Creating a Learning Community: Using ICT to Enhance Constructivist Teaching Practice at Mountview School

Canada

SITES M2 Case Report

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Part I: Innovation Description

A. Background Information

Mountview is a K-8 school with 437 students and 21 full-time equivalent (F.T.E.) staff. It is nested beside several acres of woodland in a rural area of grain farms and oil-well patches about 30 minutes from a large city, and the great majority of its students are from upper-middle and upper class families. With the exception of the kindergarten, there are two teachers for each grade learning level, as well as a part-time music specialist. All teachers make use of information and communication technology (ICT) to varying degrees, and its use cuts across all subject areas: mathematics, science, social studies, language arts, French, fine arts, and music. A few optional short courses on ICT-related topics are offered to grade seven and eight students in the areas of graphic design and Web page creation.

B. Summary of the Innovation

Innovation at Mountview started with the school’s inception and planning over five years ago, when the principal and the planning team set the main vision and orientation for the school: it was to be an institution where teacher reflection, risk-taking and experimentation in the furtherance of more autonomous, authentic, and engaged student learning was to be part of everyday practice. The use of ICT was to be a major focus at the school, not as a subject in itself, but as an integral part of teaching and learning throughout its programmes. It was seen as “an important means by which we improve the learning of our students, better access and communicate information, and extend our abilities as educators.”

A major component of the innovation was the establishment of a research and professional development centre at the school (the Galileo Centre), which provided exceptional affordances for staff development, both in terms of ICT infusion into teaching and curriculum and the promulgation at the school of new, more constructivist modes of practice. Consultants and master teachers given release time provided long-term, situated, in-class support, modeling new practices within a teacher’s class and fostering reflective discussion on pedagogy and curriculum.

Use of ICT is now widespread in the school, with most teachers and their students accessing it for a range of purposes on a daily basis. The degree to which this use is embedded in inquiry-based and student-directed practice varies significantly across teachers. Some are doing virtually no direct teaching and have students take the lead in developing inquiry questions of interest on curriculum topics, which then become themes for major student projects that can continue over several weeks and encompass all subject areas. The criteria used for project assessment are usually mutually developed with students and do not always involve quantitative grading. These teachers act primarily as facilitators. Other staff do engage in whole-class instruction; their students typically work on shorter-term projects whose directions (topics to be covered, questions to be answered,
procedures, deadlines and assessment criteria) are set by the teacher. However, both types of teachers do let students use a broad variety of ICT tools and approaches for researching and presenting the results of their investigations and projects. Nearly all the school’s 100 computers are located outside of classrooms in hall island clusters and an oversized technology room; students have relatively open access to these machines during the day. Students use these networked computers to work with advanced, professional-level data analysis, graphical, multimedia, and presentation tools, including Microsoft Office, Astound, Photoshop, Internet Explorer, and several others. No tutorial or other “educational” software is available. Children as young as seven and eight can be seen developing animations to accompany stories they have written, coding HTML for a new page they are creating for the school’s Web site, or using search engines to locate up to date population data on the Internet and then entering the data into a spreadsheet from the Web to explore population growth in a region. Many projects are cross-disciplinary, incorporating elements from both the math/science and humanities/arts streams, and they often address topics of relevance to the students, their families, and the local community; the school has a major curriculum thrust in ecological studies at all grade levels, for example. Both shared and private (password accessed) server storage space is available to students; they use the shared space for their collaborative work.

Part II: Analysis

A. Meso-level Context of the Innovation

Mountview is situated in a rural setting on 40 acres of treed land. It services the families in what is primarily a rural commuter community of higher-level business executives and professionals with considerable financial resources (according to school data). A disproportionately high number of the mothers are not employed outside the home. Observation suggests that less than 5% of students are of non-Caucasian origin. Most of the school staff appear to be under 45 years of age.

Of its annual $1.6 million (Canadian) budget, 1% is spent on hardware, 4% on software, and 7% on teacher professional development. Staffing allocations include the following: a combined 1.5 full time equivalent (F.T.E.) administrative designation for the principal and assistant principal; a .6 F.T.E. music specialist; a .2 F.T.E. technical support staff person; and a .6 F.T.E. position designated for teacher time under a Alberta Initiative for School Improvement (AISI) grant, giving release time to three AISI lead teachers in the school, two of whom provide in-service support for ICT use. These two teachers are given a few extra hours per week of release time to function as network and school Web site administrators respectively.

The school plant is an attractive and inviting facility with a large central atrium space leading to four wings laid out in an X formation. Between paired homerooms are smaller breakout rooms, which teachers or students from either room can access directly without entering the halls. These rooms are used for small-group work and student-teacher conferencing. There is usually a soft, movable wall between these paired rooms, which is
occasionally retracted, as several of the teacher pairs working at the same grade level engage in team teaching to some extent.

About half of the school’s approximately 100 Pentium and Pentium II computers are located in two hallway island areas, grouped in clustered pods (see Figure 1). This choice of layout was a conscious policy decision; the desire was to permit students free and easy access to ICT at any time. While there is no designated school computer lab, the oversized Career and Technology Studies (CTS) room containing 20 computers is available for on-demand use most of the day (see Figure 2). A further 10 machines are placed in Mountview’s resource room (library). Originally, two computers were assigned to each classroom; this has recently been reduced to one to expand the number available in the islands and CTS room. Despite its designation as a site for educational innovation using technology, the school receives no additional funds for hardware or software beyond that provided to other schools from either the Plainsview School Division or the provincial Ministry of Education (known as Alberta Learning).

The school’s present culture emerges out of its history. Area parents decided that they wanted a school that was different from the status quo, one that was forward thinking and provided their children with all the tools and skills they needed to move forward into the future. A team of teachers experienced in ICT use was brought together with parents and business community leaders under the leadership of its designated principal, Brian, who was the technology coordinator for the school district at the time. The team created a vision for the school, developed the architectural requirements for the new building, and functioned as a hiring committee for choosing the new staff. Mountview was envisioned as a place for rethinking teaching, for action research, and for pursuing inquiry-based, authentic, and student-directed learning. ICT use was seen as integral to this process, and the school’s intent was to “fully realize the leverage of technology on education”. The two major criteria applied in staff hiring have been 1) a willingness to critically reflect on practice and experiment with more constructivist approaches, and 2) a willingness to explore and exploit the potential of ICT in teaching. It was not necessary that new staff be prior ICT users in the classroom, and most were not.

Making professional development an integral part of the school’s culture was a major goal of the school’s founders. The establishment of the Galileo Centre at the school—funded initially by a local philanthropist—made it possible to provide a few of the founding teachers with some release time to work intensively with other staff. These founding teachers were adept at and committed to constructivist teaching and the infusion of ICT into practice (they will be referred to herein as ‘master teachers’). The master teachers worked with colleagues both individually and in small groups, modeling inquiry-based and collaborative teaching strategies, providing “just-in-time” after-school workshops when teachers expressed interest in learning new skills such as Web page creation, and more generally generating a culture of reflective discourse around practice through participation in the school’s Technology Committee and early-morning best-practice discussions. Although the Galileo Centre was moved to another building in the district two years ago, one consultant still works one day per week at Mountview. The Centre also funded the secondment of a few teachers per year from around the province with an interest in ICT to the school for a year, where they assumed a two thirds teaching load, engaged in action research, and worked collegially with the Centre and the school’s
master teachers in extending professional development to full time staff. In addition, it has sponsored part-time doctoral fellows at the school, who conducted research, provided professional development support, and developed linkages to off-site learning opportunities for both teachers and students using ICT (such as collaboration opportunities with other schools and academic faculty).

Both the founding and current principals have been instrumental in developing and supporting the pedagogical and ICT innovation work at the school. Brian played the lead role in the initial ICT professional development activities at the new school, conducting after-school workshops once a week and on-demand for staff that dealt not only with the technical aspects of software use but also focused on infusing the technology into a constructivist pedagogy. He also undertook extensive consulting and mentoring in classrooms during the day, helping teachers gain proficiency with unfamiliar tools and begin to explore their place in inquiry-based learning. The current principal, Lisa, has worked to foster change by making ongoing dialogues with staff around pedagogy a core part of her mission, building up a professional library, and seeking out funding opportunities for teaching staff release time for professional development at conferences and other events, although she has passed on responsibilities for specific ICT-related coaching to the master teachers. Both the formal and the extensive informal professional development activities that staff members have participated in have rapidly developed their competency in ICT use to quite high levels; over half of them report creating Web pages, and nearly all make regular use of business, communication, and presentation tools in both their preparation and teaching.

B. Macro Level Context of the Innovation

Two provincial policies are relevant to the innovations with ICT at Mountview. New schools in the province receive no additional funds on startup for the acquisition of ICT resources; they are simply allotted the standard triennial grant, prorated for school population size. This has meant that it has taken several years to get the number of computers in the school to the level desired by staff—a level that has just been reached.

The second policy of note is the new curriculum document for ICT that Alberta Learning has released. This delineates a graduated series of ICT competencies that schools are expected to develop in their students at various grade levels. Certain staff at the school were involved in the development of this document, and while it is given lip service in official school documents, it is largely ignored in practice, as the staff and administration feel that what they are accomplishing in terms of developing student ICT competencies goes well beyond the curriculum requirements.

C. Thematic Analysis of the Innovation

C1. Curriculum content, goals, and assessment

The innovations at Mountview have not been focused on changing curriculum content so much as on transformation of pedagogy and infusion of ICT into that pedagogy. There
are however some consequences that the appropriation of constructivist teaching has had for the organization and delivery of curriculum. One organizational change of importance was the school’s decision to implement long, uninterrupted learning blocks without period bells, to allow time for in-depth project work.

In reading what follows, it should be kept in mind that there is most definitely no one style of curriculum implementation or pedagogical approach taken at the school. Teachers differ widely in their willingness and ability to move into fully constructivist teaching in which students direct the great majority of their activities and engage in what Bereiter & Scardamalia refer to as collective knowledge building through inquiry. What was observed could be thought of in terms of a normal curve distribution; a few teachers did engage in full-blown enquiry practices, but most only applied elements of student-directed learning and inquiry to their work, and a few others seemed to take a traditional approach in their teaching. This latter group pursued whole-class instruction much of the time, and assigned limited and tightly directed project work which had much in common with traditional worksheets, requiring brief answers to lists of questions on a topic. A few vignettes in the teacher practices discussion below illustrate this range.

With respect to the curriculum, the teachers using a more constructivist approach commonly helped their students develop holistic and trans-disciplinary perspectives on the problems and issues being addressed. In one instance, for example, grade eight students, conducting a long-term inquiry into resources in areas of Canada, used spreadsheets to calculate resource utilization and project resource levels into the future, and incorporated these into their printed, presented, and Web-based reports. These teachers, while making some effort to cover the range of curriculum designated in the provincially mandated curriculum documents, were more concerned with depth than breadth of work, and did not worry if every factual topic in the guidelines was not fully covered. The school as a whole had a programmatic focus on ecological literacy, which applied across all grades.

Assessment remains a major problem at the school according to staff, and is often the subject of discussion. ICT was seen as introducing new modalities of student work and presentation that increased the difficulty of assessment. Digital and conventional portfolio assessments were seen by many staff as the best indicators of student progress, as only these were thought to reveal the complexity and depth of student learning. The more constructivist teachers did little if any testing. Many of the teachers interviewed and observed involve their students (regardless of their age) in the discussion and development of assessment rubrics, which could be quite detailed (see vignettes below). Some staff also engage students in individual or small-group self-assessment, with a project’s final grade being negotiated in a teacher-student conference. Staff were split in their choice of reporting formats; some were fairly comfortable with assigning grades or percentages, while others preferred to only write comments. Teachers teaching in grades 7 and 8 were forced by district policy to use quantitative grades for reporting. Reporting was sometimes a sensitive issue with parents, and dealing with their demands for comparative and quantitative reporting was a significant stressor for many teachers at the school. While some parents appreciated qualitative, portfolio based reports and “celebrations of learning” in which student work was presented and explained to them—reporting strategies the administration was promoting—others did not feel these
approaches adequately informed them of their child’s relative standing. Reporting was considered a major element of the school’s outreach to the community; each teacher was expected to send four reports home per term, to hold two parent/teacher/student conferences a year, and to keep parents apprised of the nature of their children’s work.

C2. Teacher practices and outcomes

As mentioned, teaching practices at Mountview varied considerably along several key dimensions: the degree of teacher directedness; the amount of whole-class teaching, project work, and student collaboration engaged in; the use of inquiry-based pedagogy; the authenticity of students’ learning experiences and their relevance to students’ lives; and the extent to which teachers attempted to model and scaffold more mature cognitive strategies and collaborative skills for students. The following vignettes, developed from field notes and supplementary informal interviews, illustrate the range found at the school:

1. Martha addresses her grade five class: “I’d like you to go home tonight and find out what is happening in the Middle East, enough so we can have a conversation about it tomorrow.” Discussion on the topic is pursued over the next few days, and connections are drawn to what had been studied earlier in the year about the Renaissance. Martha also provides some background on the Holocaust and its relationship to the Middle East. This leads her students to want to know how the Holocaust could happen. A set of questions develops out of the ensuing discussion, which leads Martha to talk briefly about the Crusades. Martha then asks her students to develop the questions they have at that point. Once their questions are formulated, she has class members work together to collectively cluster and interrelate their questions, generating superordinate topics and then linking these topics by constructing a concept map (see Figure 3).

Martha takes an active part in this process, mentoring, coordinating, and helping students make connections between their questions. The concept map is developed on a long chart that is hung on an adjoining hall wall, with name tags indicating individual students’ questions. This is to be the basis and layout plan for the project’s Web site structure. Students will research their questions, either individually or in small groups as they choose, and then develop Web pages that will be linked into the Web site. For example, one student will develop a page looking at what George W. Bush’s policies on the Middle East are and what they might mean for the area. Students read and respond to each other’s work as it evolves on the computer network, with the teacher helping them integrate their understanding of the various elements on the concept map. Martha has already taught her students some basic HTML coding, and will teach any additional Web development skills needed on a just in time basis, training a small group of students who will then peer tutor others as needed.

2. A grade four teacher reviews a new project students will be doing and then distributes an outline of it to her class. Each student has been assigned a region of Alberta to research and develop promotional material for with the purpose of attracting tourists or new residents to the area. The handout lists the facts that need to be researched,
such as the climate, geography, vegetation, resources, and jobs. Students are given a number of choices in the way they can present their information: a poster, a TV advertisement, a pamphlet, a pictorial display, or a radio announcement or interview. The handout dictates a series of steps to be taken in developing their projects: reading about your region in classroom books, developing a concept map for the data, deciding on a presentation format, drafting the presentation and reviewing it with the teacher, and producing the final version for class presentation. An assessment rubric with 5-point ratings for several aspects of the research and presentation is included, and a due date assigned for different stages of the work. Earlier, the teacher had involved students in a discussion of what the dimensions for rating the project should be. Students are allowed to use any ICT tools they want for project presentation: digital video, still photos, PowerPoint, Astound, Word, PageMaker. No Web sites for researching Alberta are suggested, but students know they can use the Web if they wish to. Students have the choice of working alone or with one or two others. An example concept map is given to show students how to organize their information.

3. Students in a grade eight science class are working in small groups. Each has drawn the name of a basic machine (such as a block and tackle or winch) from a hat. A project handout provides a series of questions on the definition, history and use of the machine that they must work together to answer using whatever resources they deem appropriate. Examples: “Why was this machine invented? What was going on in history at the time? How might your life be different if this machine had not been invented?” The information gathered is to be posted in a report about the machine on the school Web site. The second part of the project consists of a series of experiments that the groups are to design for their machine. They are to detail hypotheses, variables, and procedures, and record observations and conclusions. A draft of their procedures is to be submitted for approval before the experiment is demonstrated to the rest of the class and subsequently written up in a final report. An extensive 3 page assessment rubric is distributed, with descriptions of what constitutes excellent, good, etc. work on a number of dimensions. Groups will use this to assess and grade their own work.

4. Both grade six classes are working together, about to start a seven week Sky Science unit. They sit on the floor in front of one of the teachers, listening (for the most part) as she reads from a book about Galileo and his discoveries. She pauses at times to show pictures from the book to the group. Few questions are asked of the students. After several minutes, the teacher announces:

I want you to be thinking about how things have changed from Galileo’s time, and where we are now. You’ll be amazed at what’s on the computer about what people thought 100 years ago – they didn’t even know that the earth moved.

5. About half of Steven Jacobs’s grade eight class are seated at computer stations in an open area off a hallway 30 meters from his classroom. These students are working on one of two projects. Some are searching for content or quotations for a short speech—part of a language arts unit in which students present one of each of four types of speech to classmates: spontaneous, extemporaneous, scripted, and
memorized. Others are choosing and researching a U.S. state to compare on a number of dimensions (location, interaction, movement, and regions) to a Canadian province they have been assigned. Most of the students are accessing the Web to search for relevant quotes or information, and use search engines like Google fluently. The state/province comparison projects are mostly at an early stage of development—Steven’s intention is to have students (who have the option of working individually or with a partner) develop Web pages based on their research which they will code using HTML and eventually post to the school’s Web site. Steven tells an observer that the Canada-U.S. comparison project had been “rushed” due to prior off-site physical education activities that had eaten into his teaching time. Consequently, the project was student-centred rather than student-directed, something that concerned him; “I feel bad when I assign topics like I did here. Then the magic isn’t there. There’s real magic when students can chose and pursue a topic totally on their own.” He prefers to use Jamie McKenzie’s framing process, having students iteratively develop a set of “essential questions” through readings on an issue under his guidance, questions which can then drive meaningful self-directed inquiry. He typically works collaboratively with students to develop a project marking rubric, something which he didn’t have time for on this project.

The use of project-based teaching was widespread at Mountview, although as the above vignettes illustrate, there was considerable variation in their topical scope and depth, cognitive level, and degree of cross-curricular integration. Variations were also seen in the degree of student autonomy in the development of projects and the levels of student collaboration involved. The development and delivery of project presentations was usually a major element of the project itself. Having students make presentations in some form was seen by staff as making learning more authentic, improving motivation, and developing important communication skills. Students were usually free to choose the form of presentation or reporting for their projects; ICT-based formats included PowerPoint and Astound presentations, digital slide shows, newsletters, and Web pages. Non-ICT formats included artwork, plays, and recitals.

Nearly all teachers allowed (and sometimes encouraged or mandated) students to use ICT to research, develop, and present projects, regardless of their particular pedagogical stance. Since this required students leaving the room to work in the hallway areas, student management could sometimes become an issue if the teacher neglected to visit the area every five to ten minutes due to the work he or she was doing with individual or small groups in the classroom. Often more than one class’s students would be working in a computer area, and if another teacher was there he or she would take on management responsibilities for students not in his class to ensure order was maintained. Usually little intervention was needed, as students of all ages were able to work independently and in groups of two or three without getting distracted most of the time. Occasionally teachers spent their time while in the computer area helping students with technical or operational difficulties, but typically, students would consult peers to help them with these problems first, going to their teacher only as a last resort. Teachers would walk around supervising students’ work, functioning as a mentor and guide, asking
questions, making suggestions and discussing issues as the need arose. With a few exceptions, teachers (especially newer ones—19 of the staff were either in their first or second year at the school) did not always know how to get the software being used by their students to do what the students wanted done. In these circumstances, one of several things could happen. The teacher might trade off his class for a short period with a colleague proficient with that particular tool, who would then provide a short on-demand training session to a few students who could teach others. Alternatively, that colleague might send down one of his own students to provide the training. Or if the teacher was not knowledgeable about some software chosen by many students for use in project work, he might request a short one-on-one training session at lunch or after school from a colleague, or a workshop for several staff might be arranged. Teachers did not consider it critical that they be competent in the use of every one of the myriad high-end presentation and multimedia ICT tools that students might want to use, nor did they feel impelled to maintain an image of themselves as omniscient experts—they were quite willing to learn about new software along with their students.

The staff and administration at Mountview saw ICT use not primarily as an end in itself, but as a powerful new tool and medium for learning, expression, and communication that when properly utilized could play a significant role in moving education away from traditional practices towards self-directed enquiry, authentic learning, and community building. Teachers repeatedly emphasized that it was the reflective transformation of practice that is the core of the innovation at the school, and that this could be pursued (albeit with greater difficulty) without the use of ICT. Still, they saw ICT as a powerful enabler that aided student research, project development, and presentation; ICT seemed to heighten students’ engagement in their work, and by making possible the creation of more complex and polished end products it could help engender a stronger sense of accomplishment. The development of ICT skills, while thought to be important, was certainly not the primary raison d’être for ICT use in the school. The staff had collectively agreed to limit student software use to high-level tools, even with primary grade students. Teachers did not want students using tutorial packages which sought “right answers” from students—they were considered to impede the development of student creativity, autonomy, and higher-level thinking.

Staff collaboration was a key element of the school culture at Mountview. Teachers remarked on the contrast this presented with their experience at other schools, where little meaningful professional interaction occurred. A teacher at Mountview would often work closely with his or her colleague teaching the same grade, team teaching with them on certain topics or collaborating in other ways. Teachers felt no inhibitions about drawing on the expertise of colleagues when they lacked proficiency in some aspect of ICT use or wanted support or ideas for trying out new pedagogical or curricular practices.

Furthermore, the administration, by seeking and obtaining external funding from organizations and programs like the Alberta Initiative for School Improvement, the federal Office for Learning Technologies, and the Social Sciences and Humanities Research Council, did its utmost to give teachers release time to pursue their own professional development through action research, consulting, conference attendance, and to make the expertise of lead teachers like Steven and Martha available to others. Teachers unanimously stated that they learned the most about ICT and new teaching practices through recurrent informal interactions and sharing with other staff, including
the administrators, who actively engaged teachers in reflective discussions around practice. Once a week many of the staff participated in a voluntary “Best Practices” meeting, where critical discussion of teaching theory and research findings was ongoing, and many of the Technology Committee meetings focused on pedagogy and its relationship to ICT use. Staff also valued the consultancy services provided by the Galileo Network in the person of Susan Farr, who would work in the classroom with teachers who wanted to explore more constructivist pedagogies, modeling and coaching teachers in new practices of teaching and ICT use.

The key competencies required by teachers for the innovation were largely attitudinal and motivational: the willingness to experiment with more student-directed, inquiry-driven teaching, and the courage to risk failure. Staff had to be capable of collaborating with colleagues in undertaking critical reflection on their teaching practices, and researching and discussing new possibilities for renewal.

Teachers encouraged and sometimes mandated student collaboration in project work and ICT activities. The fostering of collaboration skills and the development of learning communities in the school were part of the school’s vision and a significant element of its culture. Creating a context for the social construction of knowledge was an important pedagogical goal for many of the teaching staff.

All of the teachers interviewed thought they had made significant shifts in their teaching practice in the time they had been at Mountview. They viewed it as being more project-based and multi-disciplinary, and especially as more student-centred, allowing their charges greater freedom to direct their own learning. No longer were they always functioning as “the sage on the stage”. As one teacher put it,

> I’m no longer the owner of the information. We go on a journey to find it together. I try very hard not to give the students the answers to their questions, but rather help them find the answer for themselves. It’s not always easy, but I’m working on it; I’m getting there.

There was awareness amongst staff that they differed in the degree to which their pedagogy was student-directed and inquiry driven. Veronica, for example, thought her teaching style was more teacher-directed than many of her colleagues, and observations bore that out (see vignette two above from her class).

The professional development support provided by the principal, the master teachers, and the Galileo consultants was highly valued by several of the staff interviewed, and was seen as being of great help in bringing them to a more constructivist, student-directed practice. James, a teacher who has been at the school since its inception, stated,

> It has just been a green light [here] to build the experience based on who [the kids] are and to have the curriculum serve that, which I believe is the ultimate purpose of having that in the first place. Mentors have been Brian Poole, whose vision for the school and whose vision, period, is among the most inspiring that I have ever encountered. Susan Farr and Paula Coren were tremendous mentors for me in the years that they were at the school. And I think those have been the main influences. [Note: Brian was the founding principal, Susan and Paula the two master teachers who became Galileo consultants.]
Leona, a newer member of the staff who had come to the school the previous year as one of the last Galileo Project teachers and had then joined the permanent staff this year, echoed James’ enthusiasm, and related the changes she had undergone in her practice:

My teaching has undergone a tremendous evolution in the last year and a half….I went and came in through the back door and came as a project teacher last year, so was spending a third of my time researching and gaining information and knowledge. And through conversations on the staff, Lisa Bowman, James, Susan Farr, a lot of other people, I’ve come to realize what I always knew in my heart but never practiced. And that is that the children need to be heard, they need to have a say in what’s going on in their lives. . . . And that we need to make the curriculum a good fit to them and not necessarily the other way around, so that they are really looking at life and what’s important and learning in that way, rather than me standing up and giving them information and then forgetting it two days later. So that, and again, the freedom to do that and know that you’re in a safe environment where it’s O.K. to take a step and realize you’ve overstepped and you need to take a step back and look at things again and then take that next step. . . . I also came in with misconceptions about the technology use. I came prepared to learn a lot about technology, but I came away with an even greater understanding of teaching and learning, and how technology is used as a tool, [it’s] not the flashy stuff that we to be need doing.

C3. Student practices and outcomes
Because of the shift in the direction of constructivist practice by most teachers in the school, the nature of student activity was often distinct from that found in more conventional teacher-directed classrooms (see the vignettes in section C2 for examples). Students of the most constructivist teachers such as Martha spend weeks working on major projects, reading, researching, developing notes and data, conferencing with their teacher to discuss their progress and resolve problems, and collaborating with peers to coordinate and problem solve when group projects were being pursued. The only direct whole-group learning they might participate in during a project might be teacher-led tutorials on an ICT operation needed for project work (e.g., Web page coding, or digital photo editing). Student presentations were a major part of project work at the school; staff saw them as making learning more authentic, improving motivation, and developing important communication skills. Students usually had a broad range of choices as to how to develop these, and had to consider what modes best served their purposes. They might create a dramatic monologue or short plays, put together an Astound presentation with animation sequences, or create a poster with PageMaker incorporating digital photos they had taken. The students of teachers who were less constructivist in their practice would spend more time engaging in short-term projects with highly specified activities (see vignettes in section C2 for examples). However, all the teachers interviewed and observed gave their charges the option of using any form of presentation they wished to use (ICT-based or not). Students were implicitly trusted and affirmed as capable of mature behavior; even young children could sign digital cameras and video cameras out of the resource centre, and no attempt was made to secure hard drives on computers, so students would have the flexibility to make changes to system configurations. These freedoms rarely created problems, and vandalism was virtually nonexistent.
Collaborative work was a major element of student experience at Mountview, and it took many forms. Most commonly students would work together on projects, either sharing the same grade for a project or having the grade partitioned on the basis of a collective assessment by the teacher and students of project quality and what each student had contributed to the project. Students would each take responsibility for undertaking different aspects of the project work, but would consult in developing the overall plan and structure of their joint work.

Peer tutoring was another common form of collaboration at Mountview. Often this would occur informally and spontaneously; one student might ask a neighbor how to do an operation on a computer, or watch another do a task and then practice it themselves. A student would sometimes offer help when he or she observed a neighbor having difficulty. Teachers would usually tell their classes that when a problem develops they should seek help first from their peers before bringing it to the teacher. Some teachers made formal cross-grade “buddy” tutoring arrangements, and ad-hoc peer tutoring between classes was employed occasionally when one class had learned skills another class needed.

The school went to some length to encourage cross-grade collaboration; teachers would sometimes have students from another grade (higher or lower) with experience in the use of particular software come to their class and tutor their own students in that software. Several mornings a semester were scheduled by the administration for cross-graded learning around ecological literacy. Students remarked that they enjoyed all these forms of collaborative learning and generally preferred them to working alone, although some indicated that there were times when they would choose to work by themselves to complete a specific task.

The school had a wide range of multimedia resources for student use: five higher-end digital cameras, five video cameras, audio taping equipment, electronic/MIDI keyboards and a drum machine, a video editing suite off the resource centre, and a wide range of professional-level software tools. By mutual agreement between the school’s administration and the Technical Committee of teachers that oversees ICT at the school, virtually no money has been spent on traditional educational software tutorials and games. Instead, the school has obtained site licenses for several professional-level tool packages for graphics, data analysis, animation, presentation, and multimedia/Web development, including Microsoft Office® and Image Composer®, Macromedia Flash®, PhotoDeluxe®, Adobe Illustrator® and Photoshop®, Studio DC 10® (for video editing) and Intuous (for drafting). One-user packages for some more specialized applications were also obtained, such as Ray Dream Studio® (for 3D rendering) and AutoCad LT® (for higher-end drafting). The Technology Committee had also decided to acquire an Inspiration license so students could work with computer-based concept mapping. Despite the complex nature of many of these packages, students as young as eight were able to use tools like animation software to develop short animations and PowerPoint® to make presentations, and to do simple HTML coding. Teachers were deeply struck by their students’ ability to quickly gain competence in the use of these packages, often with very little formal training. “You teach one kid and it just spreads through the school,” was how one teacher put it. They commented on the quality and depth of work that they were seeing, which typically exceeded what they expected from students of their age.
level: “What I thought perhaps 13 and 14 year olds could do, I’m seeing 5 and 6 year olds
do now,” said the principal. Their ICT skills were at a very high level relative to what is
typically found in students of the same age in other schools. Sampled work shows that
even students in the junior grades (4-6) were able to develop multi-faceted reports and
presentations incorporating various forms of representation in a sophisticated way. One
teacher cited a tremendous value he saw in ICT: its capacity to present the spirit and
competence in young children’s work in a manner that is no longer obscured by poor
motor skills (messy printing, etc.). That students were being afforded the opportunity to
create more adult looking work was thought by several teachers to motivate deeper
learning. Several staff also stated that the communication and sharing of different ways of
knowing that ICT made possible contributed to the students’ development of a love of
learning. Teachers saw their students as growing both in their intrinsic motivation for
learning and their capacity to actively engage in learning in self-directed and
collaborative contexts. Students were seen to be developing a strong sense of confidence
in and ownership of their learning. In the words of one teacher,

The majority of the students in the school really feel that they have a voice in what
they’ve learned, and they can talk about it and they can explain to somebody else
what they’ve learned and the process they worked through to learn that.

The French teacher noted ICT’s value in helping her students master a new language:

I find it very—for the work that I’ve done last year and again this year, it’s been very
good for students to be able to communicate with their peers, especially when they’re
trying to learn a second language. And I’m the only one that they have any exposure
to that speaks that second language. So giving them more opportunities outside via
the Web or e-mail is invaluable to me.

Every one of the six students interviewed considered their school experiences enjoyable
and interesting; the only improvements suggested were to have more sports (from a grade
two boy) and to have faster Internet access and more computers in some classes (from
several students). In most cases, they found the tools they worked with relatively easy to
learn, although very young students (grades two and three) remarked that it was difficult
to do some things like log in to the network.

C4. Technology used

According to staff, the software most commonly used by students included Word, Excel,
and Web browsers. Most teachers were satisfied with the amount and kind of hardware
and software available at the school, but some complained about a lack of sufficient
technical support to deal with recurring network problems. In addition, having whole
classes accessing the Internet via 2 56K modems has left many looking forward to the
arrival of broadband, which has been promised to all schools in the province.

The degree to which this school could have succeeded in transforming practice without
ICT is open to debate, and the evidence available is not sufficient to offer a firm
conclusion. Asked if the teaching innovations could be sustained without the technology
being present, staff indicated that they could, although they conceded that it would make
the task more difficult; the use of adult-level ICT tools that produced professional
looking output was seen as highly motivating to students. Analysis of student interviews
and observations indicated that students were usually very motivated and focused in their ICT based work, especially when more advanced applications (high-end graphics and presentation software, for example) were being used. Whether they would retain a similar level of enthusiasm and commitment to large-scale project work without having access to the many adult-level multimedia presentation options ICT opened up to them, and the opportunities ICT afforded to make contributions to the community that they considered meaningful and authentic (such as adding pages to the school’s extensive Web site), is questionable. Without student access to technology, some of the desired pedagogical innovations (to the extent they were realized) might never have happened—teachers might have found it too difficult to sustain meaningful student initiative.

C5-C6. Impediments and sustainability
The main impediments encountered in the implementation of the pedagogical innovations and ICT infusion at Mountview were a result of resistance from three concerned parties: parents, teachers, and school district administrators. As the school was being planned, many parents initially expressed strong concerns about giving computer technology so central a place in the school’s plan. The lead planner and founding principal of the school, by all accounts a brilliant and charismatic leader, was able through a series of public meetings and, later, work with the School Council, to assuage most of these concerns by explaining the goals, principles, and purposes ICT would serve in the school. There was also some apprehension about and resistance to using ICT from many of the new school’s staff, who felt that trying to implement ICT on top of starting to teach in a new setting and attempting to change their teaching practices was too demanding. Overcoming this required extensive in-service and professional development support, which the principal, the Galileo Centre, and others provided (described in detail above), and it was never entirely successful; teacher turnover at the school has been inordinately high, with only 4 of the original 24 staff members still present five years later, requiring that the professional development activities be sustained. While most teachers are now relatively comfortable with the constructivist view of education, it was (as mentioned earlier) not always seen in practice, and a few staff are still of the view that students need more direction and teacher-led instruction than that model allows for.

Teachers reported that the demands on their time and energy that their constructivist-oriented teaching at Mountview imposed were far in excess of what they had encountered in other schools, and several thought burnout had contributed to the departure of some former staff members. What was keeping these teachers at the school was the professional and personal satisfaction they derived from being able to teach in what they found to be a more meaningful and effective manner, and from seeing the positive impact their work was having on students. The latter was clearly a critical factor in sustaining their support for the innovations.

Students themselves had high praise for the dedication of the staff and the quality of teaching at the school. Their teachers’ passion for their work and willingness to make personal sacrifices has clearly been the main sustaining force for the innovation. The third impediment to success no longer weighs as heavily on the school—resistance on the part of the district administration. The superintendent in place in the first years of the school’s operation had attempted to subvert innovation in different ways, some of which...
were never made clear. According to a former Galileo Fellow and other sources, she feared success at Mountview would produce too much anxiety and resentment elsewhere in the district, and so she tried to contain the school’s activities, denying the principal a permanent contract and apparently making things so unpleasant that he and a few key staff eventually left the school. This administrator has since departed, and the new superintendent has offered explicit support for the school’s approach.

The prospects for sustaining the innovation are encouraging. The fact that the school has survived such a large staff turnover, including the influx of 14 new staff last year without significant erosion of its innovation bodes well for its future. The school has been able to maintain its innovative focus largely due to the strong coaching support provided to the new staff by the administrators, lead teachers like Steven and Martha, and the Galileo consultant. Staffing turnover dropped dramatically this year, and the teachers’ comfort levels and expertise with ICT is now at a high enough level that ICT use should be self-sustaining. Internal leadership at the school remains strongly committed to maintaining the culture of reflection and collaboration in the community.

C7. Transferability
The evidence from Mountview suggests that while transferring its pedagogical innovations and ICT infusion model to existing institutions might be possible, it is likely to be very challenging. The school had the advantage of being able to carefully select staff amenable to risk-taking and constructivist practice, something not tenable in an existing institution, which would doubtless make the development of a reflective community of practice much more difficult. Still, frequent visits by other teachers to the school is sparking external interest elsewhere. The approach to transfer now being used by the Galileo Network involves having experienced teacher-leaders (formerly lead teachers at Mountview) work in a situated, intensive, and ongoing basis with a few other schools which have been excited by what Mountview has achieved. Using the same modes of professional development that have been successfully used at Mountview would appear to have the highest probability of success, and, in fact, the Network is starting to have a major impact on the practices of teachers in several schools. For the longer term, both sustainability and transferability will need to be addressed at a deep structural level if widespread reform is to occur. Policy and funding changes will be needed to redress the relative lack of opportunity teaching staff have for learning about, reflecting on, and trying out new approaches to their practice within a culture and support structure that reduces perceived risk and lowers the levels of demand placed on the teacher as he or she works towards a transformation of practice.
Appendix 1. Photographs of Site

Figure 1: Island area with computer clusters

Figure 2: Small wing of CTS room
Figure 3: Grade 5 class concept map