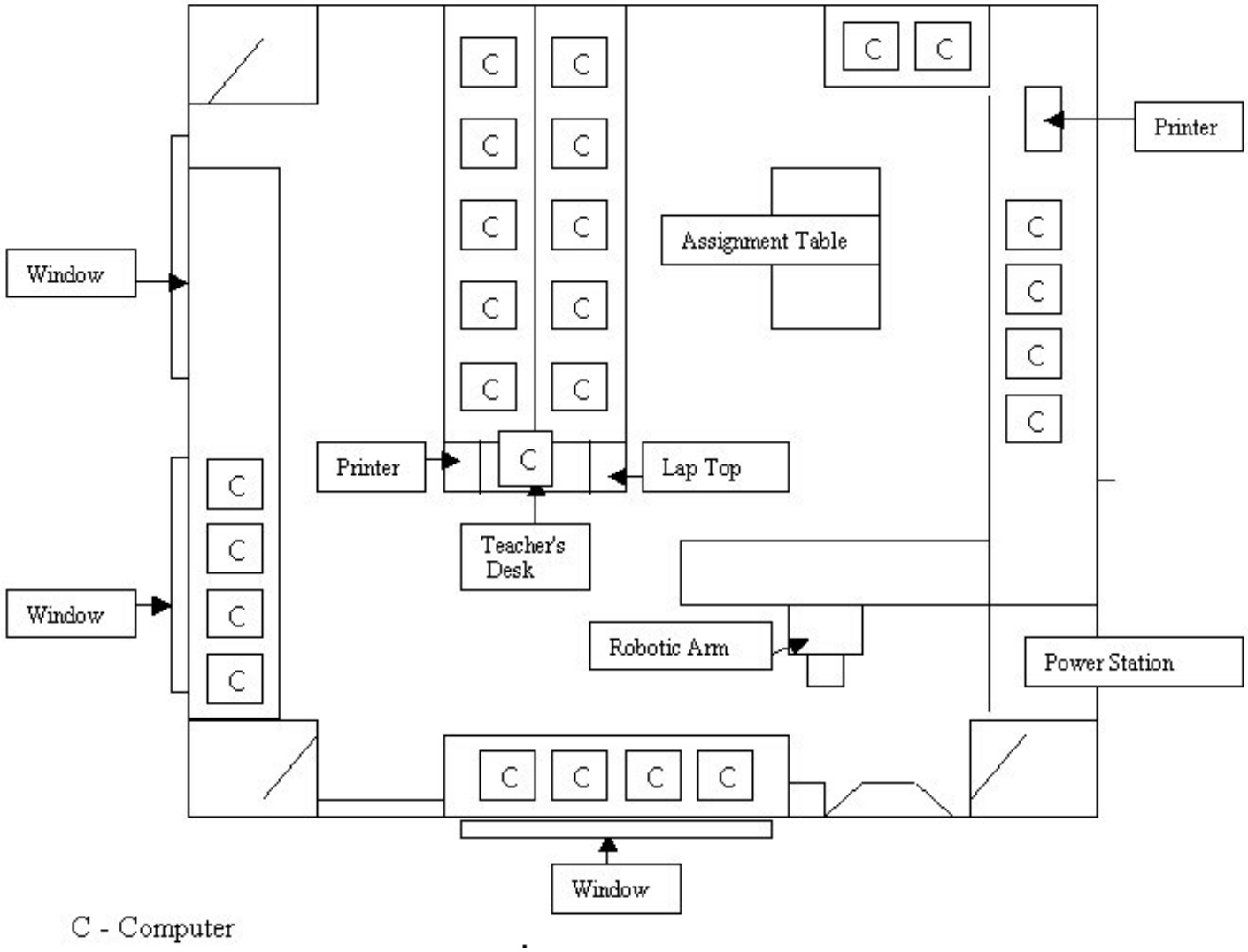
It might be possible to transfer this innovation to another site with the following in place:

- individualization,
- lack of time constraints for students,
- contacts with community partners,
- teacher-student conferencing,
- modelling,
- release-time for teacher training,
- peer to peer teaching,
- generous funding,
- adequate ICT,
- a technology director with creative expertise,
- a principal with caring, dynamic leadership.

*It worked wonderfully. I would say 90% better...*[45]

## Appendix A

## Sketch of Tech Lab




## Tapes, Transcriptions, Observations

1. Taped and transcribed interviews (10): includes, principal, superintendent, technical director, 5 teacher interviews, parent, students,
2. Random tapes: on tours, informal talks,
3. Conversations: Cam's tour; chat with principal at Board meeting (2); Bill, the technician
4. Classroom observations: (23 in total)

- Nov.28: Technology rooms; BTA Lab; Technology Lab; (see sample of language encounter following in Appendix B),
- Nov.29: Tech English; Learning Resources Centre; BTA; Ecology Lab,
- Nov. 30: Skills for Independent Living; Tech English; Interactive Satellite Room; Tech labs; Resource Centre; Ecology Lab,
- Dec. 1: Music Room; Gym; Music Room; Tech Lab; Multipurpose Room; Math; Math.

## Appendix B

## Language Encounter

In this observation the language encounter reveals how the teacher transfers to the student ownership of his/her learning. Below is an excerpt from the technical lab observation:
*Nov. 28, 2000. 9:30 a.m.: Twenty-one students grades 9-12 (Grade 9's are allowed to take BTR) work at a variety of courses. The room is quiet except for a very soft mumble of voices. The teacher moves about leaning over the students to*

*point out or comment. There are some chuckles.*
*Student A: But that's an old one.*
*Mr. M: Look again.*
*Student A: But I draw like this. Oh. Oh? The barn seems about this long.*
*Mr. M: I've got a level on it.*
*Do you guys....*
*So what are you going to do?*
(The conversation is interrupted as another technology teacher enters)
*Student B: I've got to talk to you.*
*(Mr. B. acknowledges the student's overture and sets a time to see him.)*
*Student A: Sometimes you can't see what's going on.*
*It's kinda hard working like this.*
*(Student A: continues to work. He's chewing gum softly and he's very intent.)*
*Mr. M: When you go to the Web you see little things moving around. What are you on now? You just have a couple of weeks left before Christmas to get this done.... What about this though? You have these things. Have them in blue and you can keep them on the screen all the time.*
*Student B: I want them in.* (This student takes over the keyboard)
*Mr. M: I like the idea of the shapes.*
(Two clusters of students are now chatting. The group now including Student A has three in it. Student B works on, on the project)
*Similar dialogues follow during the one-hour observation.*

In this short scenario the flexibility of the teacher-practice was evident. Groupings were fluid. No direct whole class teaching took place. The students and the teacher offer a variety of language functions in their collaborative construction of meaning. More than half of the teacher's utterances were in the top three levels of the functions of speech showing the greatest concentration to be questions (heuristic). The outcome of this was that Student B made an instrumental statement "I want them in." moving the direction of the project forward. Through the teacher's nudging the students took ownership for managing their own learning and work. In traditional teaching practice the teacher dominates the language utterances. Nudging usually entails warnings to the whole class. Compliments ("I like the idea of shapes.") usually take the form of general praises such as, "good work". In traditional classrooms they are rarely specific and usually address a whole assignment rather than one feature. As well the teacher spends time in the traditional classroom quieting the students down and policing the room. Here the students monitored their own behaviour.

## Chart for language sample

| | Utterances | Mr. M, teacher | Students A & B |
|---|---|---|---|
| **Reflective Speech** | Imaginative | 1 | 0 |
| | Informative | 2 | 2 |
| | Heuristic | 4 | 1 |
| **Social Speech** | Interpersonal | 3 | 1 |
| | Personal | 1 | 0 |
| | Regulatory | 2 | 0 |
| | Instrumental | 0 | 1 |

**references**[46]

## A summary of ICT practices survey for teachers

1. About two-thirds of the 32 teachers (out of 38) who completed the survey felt very comfortable to

- write a paper
- search for information on the www

- send and receive e-mail

1. Programming (i.e. use a programming language to write a programme) created concern for 25 of the 32 teachers. They were “Not at all comfortable.”
2. Two-thirds have never created a web page, used a computer to play a game or joined in online chat.
3. Two-thirds rated their ICT ability as good.
4. One half the teachers said they used a computer several times a week at home.
5. Involvement as teacher or student in a virtual course through the Internet was beyond most teachers.
6. Involving their students in collaborative learning over the Internet with other students was beyond most teachers.
7. About two-thirds had never:

- made changes in hardware
- updated a programme
- recovered a damaged file
- created a web site
- developed a data base

## Appendix C

1. Student progress reports to parents,
2. School newsletters, calendars,
3. School ICT goal rubric,
4. Newspaper articles,
5. Numerous examples of students’ work

- folder for bike-trailer plans
- Wheat Board Colouring Book
- Submission for computer prize contest
- Sheep-raising
- Effects of Smoking
- Gym Health Monitor - Heart Rate/Fat Count

## End Notes

[1] Teacher Interview (TI 3, page 19)

[2] Teacher Interview (TI 3, page 19)

[3] Teacher Interview 3 (TI3, page 7)

[4] Document Collection

[5] Teacher Interview 3 (TI 3, page 22)

[6] Teacher Interview 3 (TI3, page 5), Parent Interview (PaI, page 5)

[7] Parent Interview (PaI, page 8 and page 13)

[8] Appendix B, long sample

[9] Teacher Interview 4 (TI 4)

[10] Teacher Interview 1 (TI 4)

[11] Teacher Interview 1 (TI 3)

[12] Teacher Interview 3 (TI 3, page 3)

[13] Teacher Interview 3 (TI 3, page 24)
[14] Teacher Interview 3(TI 3, page 13)
[15] Teacher Interview 3(TI 3, page 11)
[16] Document Collection
[17] Principal Interview (PI)
[18] Document Collection
[19] Observation #1
[20] Principal Interview (PI)
[21] Administration Interview (AI)
[22] Principal Interview (PI, page 12)
[23] Appendix C
[24] Observation Notes #10
[25] Teacher Interview 3 (TI 3, page 4)
[26] Teacher Interview 3 (TI 3, page 22)
[27] Observation Notes #26
[28] Teacher Interview 3 (TI 3, page 8)
[29] Teacher Interview 3 (TI 3, page 5)
[30] Observation Notes #3
[31] Teacher Interview 3 (TI 3 Page 7)
[32] Teacher Interview 3 (TI 3, page5)
[33] Teacher Interview 3 (TI 3, page 13)
[34] Teacher Interview 3 (TI 3, page 9)
[35] Principal Interview (PI)
[36] Document Collection, Appendix C
[37] Teacher Interview 3 (TI 3, page 24)
[38] Rogers, 1995
[39] Teacher Interview 1 (TI 1, page 3)
[40] Principal Interview (PI)
[41] Appendix C
[42] Parent Interview (PaI)
[43] Appendix B, ICT Practice: Survey for Teachers
[44] Administrator Interview (AI)
[45] Teacher Interview (TI 3, page 7)
[46] Wells, Gordon 1986.