



UNIVERSITY OF
CALGARY

**Building New Bridges: Technology
Integration, Engaged Student Learning,
and New Models of Professional
Development in Foothills School Division**

by

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EXECUTIVE SUMMARY

EVALUATION CONTEXT

The present evaluation is phase 2 of a two-year evaluation of the Galileo Network's professional development initiative that builds and extends upon a study conducted during the first year of operations in 1999/2000, and phase 1 of this investigation conducted in 2000/2001 in conjunction with a national OLT Research initiative focused on continuous professional development (Jacobsen, 2001a).

OVERALL EVALUATION OBJECTIVES

The following research project focused on three broad areas:

1. engaged student learning,
2. professional development of teachers, and
3. integration of information and communications technology.

CASE STUDY – FOOTHILLS SCHOOL DIVISION

This is a case study of a large rural school district, Foothills School Division, which is participating in the third year of a major educational reform initiative in conjunction with Galileo Educational Network. This study focused on uncovering the essential conditions for moving a school jurisdiction forward with an education reform agenda for effective technology integration, professional development and leadership. The multiple ways in which the two organizations, Foothills School Division and Galileo Network, worked together to coordinate funding sources and leverage the impact of each other's efforts to support teachers and students in their classrooms was examined, and the essential conditions for division-wide reforms were sought.

Key themes emerged from the investigation with the educational leaders and school-based participants in the AISI/Galileo ICT initiative in the Foothills School Division. These themes strongly parallel trends which have surfaced from numerous case studies cited in the literature review, and findings are presented in conjunction with research from other educational reform initiatives. Specific study findings are structured by three key questions:

- *What does the desired educational change look like?*
- *What factors hinder the movement towards desired educational change?*
- *What factors facilitate movement towards the desired educational change?*

Nine main conclusions emerged from this study. *First*, the technology integration and inquiry-based learning initiative has been very successful at the elementary and junior high levels. *Second*, there are significant barriers to implementing inquiry-based learning initiatives to do with technology in senior high schools. *Third*, the initiative's success is due in a large part to the endorsement and encouragement it has received from the Galileo

Network and from the Associate Superintendent, Jay Pritchard. *Fourth*, an effective technological infrastructure has been maintained in Foothills School Division schools. Reliable access to technology for staff and students is enhanced by the technology support department with much ingenuity, despite limited resources and turnover of key staff. *Fifth*, teacher awareness about inquiry-based learning has been increased, and involvement in inquiry-based projects has been increased, because of the images of practice shared via exhibits, websites, and classroom visitations by the Galileo Network staff and the Foothills School Division lead teachers. *Sixth*, the initiative's success thus far is in great part due to the Galileo Network's innovative professional development approach with teachers. It is a personalized model where the lead teachers and classroom teachers form ongoing, respectful and collaborative "in-class" relationship beginning with the classroom teachers' needs and continuing in a face-to-face approach. *Seventh*, a key factor in the success of the educational reform initiative has been the enthusiastic involvement of district and school leaders. *Eighth*, success has not come without an enormous amount of time and energy spent by all involved in the initiative, particularly by the Galileo Lead Teacher and Galileo Network staff, the Foothills School Division lead teachers and the technology support department. *Finally*, given that a primary goal of the initiative is on the emergence of new and more effective teaching and learning practices, part of the initiative's progress can certainly be attributed to the fact that all of its main facilitators, from the Galileo Network teachers to the lead teachers to the technology support administrator, come from classroom teaching backgrounds.

Six recommendations have emerged as a result of this study. *First*, if the initiative is to be fully successful as originally intended – i.e. new practices emerging from all 17 schools – then a sustained relationship should be sought between the Galileo Network and each school. Given that AISI funding is term-certain, sustainable sources of funding need to be sought to support the ongoing professional development needs of teachers. *Second*, it is recommended that some means be sought to increase access to the type of responsive, flexible and ongoing professional development support offered by Galileo Network that is highly valued by teachers. *Third*, the lead teachers who are not actively a part of Galileo Network have fewer prospects of working with their schools at the same level as the Galileo Lead teacher at Gibson, Red Deer Lake and Millarville. It is recommended that every possible measure be taken to give the lead teachers expanded opportunities to work closely with the Galileo Network and with applying the Galileo approach in schools. *Fourth*, since the initiative is making only limited progress in Foothills' School Division senior high schools, it is recommended that Galileo's work in high schools of other school divisions be examined, and findings be shared. *Fifth*, in order for the Technology Support Department to fully realize the ICT vision within the Foothills School Division, the Technology Support Department will need to have its *funding increased* for personnel and ongoing professional development for technical support staff and FSD staff. As more teachers become involved with inquiry-based approaches to technology integration, the technology support and professional development needs will *increase exponentially* rather than remaining stable. Therefore, last year's budget for the Technology Support Department will not be sufficient for the increased number of teachers who are enthusiastic and becoming involved this year. *Finally*, in order to develop a fuller understanding of how successful the Galileo and AISI initiatives have been in Foothills School Division, ongoing external research is needed in order to fully understand the impact of the educational reform initiative in Foothills School Division.

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Part 1: Context

This is a case study of a large rural school district, Foothills School Division, which was participating in the third year of a major educational reform initiative in conjunction with the Galileo Educational Network. The impact of professional development initiatives in schools involved in the ICT initiative during 2001-2002 was a focus for this inquiry. Therefore, attention was on the educational reform initiatives at particular schools, including Dr. Morris Gibson, Red Deer Lake, Millarville Community School, Senator Riley Middle, Foothills Composite High, Highwood High, Oilfields High School, and Blackie School.

The educational reform initiative, entitled “Connecting Teaching and Learning Through Technology” (Appendix C), builds on funding provided by the Alberta government in the form of an Alberta Initiative for School Improvement (AIS) grant. This funding supports two lead teacher positions (Appendix D) to work alongside the lead Galileo teacher in diffusing the Information and Communication Technology (ICT) plan throughout out the division. The two lead positions were created out of a three-year grant and are important components of the Foothills School Division technology integration initiatives.

The vision for such a major educational reform began with the philosophy of the Foothills School Division, which focuses on good teaching and learning. As part of this philosophy, the administration recognized the need to help students become proficient in the area of technology and to support the teachers as they provide integrated opportunities for meaningful technology use within their classrooms. In keeping with its overall vision, Foothills School Division has had a technology infrastructure and maintenance plan in place for a number of years. The technological support resulting from this plan has been an integral part of the educational reform initiative.

Also important to this initiative has been the leadership and support that has come from the Galileo Educational Network. Teachers in select schools in Foothills School Division are provided with ongoing, onsite professional development opportunities by working closely with Galileo and lead teachers who promote the use of technology through inquiry-based learning. Although two of the lead teacher positions are funded via AIS, the Galileo philosophy of using technology successfully while focusing on good teaching and learning guided the work in targeted schools.

The spotlight of this study is on the discovery of essential conditions for moving a school jurisdiction forward with an educational reform agenda which seeks to integrate technology into teaching and learning. Attention will also be given to realities which challenge the agenda’s progress. The specific areas that will be examined are technological infrastructure, teacher professional development and leadership.

Throughout the results of this study, the reader will be able to understand the multiple ways in which the two organizations, Foothills School Division and Galileo Network, work together to coordinate funding sources and leverage the impact of each other’s efforts to support teachers and students in their classrooms.

Part 2: Introduction to the Foothills School Division

Before a report of the progress of Foothills School Division's technological integration initiative is provided, it is necessary for the reader to be familiar with the division itself. More specifically, attention needs to be given to the division's size, geographical distribution, community milieu, and organizational structure. It is also important to understand the division's mission, as well as the Province of Alberta's technological mandate, for these provide the rationale for the initiative which is the focus of this study.

Size. As of March, 2002, there were approximately 6829 students and 704 staff members in the Foothills School Division. Of the staff, 345 are teachers. There are 43 administrators, which are comprised of superintendents, learning coordinators, principals and vice-principals.

The technical support staff consists of 1 technology supervisor, Doug Dietz, 1 technical support coordinator, and 2 systems analysts. As a way of further assisting teachers with technological problems which may arise, one staff member in each school has taken on the additional role of a "systems operator". However, these systems operators are not formally considered part of the tech support staff. Furthermore, they sometimes require the assistance of two more tech support people who work closely in conjunction with the technology supervisor, and who carry out their duties on an "as-needed" basis.

There are 17 public schools in the division. They are represented by the following categories of "grades":

Grades (from lowest to highest)	Number of Schools
Kindergarten to Grade 6	3
K-8	6
K-9	1
10-12	1
9-12	2
7-9	1
6-9	1
K-5	2

Beside these 17 schools, there are 8 others which are categorized as follows: 3 Hutterite colony schools, 3 outreach schools, 1 alternative school and 1 institutional school.

The outreach schools feature a "multi-campus umbrella program" called Education Plus, which is meant to serve the needs of high school students who may be at risk of dropping out of school. Outreach educational opportunities are also given to a very limited number of grade 9 students. The three campuses are located in High River, Okotoks and Black Diamond.

The residential school is Stampede Ranch. It is for boys who are behaviourally "at risk". Their placements are made possible through Child and Family Services. Through a variety of processes, the students grow in their communication, choice-making and conflict-resolution skills. The intended goal is to prepare these students for a return to their neighbourhood school. Sheep River School is the name of Foothills' alternative school. It is created to fulfill the emotional, social, behavioural and academic needs of junior high school students with whom school-based intervention hasn't succeeded. Students gain abilities to make choices, resolve conflicts, communicate needs, and further their development in a congregated setting. Like Stampede Ranch, the goal of Sheep River is to see the students make a transition back to their neighbourhood school.

Geographical Distribution. Foothills School Division is located south of Calgary, Alberta, Canada. It is primarily distributed through four towns: Black Diamond, High River, Millarville and Okotoks. To give an idea of the amount of area that the division covers, the furthest distance between any two schools is 68.4 km (between Millarville School and Cayley School).¹

Community Milieu. The division serves communities that have various socio-economic situations and cultures. Still, there is less diversity to be found in these communities than in the city of Calgary (see Appendix G for demographic characteristics).

Parents and other members of each community are encouraged to provide input in the following ways: school and divisional development, where appropriate; and suggestions for board policies which affect them.²

Organizational Structure. Foothills' organizational model aims for simplicity and focus. All of the division's activities fall under the umbrella of one of the following service departments:

Corporate Services. This department is led by the secretary-treasurer. This person reports directly to the division's chief superintendent, and is responsible for the administration of financial, transportational, school policy, and staff contract services.

Learning Services. This department is responsible for instructional programs, special education and student-related issues.

School Services. Under the leadership of the associate superintendent, the school services department takes care of human resources, facility operations/maintenance, and technology services. In order to inform what developments are occurring within school services, the

¹ Information for the "Size" and "Geographical Distribution" sections were provided by Linda Baisley and Karen Schmidt of the Foothills School Division, through personal correspondence.

² Foothills School Division, "Foothills Business Plan for Education – 2001/2002 to 2003/2004" (PDF document), pp. 5-6. To see specific comparisons among the two biggest Foothills communities, Calgary, and Alberta, see Appendix B.

associate superintendent meets with an executive team, who then informs the chief superintendent. The superintendent, in turn, communicates with the school board.

Chief Superintendent. The chief superintendent's responsibilities are numerous; they include organizational and educational leadership, leadership development, internal and external communications, and a responsibility towards the board of trustees to fulfill the division's mission.³ It is to this mission that we will now turn.

Mission. The mission of the Foothills School Division is to provide the greatest opportunities for learning to the students, in order that they may "discover, develop and celebrate (their) unique skills, abilities and accomplishments."⁴

Towards this end, the division has created a three-year business plan from 2001 to 2004. During this period of time, the division hopes to fulfill four provincial goals, which have been authorized to all school divisions by the government of Alberta. For the purpose of our study, it is noteworthy to mention the third listed goal: *to educate learners so that they are "well-prepared...for lifelong learning, (the) world of work and citizenship."*⁵ It is in this goal where the Alberta school divisions have been given a mandate to implement the government's ICT (Information and Communication Technology) Initiative. This plan intends to have students become fully proficient in technology, across all subject areas, by the year 2005.⁶

As a way of fulfilling this mandate, the Foothills School Division has sought and received funding from the Alberta Initiative for School Improvement (AISI), which encourages projects that will enhance learning through the implementation of "innovative approaches to curriculum and instructional design"⁷.

Also, the division has secured the support and assistance of Galileo Educational Network, whose head office is in the Faculty of Education, University of Calgary. Since Galileo Network's objective is to promote "fundamental changes to teaching, learning and staff development that information and communications technology both requires and enables"⁸, this learning organization has become an integral part of Foothills' ICT implementation plan. The remainder of this report will focus on the progress of this plan. For additional background on the nature of the relationship between Galileo Network and Foothills School Division, refer to the AISI plan (Appendix C).

³ Information for "Organizational Structure" section provided by Foothills School Division website (www.fsd38.ab.ca/htm/departments.cfm)

⁴ Foothills School Division, "Foothills Business Plan for Education", p. 3.

⁵ *ibid.*, p. 21.

⁶ *ibid.*

⁷ "Foothills AISI Projects" (<http://webacc.fsd38.ab.ca/services/Foothills%20AISII/index.html>)

⁸ "About Galileo Educational Network" (<http://www.galileo.org/about.html>)

Part 3: Research Methodology

In order to carry out the inquiry into the Foothills/ICT initiative's progress, a **case study design** (Merriam, 1998; Stake, 1995) was used. Generalization was not a goal at the outset; this particular investigation focused on broadening our collective understanding of educational reform initiatives related to technology integration, engaged student learning and new models of professional development by focusing on the relationship between a professional development organization and a school division. The specific data collection and synthesis methods utilized to implement this particular research design are noted below.

Interviews

Galileo Network staff who are closely involved in the initiative were interviewed in order to get their perspective on the initiative's overall progress, as well as their own particular contributions toward it. The staff included Barb Martin, lead teacher; Richard Gaskell, technology support teacher; and Brenda Gladstone, general manager. Also, four Foothills School Division staff who, while not being a part of the Galileo Network, played key roles in the initiative also discussed their thoughts with us. These key individuals included Jerry Blake and Tony Hampshire, the Foothills/ICT project administrators; Doug Deitz, technology support supervisor; and Jay Pritchard, the associate superintendent of Foothills School Division.

The areas of focus for interviews varied, depending on the role the participant(s) had in the Galileo/ICT initiative and the depth of their involvement. Specific information was desired from individuals about their participation in the Galileo/ICT initiative. However, interview questions were used primarily as a guide to structure the interviews (Appendix B). The open-ended, semi-structured nature of the questioning allowed the researchers "to respond to the situation at hand, to the emerging worldview of the respondent(s), and to new ideas on the topic" (Merriam, 1998, p. 74). Each participant was "expected to have had unique experiences, special stories to tell" (Stake, 1995, p. 65).

Interview data from the previous two years of the study

Interviews conducted with 30 classroom teachers and school administrators in past years, 1999 to 2001, were re-examined in an effort to capture any parallels or contrasts with what was discovered from the present interviews. Interview questions for principals focused on initial contact and relationship building between school and Galileo staff, perceptions of satisfaction in professional development for teachers, evidence of student engagement and achievement, and issues to do with the technological infrastructure. Areas of focus for teachers depended on the amount of involvement with Galileo staff, whether they were in the first or second year of the project, the teacher's experience and understanding of inquiry-based learning and technology integration, and on individual levels of technology expertise and use.

Literature review

Numerous case studies of large scale educational reform were consulted in order to develop a picture of what other educational researchers have discovered about large scale professional development, leadership and technology initiatives. Other case studies and research literature provided an idea of what we could anticipate as we began to collect our findings. In keeping with the initiative's focus on good teaching and learning, the case studies we examined included *general educational reform* as well as those cases which specifically involving technological integration.

Access to internal data

Several documents produced by the Foothills Division and Galileo Network were studied in order to gain a fuller understanding of the vision and purpose behind the ICT initiative, as well as the expected progress and outcomes. For two of these documents, see Appendix C and D.

Galileo and Foothills websites

Both the Galileo Network and Foothills School Division websites were viewed with the objective to make connections between these institutions' purposes for the ICT initiative and their overall educational goals. Also, the websites of the specific schools who have worked with both Galileo and Foothills were also visited, in order to develop exhibits based on technology-enhanced inquiry projects which are described in Part 5 and listed in Appendix A.

Part 4: Research Results and Key Themes

The following section summarizes key themes emerging from the investigation with the educational leaders and school-based participants in the AISI/Galileo ICT initiative in the Foothills School Division. These themes strongly parallel trends which have surfaced from numerous case studies cited in a review of the literature, and findings are presented in conjunction with research from other educational reform initiatives. The findings in this section are structured in such a way that information addresses three key questions:

- *What does the desired educational change look like?*
- *What factors hinder the movement towards desired educational change?*
- *What factors facilitate movement towards the desired educational change?*

SECTION 1: WHAT DESIRED EDUCATIONAL CHANGE LOOKS LIKE

This section is organized into four key areas:

1. Vision and leadership that provides direction.
2. An outcome of new ideas and practices
3. A focus on teaching and learning rather than on technology for its own sake
4. School Leaders' Perspectives on Educational Change, 2000 - 2002

Vision And Leadership That Provides Direction.

Foothills School Division has been engaged in “purposeful reform” (Fullan, 2001, x) with regard to technology integration in conjunction with the Galileo Educational Network since 1997. “Schools are beginning to discover that new ideas, knowledge creation, and sharing are essential to solving learning problems in a rapidly changing society” (Fullan, 2001, xi).

The vision for educational reform has emerged from the combined leadership efforts of Jay Pritchard, associate superintendent for Foothills School Division, Barb Martin, Galileo Lead Teacher in Foothills School Division, and the three founders of the Galileo Network, Pat Clifford, Sharon Friesen and Brenda Gladstone. “Leadership is not mobilizing others to solve problems we already know how to solve, but to help them confront problems that have never yet been successfully addressed” (Fullan, 2001, p. 3). At its heart, this educational reform initiative is about shared vision, engagement and relationships. The two learning organizations share a common vision about needed reforms in children’s learning opportunities, and about leaders, professional developers, researchers, teachers and learners becoming engaged in a community of inquiry focused on problem posing and collaborative problem solving, and at all levels, cultivating mutually beneficial relationships among relevant stakeholders.

The following testimonials from Jay Pritchard, published on the Galileo Website (<http://partner.galileo.org/video/about/>), attest to the level of shared vision and

accomplishment that Foothills School Division and the Galileo Network have achieved since their partnership began in 1997.

Effective ICT (Information and Communications Technologies) Implementation

JAY PRITCHARD: I just came back from doing an evaluation in another school district...I was looking at their technology plan and their implementation strategies for ICT...I found myself speaking with the superintendent of schools there indicating that it was time that they looked for other images of staff development. The approaches that they were using were having some limited success but were not causing the kinds of pedagogical changes that the superintendent hoped for when he initiated this tech plan and spent huge sums of dollars to try to implement the ICT curriculum. His comment to me initially was to say 'Well we think what we're doing is actually working very well. What would you suggest?' So I directed them to the website of the Galileo Network and I said that you need to understand even the process of including technology outcomes along with curricular outcomes in other areas. You need to see some images of what this could look like with kids because I'm not seeing any of that in your district. And you need to think seriously about coming up with a plan that would see sustained onsite consultation that would provide teachers with the real support to change their practice without feeling threatened or somehow inadequate.

Building the Capacity of Teacher Leaders

JAY PRITCHARD: I think the measure of the success of the Network is this building of an increasing mass of people who believe that they can do this work differently. It is having a tremendous influence on instruction in this area.

Creating a Pedagogical Revolution

JAY PRITCHARD: It is our intention largely through the influence of the Galileo Network to create a bit of a pedagogical revolution in our schools...I think what I see happening is Galileo influences the thinking of our leaders which allows them to work effectively with staff to bring about the kinds of changes that we're looking for.

New Images of Staff Development

JAY PRITCHARD: I think that Foothills School Division would say that among its highest priorities is staff learning and Galileo has contributed to that in a huge way in terms of providing new images for teachers but also new images of staff development itself.

Different from the 'Workshop' Approach

JAY PRITCHARD: We can understand now that by having someone in the classroom working with a teacher that they can and will comfortably try new ideas. It's quite different from the notion of attending a workshop for a few hours and being expected to return to class and change your practice.

In an online interview with Jay Pritchard, he expanded upon the many reasons that he is in full support of a continued partnership between Foothills School Division and the Galileo Network. First, the two organizations share a common vision and shared purpose that focuses on the needs of schools, particularly those of teachers and students. Fullan (2001) discusses the need for *moral purpose*, intentional actions focused on making a positive difference in the lives of employees, customers and society as a whole.

Jay Pritchard speaks of the division's partnership with Galileo Educational Network in the following statements that highlight the shared moral purpose that guides the work of the two organizations on behalf of teachers and learners:

There was a mutuality of purpose in working together on behalf of Foothills learners and staff.

The Galileo folks wanted to focus on teaching and learning first and foremost – they knew that this is where the teacher 'lives', that this was the place to start.

After spending time experiencing the work of Galileo in the classrooms of others, I just knew that they would enrich our environment to the point where ...changing practice would result from this partnership.

...it seems to be very significant to describe the work as presenting outstanding learning opportunities for kids.

The attention given to teachers and learners, as revealed by the above comments, is a good example of the Galileo Network's focus on local needs. The Galileo approach is flexible and responsive to individual contexts rather than being a pre-set training model that is delivered in the same way to all teachers. Flexible and responsive professional development that involves teachers directly in planning, implementing and evaluating changed teaching practices is known to be crucial for successful educational reform. "They found that school-district decisions to engage in particular reforms were to two types: those reflecting opportunism, in which districts were motivated primarily by the desire "to reap federal funds", and those characterized by problem solving, in which the main motivation emerged in response to locally identified needs... The main point...is that school districts sometimes adopt innovations that are not intrinsically related to their educational needs" (Fullan, 1991, p. 21). Evaluating the impact of the Galileo and AISI professional development initiatives on Foothills School Division is a goal of the present research.

The nature of needed changes to classroom planning and instruction was negotiated with each teacher in relation to locally identified needs and the teacher's aspirations for children. "Many innovations are attempted without a careful examination of whether or not they address what are perceived to be priority needs. Teachers, for example, frequently do not see the need for an advocated change. Several large-scale studies in the United States confirm the importance of relating need to decisions about innovations or change directions" (Fullan,

1991, p. 69). In contrast to the failure of many educational reforms, the Galileo approach focuses on local needs, and negotiates the nature of the individual classroom reform effort with each teacher in response to diverse learning goals and needs. “In summary, the “fit” between a new program and district and/or school needs is essential...” (Fullan, 1991, p. 69).

There must be some relative advantage (Rogers, 1995) to teachers to pursue a reform on behalf of learners. The Galileo Network offers hundreds of projects and integrated units of study online as case studies of meaningful, engaging and challenging student work that provide teachers with the initial confidence to discuss changes to their own practice. “Changes in schools must also pass the test of the “practicality ethic’ of teachers” (Doyle & Ponder, 1977-78). The Galileo teachers have a high level of credibility because they have taught in ways that these teachers want to teach. They have been where these teachers want to go. Practical changes are those that address salient needs, that fit well with the teachers’ situations, that are focused, and that include concrete hot-to-do-it possibilities (Mortimore et al, 1988). Therefore, Galileo teachers bring experience with inquiry-based approaches to working with children and technology, and work side-by-side with classroom teachers to design, implement and evaluate each step and next step in response to the local classroom context. Practical does not necessarily mean easy, but it does mean the presence of next steps” (Fullan, 1991, p. 72-73).

An Outcome Of New Ideas And Practices

The partnership between a Foothills School Division school and the Galileo Network is based on a shared commitment to question fundamental issues to do with teaching, learning and leadership, examine and reconceptualize conventional teaching practices, and embrace inquiry-based approaches to technology integration.

Barb Martin, the lead teacher for Galileo in the Foothills ICT initiative, describes how her purpose for working with teachers goes far beyond mere technological integration:

....the idea of Galileo working with the schools in this way is that they have to be committed – so they have to say ‘Yes, we are interested in working towards different images of teaching and learning’, because if they’re not, there’s no point in me being there. So they are all willing to think and work in different ways.

The changes being sought are revolutionary; moving from curriculum delivery to curriculum design, and moving from first order uses of technology (described by Moursund, 2002, as using a word processor as an electric typewriter) to **second** (using technology for communication, problem solving, inquiry and decision making) and **third order** uses of technology (knowledge construction, representation and design). These changes require hard work, sustained conversation and collaboration among teaching professionals, attention to design, implementation and evaluation of educational innovations, and finally, no small courage. “Technology leadership is not for the timid. An effective technology leader must be able to navigate the sea of ever-increasing information and equipment, as well as the changes in education that come from technology use” (Jewell, 1998-1999, p. 57).

One teacher participating in the initiative speaks of how the Galileo / FSD ICT initiative broadens one's horizons:

TEACHER: Galileo has an adventurous spirit, trying lots of different things. Sometimes you have the feeling that you're a little out of control because you've got this person doing that and that person doing that and you think they're all doing things I'm not good at, you know? I just want to shut the door and do something I'm good at. But you just have to be able to let that go and just do it, because you really end up with something really neat (2001 Interviews).

After reviewing countless case studies of educational reform initiatives, Fullan (1991) concludes that "the essence of educational change consists in learning new ways of thinking and doing, new skills, knowledge, attitudes, etc." (p. 37). Teachers are energized and feel a sense of professional renewal when they have meaningful opportunities to work side-by-side with a fellow teacher who supports their reform initiatives, and when they have an opportunity to become a learner about teaching again.

The work has become self-sustaining for some Foothills School Division elementary school teachers. Fullan (1991) suggests that "...if the change is a potentially good one, success (such as improved student learning or increased skills on the part of teachers) will depend on *the degree and quality of change in actual practice*" (Fullan, 1991, p. 66). Evidence of transformed pedagogy is found in elementary teachers who state that they will not go back to the way they were teaching before. These elementary school teachers are convinced by the level of scholarship and engagement that they see from their students that they are doing the right thing.

"Any kind of strategic behavioural change, if it is to be successful as a long-term solution, must be supported by prior affective changes in the participants. In other words, the people involved in the change process, from top to bottom, must believe in what they are doing, or the inertia generated by innovation for its own sake will quickly disappear" (Kearsley & Lynch, p. 52). Teachers who have worked closely with the Galileo Network over the last three years are engaged as learners themselves, and hence have a personal stake in the inquiry projects with students and in their own continued professional development.

The teachers must have ownership in the curriculum design process for the desired changes to continue. Several elementary teachers have become technology leaders among staff. So, not only are these teachers sustaining the inquiry-based approaches to learning in their own classrooms, they are mentoring other teachers in how to plan, implement and evaluate inquiry-based technology projects in other classrooms.

A Focus On Teaching And Learning Rather Than On Technology For Its Own Sake

The Galileo initiative is focused on fundamental changes to teaching and learning that are required by information and communications technology. However, the thrust of their work with individual teachers is focused on changed teaching practices and reformed dispositions towards learning, rather than targetted at implementing technology itself.

TEACHER: Computers are just a tool, one thing you can use. Teachers get stressed when they think they have to use computers for everything. Always look at the big picture first and the technology will take care of itself (2001 Interviews).

Galileo Network does not approach technology integration as an add-on to current practices, but rather provides practical and hands-on instructional design approaches to meaningful use of technology with support.

TEACHER: When we're here doing our projects, we're doing what we're actually doing. It's not something extra, this is what we're doing in order to teach our kids....And we're getting the guidance that we need to keep moving along (2001 Interviews).

JERRY BLAKE: The Foothills ICT initiative is essentially focused on implementing the ICT curriculum in our schools. The Galileo component of that is to help with the technology but with the additional understanding, interpretation and application of the communication levels – of engaged learning and enduring understanding. So it isn't sufficient to just put 'hands on computers' – it is to try and restructure our thinking about our teaching. Galileo has been instrumental in keeping that aspect in the forefront.

According to Jay Pritchard, Galileo Network has “the expertise, process and enthusiasm that would enable Foothills to achieve realistic goals in terms of technology integration. Moreover, the Galileo folks wanted to focus on teaching and learning first and foremost. They knew that this is where teachers ‘live’, that this was the place to start. The technology stuff came later as the work with teachers was progressing”.

The Galileo Network initiative is well supported in the schools and at the divisional level. It is interesting to note that teachers describe the work as presenting outstanding learning opportunities for kids, rather than discussing this as another technology project.

Jay Pritchard described the new images of teaching and learning in this way: “In some classrooms teachers are not the know it all person any longer. They are seen by kids as joint learners and individuals who possess unique and valuable expertise and knowledge and they share in contextually appropriate ways. Technology is but one arrow in the teacher's quiver. They rejoice in the great works of their kids and they work hard to learn from mistakes or inaccuracies. They help learners to make the decisions fundamental to their growth as long term learners. Technology is utilized in ways that enhance learning, not distract from it.”

School Leaders' Perspectives on Educational Change

Current and changed perspectives on the role of a school technology leader were sought in the present interviews, and also by analyzing transcripts of interviews with school leaders from 1999 – 2001. Jay Pritchard describes his approach to technology leadership: “I try not to be the expert, instead the learner, the supporter, the advocate and the celebrator. I try not to

let the focus be technology infrastructure, instead it is the wonderful learning and teaching opportunities.”

Different reasons were cited for getting involved with the Galileo Network, and continuing the relationship over time:

PRINCIPAL: (We) got involved with Galileo because the school wanted opportunities to be exposed to appropriate, new, modern, leading edge kind of ways of implementing the ICT curriculum.

PRINCIPAL: The culture of this school is to do new and innovative things, to be on the cutting edge....And there's an attitude of let's try it, let's refine it, let's make it work. That particular culture, if you will, has been around for twenty years.

PRINCIPAL: Two things are at work – One is the nature of teaching is changing - the way that the staff is actually looking at the way they present information to the students is changing. The other thing that's changing of course is the fact that people are using the technology in what I believe are really appropriate ways.

PRINCIPAL: I think how much of a risk taker we really are. Those things are going to come in and the culture of the staff or the school, like this Galileo upset the culture. It comes in and changes the culture, so you have to be open to that change.

PRINCIPAL: Also, staff is involved in research – investigation of what’s appropriate regarding IT integration.

A school leader reflected on the new requirements and expectations that the ICT program of studies has put on his/her role as principal:

PRINCIPAL: New expectations as a curriculum leader – to understand the ICT curriculum, needing to get out of the way and letting the natural leaders of the school take over, and finally, making sure that the appropriate resources and assets are in place so that the teachers can achieve what they want to achieve.

For many, the desire to get involved with Galileo Network was the focus on good teaching and learning, rather than the allure of technology. As the relationship between an individual school and the Galileo Network matured over time, school principals emphasized the focus on improving learning opportunities for teachers and children.

PRINCIPAL: As much as at the beginning of the year I was told that what we're about here is good teaching and pedagogy, I think I've got a clearer idea of what that means now as I've seen these groups work together.

PRINCIPAL: Galileo is a group that says somehow or another we need to look at actively integrating the use of technology in what we're doing. So I wouldn't think of Galileo without thinking technology. But if you stop there you stop way short of what it is.

School leaders demonstrated their own commitment to the educational reform initiative by becoming involved in projects with students. Two principals commented on their belief in the importance of sharing the work first hand in order to better empathize with and understand the risks that they were asking teachers to take in their practice.

PRINCIPAL: Whereas if we could look at something that would pull us into it--and I think it's important that staff sees the administrators as feeling some of the frustrations that they're feeling. Going through the same questioning techniques. And that's often something I deal with as an administrator anyway -- is once you become more removed from the classroom, how do you really know what's going on in the trenches? If you, the administrators don't teach, you don't have a connection.

PRINCIPAL: . . . if teachers see an administrator experiencing those things whether or not that helps, whether or not that allows people to share their doubts and frustrations and their excitements and positive things about it. I don't know. I don't know how much people were aware of that. But I would certainly talk to anybody that happened to be around at the time.

SECTION 2: CHALLENGES TO DESIRED CHANGE

This section is organized into four key areas:

1. Challenges in The Realm Of Technological Infrastructure/Support
2. Challenges in The Realm Of Leadership
3. Challenges in The Realm Of Teachers' Professional Development
4. Special Challenge: Resistance From High School Cultures

Challenges in The Realm Of Technological Infrastructure/Support

Foothills School Division has an effective technology infrastructure to support the implementation of the ICT and CTS Programs of Study, and also has a strategic plan for providing technology support services. The Technology Support Services, supervised by Doug Dietz, consists of three full-time staff and one contract person. Onsite technology support is provided by a level 1 system operator at each school who works in conjunction with Technology Support Services.

The Technology Support Supervisor, Doug Dietz, described the support, training and maintenance model used to organize technology support services. Service support is primarily maintenance activity. Tactical issues are implementation issues with fairly immediate impact of one sort or another. Strategic issues start with trends analysis and also examines where the division needs to go in order to leverage resources and imperatives.

Service / Support	Tactical Issues	Strategic Issues
<ul style="list-style-type: none"> • Break/fix • Service calls • Should be 40%, is currently 40-45% of workload 	<ul style="list-style-type: none"> • Implementation • Immediate impact • Work w/administration • Should be 30%, is currently 35% of workload 	<ul style="list-style-type: none"> • Trends analysis • Leverage resources & imperatives (ICT & CTS curricula, ABLrn data) • Look into new technologies (PDA) • Should be 30%, is currently <20% of workload

There are many more demands placed on technology support services than merely supporting classroom applications.

DOUG DIETZ: If you're not careful, any one of these categories could absorb 100% of your time – at least in our environment, where there are always computer demands. So part of what I do at times is try to help balance these three areas... More and more web-based applications are coming. Our student e-mail is a web interface. We first introduced it about a year ago now, and made it available to schools. Before that, we didn't have student e-mail. So we said, "Okay, we want to move that way", because we saw that as being compatible with supporting the ICT program. And that's what I

mean by this idea of “leveraging imperatives”. There are some imperatives that we have – ICT and CTS. And then there are other imperatives too, like Alberta Learning data. That doesn’t affect the classroom day by day, but it’s still an imperative which, overall, we have to meet. I could list a bunch of other imperatives, too. We have student databases being used at our secondary schools right now that are developing web-based interfaces. Also, the gradebook program, that some of our schools are using right now, has an option for a web-based interface so grades as well as other things are involved in there.

There are some technological challenges that can hamper the efforts of leaders, teachers and students to pursue innovative digital media and communications projects. A key issue is that as more teachers integrate technology and put demands on the system, the support and maintenance needs increase.

DOUG DITEZ: I work with my 3 FTE people, plus my local sys-ops in the schools. A lot of what I do is managing the three areas, and I say, “Okay, how can I drive through to about 30% of our time here, and 40% of our time here, to allow for a better balance here, so that we’re providing better solutions, and not driving these people insane?” And also, at the same time, part of what drives us is the fact that there is a sys-op in each school, so sys-op training is part of this tactical thing that has some kind of impact on workload.

A challenge that Foothills School Division must consider is that while the support and maintenance available from technology support services is perceived to be adequate for current use levels, it is insufficient to promote widespread integration and growth. The current resourcing of technology support services doesn’t necessarily reflect the impact of all of the innovations introduced each year and the increased demands placed on the system because of the ICT and CTS Programs of Study. The budget for technology support services has remained stable for over five years even though the network infrastructure and technology use has increased.

The remainder of this section on challenges to technological infrastructure/support is organized into six key issues:

1. The Maintenance Required To Achieve Optimal Performance Of All Computer Systems And Networks
2. Impermanence Of Tech Support Staff
3. Limited Number Of Tech Support Staff
4. Limited Funding
5. Temporary Limitations To The Provision Of Network Access From Home, Due To Security Measures
6. Problems Arising When Technology Is Relied Upon

A. The Maintenance Required To Achieve Optimal Performance Of All Computer Systems And Networks

It must be emphasized that the current technology support services are seen to be effective by teachers and leaders, and are recognized as providing excellent support given current resource constraints.

There is a significant risk when a technology system is seen to be unreliable; if teachers begin to observe too much “down time”, they will be very reluctant to use technology regularly in their teaching practice.

DOUG DIETZ: They’re still doing most of their normal management activities, but we’ve leveraged it to a much higher level of performance. That’s, I guess, my biggest challenge and what I spend the majority of my time thinking about. I ask, “How do we continually look for those points of leverage that push hard?” Because if you continue to do things the way you’ve always done them, in our context, you’re not going to survive. You’ll have frustrated people who will say, “The systems don’t work. I can’t do what I want to do. I’m better off doing something in the classroom that has nothing to do with technology.” Students will say, “I’ll wait until I go home and do this on my machine at home, because I don’t want to do it here...” I think by going this road, we have a much better chance of encouraging everyone. They’ll say, ‘Yeah, the systems will work.’ So there are times when that leverage becomes important to us.

Doug Dietz commented on the 5-year evergreen plan that is meant to support status quo, not growth. So, the plan is focused on replacing hardware every five years, not on increasing the number of workstations or network infrastructure. However, there has been an increase in the number of workstations in individual schools, and with the building of new schools. There are also hundreds of older workstations that need to be repurposed for ongoing use.

RICHARD GASKELL: One problem is the IT dept. faces is this: you have a whole pile of older computers that are no longer viable as regular workstations, so what do you do with them - especially in light of the fact that most of the students are browsing the Web or using a word processor? It doesn’t make an awful lot of sense to buy 5 top-end machines and throw out all of the old stuff at once. It’s not a great idea. So what they have done is that they’ve taken these and basically made them into “thin clients”....It’s quite neat – *in the short-term*. And this is the thing that’s vital. But it is not a long-term solution.

Doug Dietz’s view is that thin client is a technology that does have long-term potential to support certain types of functions. The key is to make it *part* of the solution and to have users recognize when its use is appropriate.

Overall, the support and maintenance requirements in the school division have increased in complexity and coverage over the years, while the budget for these services has remained the same in the past five. Doug Dietz emphasizes that the current technology budget was a result of deliberate decisions to balance expenditures for technology versus committing funds to

critical instructional issues. He supports this decision, and does not advocate increased spending on technology at the expense of other important learning initiatives and resources. That being said, Doug Dietz would support increased spending on technology if the necessary resources came from increased funding from Alberta Learning.

B. Impermanence Of Tech Support Staff

One challenge for school systems is to recruit technological & network experts who are willing to accept posted salaries and who can also stay with the division for some time.

DOUG DIETZ: Keeping quality staff is a concern. A year ago, last January, I lost my other network analyst. And he was really qualified...he left us and just about doubled his salary overnight, on probation, and went into six figures as soon as he got off probation... In the next round, the top two applicants were from South Africa and South Carolina. None were from Alberta that came close to what we needed. Alberta is not an easy place to recruit in right now. Being right next to Calgary makes it that much tougher.

This tendency toward staff impermanence is also confirmed in a case study that Michael Fullan cites: "...one of the most powerful factors known to take its toll on continuation is staff and administrative turnover (Bermand & McLaughlin, 1977; Huberman & Miles, 1984)." (Fullan, 1991, p. 90).

A technological staff retention strategy that has proven effective for Foothills School Division is to provide ongoing professional development opportunities for technology support staff, and to implement a shared leadership organizational model. The technology support services group operates as a self-managed team who understands their individual and collective leadership responsibilities.

DOUG DIETZ: Virtually every one of the people that works for me could make more money in the city; it's a lifestyle issue. So that's what you've got to look for. Plus, you've also got to create an environment. The other thing that I'm proud about is that this team has high-level problem solvers. They're highly capable problem solvers. They have very active minds. As long as I can provide them an environment in which those minds are comfortable and continue to work and grow, have reasonable remuneration, and as long as the lifestyle issue is linked to it, that's the only way that I can do it. If I just competed on dollars straight across in the industry, I'd be toast.

A key strategy for Foothills School Division has been to emphasize the lifestyle benefits that they can offer (i.e., rural, nature of work place, benefits, learning environment, etc.) to technological support staff. This has been an effective strategy for retaining outstanding technological support staff and avoiding the impact of high turnover. Foothills School Division has been successful in attracting the technological support staff they want who have stayed with the organization for long periods of time.

C. Limited Number Of Tech Support Staff

The support/service component of Doug Dietz's area could consume all of the efforts of the three full time staff. Therefore, a plan was put into place to provide onsite support at each school. The Technology Coordinator has developed an innovative approach to make best use of limited resources in the school division by making sure that there is a level 1 systems operator in each school. Dietz requires each school to commit the resources for that person which also increases the school's ownership and responsibility for technical support. The Level 1 system operator is highly valued by schools for instructional support, as well as for keeping the technology infrastructure accessible and reliable.

DOUG DIETZ: The agreement is that all schools have Level 1 system operator capability. That's their responsibility. Now my responsibility is to provide the training, and it's their responsibility to identify someone, and to make sure that, however their budget and staffing in the school works, that person is somehow available to do this stuff. Most of the Level 1 support is fairly easily resolved. Say, 'How do you unjam a printer that's jammed? Or, 'If a printer's not printing, what things should you check going back from the printer to the network that might not be functioning properly?' It could be anything from the Net port that we used to a bad cable. This is stuff that is easily addressed at the school level. And probably Level 1 amounts to about 75% of the irritants that can stop students and staff from wanting to use technology. So what we do is that we built a series of workshops around all of this, and delivered them on a routine basis. We also provide Level 2 workshops. Level 2 is almost a joint exercise – depending upon circumstances. Some of those circumstances mean, 'What's the experience of the local sys-op?' We have some sys-ops in some of our schools that are well-experienced and have been to all kinds of our own training, and in some cases, even smarter training. They can do the majority of the Level 2 stuff. We don't expect them to, but they do and so that saves us a bit. The other thing is the size of the network. We've got a couple of high schools that have anywhere from 170-240 workstations in it. That's a pretty big job, and we say that they should have somebody who has a reasonable amount of Level 2 capability, simply because, with the size of the network, more of these issues will show up more often. And Level 3 is sort of what I would call major development-type stuff, and that is the domain of my department alone. We don't even want or encourage the sys-ops to go there. That would be anything from images on new workstations – if we've bought 200 new workstations and we have to create an image, or create application objects that we can flow out to the schools. So my department would do most of the support there. You know, install new servers, building new systems, transferring operating systems from an older server onto a new one, and that kind of stuff. That kind of service would flow here.

In past years, the Technology Coordinator provided professional development for the school-based people. This year the demand was so high on the three tech support staff that training fell a bit by the wayside. However, the Technology Coordinator realizes the importance of this training, and is strategic about the widespread impact it can make in the division. Further, Doug Dietz recognizes the value of increased investment in staff development with regard to ICT.

There is an adequate level of trust and satisfaction with the technological support provided by the school division.

BARB MARTIN: Based on the number of people, who are providing technology support in Foothills School Division, the support is adequate. We have limited "human" resources and as a result there are times when it becomes frustrating for the teachers in the schools. With the SYSOP teachers at each school, the minor glitches are repaired and work continues. We have telephone contact with the Tech department at DO and manage to keep the system up and running. As there are only 3 people they do the best that they can to help us with our work. If the system is not running effectively and consistently, the work of the teachers and students cannot happen.

Doug Dietz recognizes that some of the concerns with respect to support limits are valid. The Technology Support Services staff cannot always respond as quickly as desired. Careful and strategic planning and application of policies and procedures is necessary to get the best leverage out of technology support.

Given present limits, technology support is targeted specifically to the needs of the majority rather than to the needs of the early adopters. Thus, technology support solutions are focused on vital and imperative services for the majority of teachers and students, rather than investing an unsustainable amount of time on individual or one-time projects.

D. Limited Funding

The challenge of frozen budgets in a time of increased support and training needs by teachers has an impact on educational reform initiatives. As more teachers become involved in designing and implementing inquiry-based technology projects with their children, the support and training needs go up. The demand on the school and system technology infrastructure goes up. The size of the system infrastructure (i.e., number of workstations, diversity of software tools, extent of network) has grown over the past 5 years as new schools have opened, however the budget for technology support has stayed the same.

DOUG DIETZ: Still, (funding) has been more or less frozen on the support side for four years, and the budget submission for next year is still identical. My budget process lasted about ten minutes; I just took last year's spreadsheet, and just made a few small changes to it.

Doug Dietz describes major factors that characterize his role: managing expectations, balancing current needs for security and innovation, and leveraging current systems and infrastructure.

DOUG DIETZ: I submitted a budget for the 2002/2003 school year, which is essentially a budget that was frozen four years ago. It's the fifth budget in which the same dollar values, more or less, that are there were there five years ago. So because

there was a decision by our executive leaders that said, “Okay, we’re only prepared to invest a certain amount of technology, and that’s it – the rest has to go towards other kinds of things”, my point to them was, “Okay, I’ll live with that freeze, as long as there’s some kind of freeze or control on the other end. We can freeze our support costs if we don’t have climbing support needs.” So that’s the balance we’re working with. Now, the reality is we have a lot more equipment and a lot more things happening technologically than the time when we “froze things” almost five years ago now. We’ve been able to do that, I guess, by looking at various technologies, by trying to maximize the tools that we have available to us.

It is important to help those in the provincial learning ministry to understand the increased need for technology and human resources in this time of increased usage and widespread implementation.

Doug Dietz participates in and contributes to several provincial committees as part of his professional development and leveraging strategies. By coordinating initiatives with other jurisdictions, drafting and forwarding policy, discussing innovative approaches to similar issues, and sharing knowledge about promising solutions, the technology support services provide long term benefits for students and staff.

JAY PRITCHARD: Funding is an inhibiting factor. Many of my previous budget proposals have failed because of finite resources. We keep trying. In the meantime, we are doing the best we can to provide the support necessary to keep our infrastructure alive and functioning.

JAY PRITCHARD: I think we are frequently limited by what we don’t know about what is possible within infrastructure. Similarly, we often find ourselves frustrated not being able to do what we know we should do because of the lack of fiscal supports.

Part of the challenge is to respond effectively to the many requests from earlier adopting teachers who want to do innovative projects that put a new demand on the technology infrastructure. A balance is sought between maintaining the current technology infrastructure for the majority of teachers, students and staff, and supporting innovative extensions and additions to the infrastructure requested by individuals and for one-time projects.

DOUG DIETZ: (A teacher) said, ‘We’re working on a project this spring, where we’d really like to have students accessing NIMS from home’, he said, “and it’s web-based, why won’t you make it that?’ I had to say, ‘I won’t do it right now, because I’d have to spend too much time, and that drives me here, investing time in these areas, as opposed to the time we’re trying to spend on developing a portal which will look after this and a whole lot of other things – we hope – by fall’. And when I explained some of this to him, he said, ‘Okay, this is starting to make sense to me, because I know that you don’t have very many people.’

Evidence that the skeleton technical support staff is working at maximum capacity to keep the present infrastructure working, let alone providing support with innovative and emergent uses of the technology, was found in a number of interviews.

It is important for leaders in a school system and at the provincial level to understand the real impact on system resources when an innovation like technology moves from the early adopting teachers (13%) to the early and late majority (68%). The technology support and professional development needs *INCREASE EXPONENTIALLY*, they do not remain stable. Therefore, last year's budget for professional development and technology support will not be sufficient for the increased number of teachers who are enthusiastic and becoming involved this year.

E. Temporary Limitations To The Provision Of Network Access From Home, Due To Security Measures

DOUG DIETZ: So far they've been using the network in-house, but of course, the question becomes, "Alright, if we get our teachers and students used to using this, why can't they see it from home, or from wherever else they happen to be?" Well, right now it's behind our firewall. It's not on our network and our address translation table. So they can't see it. The same goes for NIMS, really. Because that's a web-based interface, there's no reason why, in a theoretical sense, students shouldn't be able to check their e-mail from home if they wanted to. Right now, they can't, for the same reason: it's behind our firewall, and there are security issues that need to be addressed.

F. Problems Arising When Technology Is Relied Upon

There is a risk in having too much downtime, or trying to promote widespread adoption during a time of network and workstation unreliability. Teachers who may have low confidence and low skill with the technology are particularly vulnerable to downtime or system failures as they attempt to use the technology with students. All they need to experience is one failure and newer adopters' motivation to discontinue use or reject technology increases exponentially.

PRINCIPAL: If there are you know some drawbacks to the whole process of activating a dream of having you know, the staff in the school ICT ready and up and running, is that when you use it you rely on it. And when it fails you're crippled.

There is an adequate level of trust and satisfaction with the technological reliability and robustness available in the school division.

DOUG DIETZ: There are some people that get very frustrated with it not working and say "I'm not doing that." But there also are teachers who overcome it because they understand that is the whole nature of technology; you have to plan for it not working so you are not disappointed. I think that because our system is run pretty well it is

happening less frequently. Because of that teachers are now adopting it more easily. There is nothing more frustrating than things continually not working but I don't think you can say that at Foothills. There are times that are really awful; for example, the high school just got evergreened and everybody was really excited and then the server went down for four days. Things like that happen, but it doesn't happen regularly.

Some findings in the literature confirm the challenges that computer systems can present to those who are eager to implement reforms.

BARB MARTIN: It's frustrating - technology is frustrating.

"Participants can have a high degree of motivation about technology, but if no one is around to answer or assist when they actually begin using technology, their motivation can plummet" (Bailey, 1997, p. 61). Teachers reported that equipment failure was an impediment to computer usage (Cuban, Kirkpatrick, & Peck, 2001). System support is necessary; teachers won't use technology if it is difficult or confusing to operate (Wisniewski, 1999).

Fortunately, Foothills School Division teachers and students enjoy a high level of system reliability to support their technology integration efforts. Doug Dietz attributes the success of his technology support team to ongoing training and support, and developing innovative solutions to leverage existing resources. "It's amazing how quickly the wheels fall off when you neglect training".

Challenges in The Realm Of Leadership

This challenge focuses on sheer effort and the enormous amount of time and energy required from the initiative's leaders. The positive side to this challenge is that the **demand** from teachers for support in working in inquiry-based, technologically enhanced ways with children **is increasing** with each year of this educational reform initiative.

TONY HAMPSHIRE: I'd say the biggest challenge probably for us is meeting the needs...If we have one big problem with this project; its that demand far outstrips supply, in terms of time, energy, and other things. I mean, we could have a Galileo/Foothills/ICT person in every school five days a week, and they'd be going flat-out. They really could. There's *that* much to do, and that much that people would like to do.

One interesting finding is that originally the lead teachers expected to work themselves out of a job, but this expectation greatly underestimated the degree to which educational change with technology requires ongoing coordination and support. "Implicit in this goal was the idea that as teachers became comfortable with computers and various software programs, they would eventually use them in their teaching and no longer rely upon the help of the coordinator. Although this may be a laudable goal to work toward, in retrospect, it underestimated the complexity of educational change with technology and the amount of sustained effort that it would require of teachers" (Strudler, 1995-1996, p. 251).

BARB MARTIN: My biggest challenge is meeting the demand from the teachers for support in creating engaged inquiry-based projects with effective technology integration for their students. Support could be with the design or implementation of their project. It could be around the integration and understanding of technology as a tool for learning. Each of the teachers who I work with would like to have an onsite presence 5 days a week and this is not possible when I work with over 30 teachers. I've got 45 projects – that are all just amazing.

The literature confirms the magnitude of human capital required to keep a technological education reform initiative going. “Regardless of the type of training and support, a common thread in experienced technology-using sites is that substantial investments in human resources for technology integration is essential” (Ritchie, 1996, p. 49). These investments need to be made in teacher professional development, and also in technology infrastructure maintenance and support, and the ongoing professional development of technology support staff.

“Some of this time is needed to overcome the ‘comfort zone’ all of us create around the way we are accustomed to work, and the reluctance we have in restructuring our teaching” (Ritchie, 1996, p. 47)

Challenges in The Realm Of Teachers’ Professional Development

This area is organized by two key issues:

- A. Finite Amount Of Time Allotted To Each School To Receive Professional Development And Support – More Support Needed Over Time, Not Less
- B. The Uncertainty Of Whether Or Not Staff Will Continue New Practices Once The Initiative Is Over: Sustainability

A. Finite Amount Of Time Allotted To Each School To Receive Professional Development And Support – More Support Needed Over Time, Not Less

How much time is needed for an educational reform to become institutionalized? Fullan (2001) estimates that it takes 3-5 years to change elementary schools, 5-6 years for secondary schools, and 6-8 years for school districts.

Teachers who are involved in 'reform' need individual time for professional development but also time together. Fullan (2001) articulates that developing the individual in any social organization is not enough. He recommends that healthy organizations emphasize the importance and role of relationships. This alone should not be the end, as Fullan (2001) emphasizes that the creation and sharing of knowledge should be the binding glue between members of any social organization.

The Galileo approach focuses on teacher engagement and responsive relationships. This approach provides individual time for professional development, and also provides for time

together in the form of two and three day symposia. There is a growing realization, echoed in the research literature, that educational reforms take years to become sustainable and that demand for professional development services with regard to technology integration are increasing rather than decreasing as more people become involved.

JERRY BLAKE: There are 17 schools in the school division – so divide by 3 and then take out the schools that Barb works with, because Galileo already has that commitment in place. So Tony and I hop, skip somewhat with the others. It's not good that we don't show up as an ongoing presence in all of the schools in the division. But at the very same time that we are attempting to do that I think that we undercut what effect we might have. Mere appearances don't do the job.

RICHARD GASKELL: But it's also the case that *the teachers' requests for us to help them has actually increased rather than decreased*. We were looking at a model where we would be in a school for 3 years. We expected that in the first year we'd give an enormous amount of support, in the second we'd sort of taper off a little bit, and in the third we'd merely check up on it while moving to a new school. *But it's not working out that way*. What's happening is that as we work, the requests for our services actually increase – exponentially. This really comes down to the question, 'How do you make sure that this initiative is sustainable?'

BRENDA GLADSTONE: There have had to be extensions in the amount of time we planned to spend with a school. For most schools and school divisions, we had originally aimed for a 3-year plan but this is turning into a 4-year plan now. The needs of leadership and staff for assistance have turned out to be greater than we expected.

Providing access to Galileo's onsite professional development is a key challenge, there was plenty of evidence that people were grateful and satisfied with the opportunity to participate.

PRINCIPAL: But I think what they're doing is they're finding great excitement in stumbling and stumbling and discovering through this together. And you know, I think it is exciting to experience new learning that way with someone else, rather than on your own (2001 interviews).

B. The Uncertainty Of Whether Or Not Staff Will Continue New Practices Once The Initiative Is Over: Sustainability

Galileo Network staff are very enthusiastic about the level and quality of change experienced with teachers in many schools. However, there is sense that the good work that has been cultivated needs ongoing support in order to continue.

RICHARD GASKELL: And it seems to me that *there needs to be some sort of systemic change* in the way that you look at how teachers work and spend their time. I'm not quite sure what that would be, but my fear is that, while people will still have a desire to change even after Barb leaves, there won't be the support that will allow them to continue to change.

BARB MARTIN: I think the biggest challenge is sustainability...How will the work continue when we are not in the schools? So, to get the teachers to work in this way and then be committed to continue it, I think that's the biggest challenge that we're facing right now. If teachers work in an inquiry-based approach to learning and understand the changes that this requires to their teaching, they will be committed to continue teaching this way. Support is crucial to the continuation of this work over time. We need to stay connected in an on-line environment, as face-to-face will eventually come to an end. I think this is the biggest challenge that we are facing right now.

JERRY BLAKE: Key question – raised in the school division, and I believe it is one we all have to work at answering - is sustainability. This is not a one-year show, I think three years minimum in any one school. Where's the money to do that? I physically can't be in three high schools and a middle school and expect to have much of an influence. So I had to make a choice.

The need for ongoing support has resource implications that need to be considered by the school division and the Galileo Network. A promising direction for ongoing support and increased participation is the availability of IO, Galileo Network's online professional development service (www.myio.org).

BARB MARTIN: One of our biggest challenges will be to establish ongoing support in each of the schools. Establishing an on-line environment where teachers can work and plan collaboratively. We know that the workshop support model meeting 3 times a year for PD just does not support in-time, on-time sustained work. Some times teachers need help as they plan or implement their projects and cannot always wait until a workshop to have PD support on something when they need right away. You need help right now. I can't wait until May for PD support on something when I want it right now. Those are the things that we are trying to work out. Our superintendent has questioned the sustainability as well. He's knows its good, so he wants to keep it going.

Given that AISI funding is term-certain, sustainable sources of funding need to be sought to support the ongoing professional development needs of teachers.

JERRY BLAKE: If we return to the AISI/ICT funding, I am told recently that there will be a fourth year of such funding. Somewhere that funding will end and therefore the great amount of it which has been devoted to our division and within Alberta will, I assume, dry up. I don't know what happens then. Will mindsets have changed sufficiently? It will be up to individual schools and school divisions to what sustainable ongoing program developments there are.

School leaders have expressed concerns about sustainability. One principal worries about ongoing success when Galileo Network is no longer in the schools: "...some things might carry on, some might not – some might have to be changed" (Interviews, 2001). Another school leader expressed concern about the burden on teachers who work as informal

professional development leaders in the school “I’m not sure that when a teacher's teaching 100% of the time that they can sort of bring someone on board” (Interviews, 2001). It was clear from interviews with principals in the first two years of the Galileo Network initiative in Foothills School Division, that “onsite consistent support is needed” (Interviews, 2001).

Despite the difficulties related to sustainability, a teacher participating in the initiative is still hopeful: “I just think this is the ideal optimum way to be learning in a useful way. I mean-- and you were asking about whether this change in practice is sustainable. I think so, because it's a change in practice. It's not just you know, taking a course and thinking okay, now what am I going to do with that? We're actually changing the way we teach...And it's over three years, so we have significant opportunity to actually do those changes in practice and implement them and have them become part of our practice” (2001 Interviews).

The literature confirms what a critical role teachers and administrators must play if the desired educational reforms and innovative practices are to be sustained: “Huberman and Miles (1984) stress that continuation or institutionalization of innovations depends on whether or not the change gets embedded or built into the structure (through policy, budget, timetable, etc.), has (by the time of the institutionalization phase) generated a critical mass of administrators and teachers who are skilled in and committed to the change, and has established procedures for continuing assistance (such as a as trained cadre of assisters), especially relative to supporting new teachers and administrators” (Fullan, 1991, p. 89).

Special Challenge: Resistance From High School Cultures

While many successful projects at the junior and high school level were described by lead teachers (see Appendix A for examples), there was also a sense that it is more difficult to convince senior high school teachers to adopt inquiry-based, technology enhanced approaches to learning versus their elementary counterparts.

JERRY BLAKE: One (difficult) factor (in high schools) has to do with organizational structures, no question. The way timetables are laid out and the sense of exams..... Sometimes it is just the simple pressures – ‘I’ve got 30 kids and I need as many marks as possible, and no-one can get on my case and this is work and I’m not going to do extra work.’ Many things are perceived as extra work. Then there are structural issues: ‘I’d like to do that, but I can’t ever get to the lab.’ The structure of labs, that alone is one of the toughest nuts to crack in this whole process. The one high school I am in this year was just evergreened or upgraded and as of February 2002 had 3 computers placed in each classroom. You can go around and show them, but 2 days later they are turned off again. They are not prepared to change their unit structure thinking sufficiently so that kids could flow through a number of assignments or activities over two months.... The subject content coverage focus consumes high school teachers as opposed to individual student learning.

BARB MARTIN: In Junior High and especially High School with the way that the curriculum is departmentalized it makes it difficult for our work. The timetabling of classes makes it difficult for flexibility of time and project work. The teachers are

very concerned with covering the curriculum and they feel that because of time the best way to do this is teacher directed. The high school teachers are more this way than the elementary teachers. They are very concerned about final exams. This is not only in Canada but also more obvious in the United States where their test results are very important to both the students and the teachers.

The emphasis on curriculum coverage in high school, conventional scheduling and organizational structures, and preparing for provincial exams, appears to make it more difficult to persuade secondary teachers to adopt and sustain inquiry-based learning and technology enhanced approaches to student learning.

There are a number of possible explanations for the low rate of technology adoption in high schools even though access to technology tends to be similar to that enjoyed by elementary teachers. First, the high schools are only in the first year of participation in the educational reform initiative in Foothills School Division, and therefore have only had access to onsite professional development and support for one year. It may be too early to observe major changes to the ways in which high school teachers adopt inquiry-based, technology enriched instructional practices. Onsite time during the school day is needed on an ongoing basis for lead teachers to build relationships with individual teachers, share ideas about what is possible, and plan and implement projects over a sustained amount of time. In ways similar to the successful projects that have emerged in the elementary schools, the lead teachers need to design, implement and complete successful projects with high school teachers, and then publish these cross-curricular exemplars on the web so that the results can be disseminated and shared with other high school teachers in the school and division.

Second, high school teachers may feel greater pressure with regard to the provincial diploma exams which may lead many of them to focus more on curriculum delivery rather than curriculum redesign. Organizational structures within the school, like time tabling and access to computer labs, may also impact innovation and implementation efforts. The lead teachers discussed the challenge of convincing teachers to “give up” a significant chunk of time to focus on an inquiry project. The general perception by teachers was that an inquiry project took too much time, and that the time spent on inquiry was “lost” from valuable curriculum coverage. One lead teacher discussed how difficult it was to break free from the “unit” model of breaking up the curriculum, and move towards a more fluid model of pursuing multiple projects at once and increased student ownership and choice.

A third possible reason for limited adoption of technology and inquiry-based learning in the high schools may be related to the perception of high school “subjects” as disciplinary silos. For example, high school teachers often view themselves more as content specialists rather than generalists, and have more allegiance to their content area than to technology integration in general. Some may regard technology-related professional development as “extras” or “add-ons” that are not fundamental to their curriculum area or current practices. The CTS and Information Processing focus in high schools reinforces the specialist view, and perpetuates the “my subject-your subject” delineation of curricular responsibility.

At the same time, it must be emphasized that access to technology does not appear to be the most important issue facing high school teachers in Foothills School Division, and elsewhere.

While the deployment of computers using lab settings rather than classroom-based workstations may impact accessibility and willingness to use computers on a regular basis for instruction and learning, many teachers still make the effort to travel to the lab for certain activities.

Cuban, Kirkpatrick & Peck (2001) studied two high schools in California's Silicon Valley with ubiquitous access to networks and computers, and found that most teachers and students were occasional to rare users of the machines for instruction. Further, when teachers do adopt the technological innovations, these changes tend to maintain rather than alter existing classroom practices (i.e., lecturing, conducting a discussion, reviewing homework, working on assignments, projecting materials on a shared screen or whiteboard). Thus, in high schools, the focus still appears to be on first order uses of technology, which Moursland (2002) defines as using the computer to do familiar things faster, rather than on second and third order uses of technology for learning.

SECTION 3: CATALYSTS TO DESIRED CHANGE – DIFFERENCES THAT MADE A DIFFERENCE

The following section organizes results into three key areas to summarize the differences that made a difference in the school division:

1. Catalysts In The Realm Of Technological Infrastructure/Support
2. Catalysts In The Realm Of Leadership
3. Catalysts In The Realm Of Teachers' Professional Development

Catalysts In The Realm Of Technological Infrastructure/Support

This section is organized by two key factors:

- a. The Careful Attention Given To The Networks By The Technology Department*
- b. The Responsiveness Of The Tech Support People Who Work Within The Schools*

A. The Careful Attention Given To The Networks By The Technology Department

The technology department maintains a robust network with limited downtime which enables teachers to implement the ICT Program of Studies.

RICHARD GASKELL: The teachers see the tech department as providing internet connectivity...however, teachers don't always see this, because the tech department has done a really good job of making this connectivity transparent. The whole idea is that they have a common folder area they can work with. That structure has been working very well.

The successful support of a vast network infrastructure and hundreds of workstations is largely in part due to the innovative planning and resource leveraging done by the technology support services area, lead by Doug Dietz.

B. The Responsiveness Of The Tech Support People and Galileo Staff Who Work Within The Schools

The availability of onsite technical support provides a level of comfort and trust in the reliability of the infrastructure for teachers.

RICHARD GASKELL: the on-site tech support people are very responsive to any of the problems that people have with gaining access to folders, their home drives, or e-mail. So when it comes to the primary focus on *the technological core that needs to be there*, they are very responsive in that way.

TEACHER: ...hiring a technician “has made a huge difference to people's comfort level. Because they know that they can go into the lab and she'll be there and help them. (2001 Interviews).

SCHOOL TECH SUPPORT: I help the teachers and with the technology itself. So with the teachers it's a case of doing some research, setting up web pages for them, research pages for the students to use. Sometimes it's helping them getting a program to work the way they'd like it. Just suggesting some ideas, brainstorming some ideas for them, helping them, when they give me the name of their next project or unit, brainstorming with them how they might be able to use technology sometime if they would give me some ideas of what they would like to do and I might be able to help them. Also I am up in the lab so there are a couple of teachers that like me to help them with the kids setting up with them what they are doing. For many of the classes I am available to circulate around with the kids” (2001 Interviews).

Galileo Network provided just-in-time, onsite technological support that was highly valued by teachers while they were pioneering. Teachers were enthusiastic about pursuing an inquiry project with technology, but did not always find the technology inherently attractive or motivating in and of itself. Thus, they appreciated being able to get the technical answers they needed in order to make the inquiry projects work without feeling overwhelmed.

TEACHER: Richard was available to me to provide technical expertise that I don't think I ever really want to develop. Because you know, there comes a point where it's just way more efficient for somebody who knows what they're doing to get it done, as opposed to me learning it all, being able to do that little bit that I needed for that moment, and then never using that again. He was able to help me with some glitches that we had with the system not reading FrontPage which I'd used to create the web page, you know, those kinds of things? And again, I think that's so valuable to have. Because I can't see how teachers can take on that role too. That if you want to use technology, now you also have to become a technical expert. (2001 Interviews).

TEACHER: As long as I feel I have somebody I can turn to if I get into a problem, I'm more than willing to plunge forward. It's when I feel like I am pioneering and developing everything and having to create and understand everything myself, then I'm way more reluctant to start. But I have no problems jumping into something. And even, I did a project with the kids, a survey project and I'd never really used Excel in that capacity. And Barb created a sample for me and I went in it saying to the kids you know what? I've never done this either, but together we're going to walk through the steps and figure out how we're going to get this done. And you might teach me something and I might teach you something, we'll learn this together. And I'm really okay with that. So I don't need to feel like I'm an expert. Because invariably there's a kid in the class that knows. And they feel really good about helping (2001 Interviews).

The combination of Galileo Network and Foothills onsite technological support was a crucial factor for teachers' comfort with making changes to their practice.

BARB MARTIN: 3 of the 4 schools where I work have strong tech support. Two schools have a full-time tech support person. This person provides tech support, keeps the machines running and helps teach classes giving the teachers the opportunity to learn about technology. One elementary school has a tech support person half time who provides some help. In one of the schools the tech support person is trying to carry on several jobs; classroom teacher, administrator and tech support person. It is very hard but they are determined to make it work as they see the value in effective integration with inquiry-based learning.

Ritchie (1996) reinforces the importance of on-site technical support: Working only with a lab model maintains the status quo of traditional instruction. For full integration to occur, technology resources must be available in each class and teachers should encourage students to use them.

Another difference that makes a difference is immediate and daily student access to technology in order to do their work. Instead of computing being an event, many of the elementary and junior high schools have moved beyond the lab + specialist model and have changed school routines in order to facilitate widespread and distributed access to the technology.

PRINCIPAL: I almost see the ideal classroom as being a bunch of tables in the middle with the computers around the outside, and you come back and have dialogue and discussions around the major topic, going back to the computers, and this flow back and forth. And in order to operate that, you have to have a very knowledgeable instructor and very knowledgeable teacher.

PRINCIPAL: Ideally we would have at least 6 computers per class – the school is trying to set up a pods of computers, rather than the lab – we feel that the lab is not ideal, booking time does not work.

PRINCIPAL: I think as you need something, if you need to research something, I can get on the computer right away. What's happened here, which I think is really strong, is that we have kids roaming from classroom to classroom, saying “can I work on your computer? I have to do A, B, C, and D”. And in most cases, the answer is yes, come on in because nobody is on them at that time.

As mentioned earlier in this report, however, there is increased awareness that more technology and professional development support is needed, not less, as more teachers adopt an inquiry-based, technology enhanced approach to learning with children.

Catalysts In The Realm Of Leadership

This section is organized by four key factors:

- a. *A Vision That Involves Many People*
- b. *The Primacy Of People Over Programs*
- c. *Enthusiastic Involvement Of Administrators*
- d. *Providing Models And Images Of Successful Projects In Order To Stimulate Teachers' Interests*

A. *A Vision That Involves Many People*

In describing her position within the Galileo Educational Network, Brenda Gladstone says, "The role that my work plays is to plan strategy and carry out the management and operations for Galileo. I help create the right network of people to enable a vision."

The literature shows that successful educational change initiatives which utilize technology always begin with a vision of change. Successful technology adoption and integration for learning requires concerted focus on the mission of improving education for all students. It grows from the shared vision and mission. As an add-on or fad, enthusiasm for technology use soon withers. Technology integration must be seen as an ongoing innovative process designed to meet valued instructional and learning goals (Earle, 2002). In addition to setting goals and policies related to technology, many have pointed to "vision" as essential to technology programs. Researchers have also claimed that developing a shared vision is critical to managing information technology in a school setting (Costello 1997; Hoffman 1996). From case studies of two high schools, Anderson and Dexter (1999) concluded that "successful technology implementation depended upon shared goals across various organizational levels" (p. 3).

Jay Pritchard oversees professional development staff, technology support staff, and school administrators who all work together to achieved the shared vision to do with technology integration. Galileo Network participates on the Foothills School Division's formal technology committee that has representation from teachers and administrators.

Czarnomski (1996) and VanSciver (1994) propose that a technology committee develop a mission statement for technology use, identify technology needs, oversee the technology budget, and plan staff development and training around technology. A technology committee also may help to mobilize broad support for the technology program (Musco, 1995).

The educational reform initiative by Galileo Network and Foothills School Division builds in many ways on its connection with the University of Calgary and the University of Lethbridge with regard to research, teacher preparation and graduate education. Opportunities are provided for student teachers to apprentice with classroom teachers involved in the technology integration initiative. Classroom teachers are given opportunities to pursue graduate credit for classroom-based, action research and reflection on innovative practices. Research supports the strong connection between school based initiatives and the university:

“In the Chicago ed reform article, a partnership was set up with the local university which included the following aims: ‘four pillars of support – infrastructure, teacher training, system support and the development of curricular resources’” (Wisniewski,1999, p. 24). A close connection is being cultivated between campus and classroom educators and leaders in order to support educational reform and research on outcomes.

Both Foothills School Division and Galileo Network leaders have worked to establish and share a common vision for reform that includes the diverse perspectives of school leaders, classroom teachers, professional developers, and learners. “Successful transitions occur when leaders articulate and share a vision; exemplify the change through example; and educate, support, empower, and share decision making and leadership with faculty and staff. As these strategies are implemented, the incorporation for technology often progresses to a point where a critical mass of teachers, technologies, and activities combine to form a climate in which technology becomes a part of life, and ideas for integrating technologies into the curriculum become more spontaneous” (Ritchie, 1996, p. 48).

B. The Primacy Of People Over Programs

i. Building rapport with all partners involved, including parents and the community

Richard Gaskell: I think one of the key ingredients in making this work is *relationships*. You have to develop a relationship with the people you’re going to work with.

JERRY BLAKE: I truly believe that the nature of this job has to do mainly with personality and relationship issues with people.

BARB MARTIN: Parents respect and trust the teachers... Parents are welcomed into the classrooms of all the schools I work in. As a result they have a sense of the importance of the learning, how the children learn and why learning is taking place.

Jay Pritchard talks about how he helps celebrate the successes and get everyone involved:

At every opportunity (with staff, with administration, with executive and with the board) I speak with enthusiastic positiveness about the work and impact of Galileo. I recognize and celebrate accomplishments whenever possible. I structure regular formal opportunities to keep the work of Galileo in front of our Board, Senior administration and school administration. I try to put in appearances at Galileo events to say a few words in support of their valuable work.

JERRY BLAKE: In doing this job as a lead teacher, you try to be a friend and a positive person.

ii. Emphasizing face-to-face communication

TONY HAMPSHIRE: Face-to-face is critical. I personally believe that a lot of this is based on relationships. You have to establish strong, collegial relationships with people before you're going to be able to do much of anything else. So that has to be based on mutual trust and respect.

BARB MARTIN: Face-to-face is really important in the whole process. When I am working with teachers I explain that I am coming to work with the teacher and not to release the teacher. The way to learn onsite is to be actively involved with the work inside and outside of the classroom.

iii. Collaborating with classroom teachers as partners

Far from a "lone ranger" approach to sharing expertise, the successful inquiry projects and professional development relationships emerged out of an inclusive, responsive and collaborative process of building upon diverse strengths and views about teaching practice. New meanings, new behaviours, new skills, and new beliefs depend significantly on whether teachers are working as isolated individuals (Goodlad, 1983; Lortie, 1975; Sarason, 1982) or are exchanging ideas, support, and positive feelings about their work (Little, 1982; Mortimore et al, 1988; Rosenholtz, 1989). The quality of working relationships among teachers is strongly related to implementation. Collegiality, open communication, trust, support and help, learning on the job, getting results and job satisfaction and morale are closely interrelated" (Fullan, 1991, p. 77).

RICHARD GASKELL: As Barb and I work together, we can bring both technical expertise and full curriculum understanding to bear upon the ICT initiative.

BARB MARTIN: You can't do this by yourself. This work cannot be done by yourself. You have to have people to collaborate with.

TEACHER: So it's the whole idea of learners teaching other learners about what can happen. And in other grades. You know my students lots of times run to the grade one room and help them with technology kinds of things. And I have a very collegial kind of group this year that are really good to be mentors with other class mates and really enjoy it...But now everybody in the staff knows somebody else that may know a little bit. Like technology is one of those things that you can know a little pocket here and a little pocket there. So you know, they'll say well Teacher, have you tried to import images into PowerPoint? And I'll say no, but I know you can do it. I would ask Greg in my classroom, okay? Because he does that kind of thing, okay? And so it's a whole idea of finding somebody who can be the person that helps because the teacher doesn't have to know it all. (2001 Interviews).

TEACHER: Teachers collaborating with other teachers is an important and valued form of professional development. "And it's critical, I think, just as I don't believe the students should work...alone on information like this, I don't think I should have been

working alone...Go back, try it, come back and talk was so empowering (2001 Interviews).

The following commentary from research on other initiatives provides further evidence of how crucial collaboration is between all who are at the forefront of an educational change initiative. Working together has the potential of raising morale and enthusiasm, opening the door to experimentation and increased sense of efficacy (Cohen, 1988; Rosenboltz, 1989). “Constant communication and joint work provide the continuous pressure and support necessary for getting thing done” (Fullan, 1991, 84).

Tony Wagner (1994), in his book *How Schools Change*, speaks of how the quality of personal communication among the staff of Brimmer and May School in Boston played a substantial role in the fulfillment of its vision: “Brimmer and May was able to define and implement a demanding set of academic goals not simply because it was an independent school, but also because it was a comparatively *small, autonomous community where people could meet and talk face to face to reach consensus*” (p. 229, emphasis in original).

iv. Giving people space to cultivate innovation

The Galileo approach is responsive, flexible and sensitive to each teacher’s starting point and way of responding to the many demands that inquiry-based learning brings to the classroom. The success of this approach to professional development and mentoring relies upon individual relationships, and knowing the teacher well enough to make a judgement call about when to push harder and when to back off and give the person space and time to reflect and to try things out.

RICHARD GASKELL: I think there is value to being “apart from” the teacher and yet to still somehow be involved. Of course, I have to allow that space for their expertise to shine, because that’s where I want them to develop anyway.

BARB MARTIN: I think that you have to realize that it is very important that teachers go to whatever level they are comfortable with to start out with.... I just take teachers and whatever they want to do. I might suggest – so what do you think of this? You can automatically tell by their body language and facial expressions that they’re not ready to go there yet and so I just back off.

TEACHER: Especially with regard to computers, if somebody’s not turned on or allowed to come to it themselves, then they’re more apt to be turned off and won’t want to have anything to do with it (2001 Interviews).

The Galileo Network staff recognize the vital importance of beginning the process from where the teachers are at individually.

TEACHER: We all are so different in our skill level in computers. (The leader) is well rounded. She can help the person who's advanced, and she can help the person

that is not. And she is not intimidating. ... and she's very positive. That's about all you need, is a *positive mentor* (2001 Interviews).

It is important that teachers make the choice, or self-select, to work with a Galileo or lead teacher. For example, teachers discussed how they had the opportunity to choose to work with Barb Martin, it wasn't something that was thrust upon them.

TEACHER: Before, I mean I knew she was around and you know, I had talked to her briefly, but I said I'm just not ready to go anywhere with anything. And she said that's fine. Like as you start to go through the curriculum, just keep things in mind about how you think you would like to involve technology in this (2001 Interviews).

TEACHER: She certainly hasn't pushed it on me which would have turned me right off. She's sort of waited... (2001 Interviews).

Teachers valued the opportunity to choose the level and nature of their involvement with the Galileo and lead teachers, rather than being required to take part.

v. Having patience, respect and understanding

A heightened sense of what a teacher might be experiencing comes from the positive mentor's own first hand experience as a teacher who has worked with children on inquiry-based technology projects. Barb Martin emphasizes how important it is to be sensitive to the daily realities of being a professional teacher in a complex learning organization:

Patience is very important. Understanding where they're coming from – realizing that everyone is really busy. With me being a teacher for so many years, I can appreciate when I go to them and they say “You know what Barb- I've got nothing done.” And I say “That's okay, I've been there, I know exactly where you're at.” Rather than saying ‘I was here last week, you've got nothing done in a week’. So that understanding is very important.

A deeply held mutual respect and commitment to each other's professional growth is vital in developing a shared understanding of the project goals and direction.

BARB MARTIN: A mutual respect in that the teachers respect where I was coming from and my expertise and I totally respected where they were coming from and didn't force them in a direction.

Galileo Network's approach is to dig in and work alongside willing teachers as they design and implement inquiry-based projects, rather than dropping in once a week to do a status check and give the next set of instructions. “One of the reasons that peer coaching works so effectively is that it combines pressure and support in a kind of seamless way. Successful change projects always include elements of both pressure and support. Pressure without support leads to resistance and alienation; support without pressure leads to drift or waist or resources”(Fullan, 1991, p. 91).

Barb Martin reflects on her work with Foothills teachers:

BARB MARTIN: Respect – I respect where the teachers are coming from, so I would hope that when they work with other teachers, they do the same thing. When I work with a teacher, I do part of the work. I don't come in every Wednesday and say this is what I think you should do and then leave and come back next Wednesday and say so what have you done. So I take on ownership of part of every project that I do. I think that's important as well, so that when they are mentoring or showing leadership with someone else, they have to realize that that has to be there as well. You can't just float in and say to somebody "I think you should do this" and then leave them. Patience is very important. Understanding where they're coming from – realizing that everyone is really busy.

Part of the challenge for an early adopter of technology is to resist leaping in with too many suggestions when a teacher is first experimenting with technology.

JERRY BLAKE: The challenge with individual teachers is staying patient. We have to watch - because we like technology, and we are so habituated - the one teacher who hadn't even opened his email. What was the challenge? I am trying to get him to log in and he doesn't know how to click with the mouse, so he circles the login box. I said no, see when it is in the box, it changes shape. Similarly, with that teacher, you say something which we take for granted. I say 'right-click' and he has no idea of what 'right-click' means. At the same time, on the other end I'm working with a group of students who could out master me on technology with two blinks of an eye down to people who might be like that newbie teacher. That incredible range is both the fun of this job, but also the challenge.

The literature emphasizes the centrality of people in the educational change process: "Many attempts at policy and program change have concentrated on product development, legislation, and other on-paper changes in a way that ignored the fact that what people did and did not do was the crucial variable. This neglect is understandable, for people are much more unpredictable and difficult to deal with than things. They are also essential for success" (Fullan, 1991, p. 65).

One explanation for an over emphasis on computers and applications is that they tend to be more predictable than people. There is a shift in focus, however, for many educational reform initiatives from computer applications and what they can do, to what teachers want to do with their children and what is the best tool for the job.

vi. Having a strong educational background as a prerequisite for educational leadership

It is clear that those who provide leadership in the educational reform initiative must have a strong background in teaching and technology. That said, a teaching background is valued over and above a strong background in technology alone.

TEACHER: The mentor has to be a very experienced teacher (2001 Interviews).

The Galileo and Lead teachers all have a strong teaching and learning background. In an article about the leadership reform in the Chicago school division, the person they chose to lead the project was a former high school teacher. Wisniewski (1999) states that: “It would be difficult to maintain a department like mine under [Information Technologies], which would be dominated by people who are into the boxes and wires and less into students (p. 22).

The discipline of educational technology is defined as the systematic application of technology to posing and solving problems to do with teaching and learning (Ely and Plomp, 1996). There is a shift in public education from investing in a technologist to support teachers, to an investment in educational technologists who are expert in framing and solving problems, designing instruction and applying appropriate technologies in the construction of solutions.

Feldman, Coulter, & Konold (2000) discuss this shift in replacing the role of computer coordinator with an educational technologist as reflecting a significant shifts in the school district’s views of both technology and professional development. “The computer coordinator kept the computers running, ran workshops for the faculty, and recommended software for purchase. In contrast, the educational technologist is an experienced classroom teacher whose primary responsibility is the faculty’s professional development and working with teachers to integrate technology into their curriculum” (p. 45).

“The creation of the role of educational technologist, the use of systemic perspectives, and the shift to embedded professional development are key strategies to link technology to substantive changes in teaching and learning” (Feldman, Coulter, & Konold, 2000, p. 47).

C. Enthusiastic Involvement Of Administrators

A key factor in the educational reform’s success thus far has been the enthusiastic involvement of district and school leaders.

BARB MARTIN: The commitment first of all came from Division office and then the administration. It then slowly moves from school to school.

BARB MARTIN: We have support from the superintendent, which is key. The schools that I’m in and the other schools that the 2 others are working in have the support of the administration and that’s where it starts.

TONY HAMPSHIRE: School administrators are critical. Absolutely critical. Virtually all of the administrators have been coming out to the special sessions we hold for them, and have shown a lot of interest. The principals – especially [Name] at this school – have been willing to take on the instructional leadership that’s required for something as big as this. They’re very forward-thinking people.

JERRY BLAKE: So much depends on what kind of focus the individual school has. If I think of my three high schools this year, in one high school the principal is totally committed to this and I'm seeing a change in the staff because of that. I mean s/he is mandating, if you will.

Jay Pritchard, the associate superintendent of the Foothills School Division, describes the ways in which he contributes to the progress of the ICT initiative:

At every opportunity, I speak with positiveness about the work and impact of Galileo. I try not to be the expert; instead I'm the learner, the supporter and the advocate and the celebrator. I try not to let the focus be technology infrastructure, but instead the wonderful learning and teaching opportunities.

The crucial role of a supportive administration is echoed strongly in the literature. The support of central administrators is critical for change in district practice. ...teachers and others know enough...not to take change seriously unless central administrators demonstrate through actions that they should....All major studies show that the local implementation process at the district level is essential if substantial improvement is the goal (Louis, 1989; Marsh, 1988; Rosenholtz, 1989).

“The chief executive officer and other key central administrators set the conditions for implementation to the extent that they show specific forms of support and active knowledge and understanding of the realities of attempting to put a change into practice. To state it most forcefully, district administrators affect the quality of implementation to the extent that they understand and help to manage the set of factors and the processes described in this chapter” (Fullan, 1991, 75).

Irrespective of the formal structure, it is important that the administrative leadership reward and encourage staff for their participation in technology supported projects. In addition, unless the top administrators in a school use the technology themselves, e.g., use email for communication with a variety of groups, other staff will be less likely to utilize the technology (Anderson and Dexter, 2000; Ritchie, 1996).

Few words could sum this discussion of successful school-level factors better than Judith Little's (1981) based on a study of work practice in six urban schools:

‘School improvement is most surely and thoroughly achieved when:

Teachers engage in frequent, continuous and increasingly concrete and precise talk about teaching practice (as distinct from teacher characteristics and failings, the social lives of teachers, the foibles and failures of students and their families, and the unfortunate demands of society on the school.) By such talk, teachers build up a shared language adequate to the complexity of teaching, capable of distinguishing one practice and its virtue from another.

Teachers and administrators frequently observe each other teaching, and provide each other with useful (if potentially frightening) evaluations of their teaching. Only

such observation and feedback can provide shared referents for the shared language of teaching, and both demand and provide the precision and concreteness which makes the talk about teaching useful.

Teachers and administrators plan, design, research, evaluated and prepare teaching materials together. The most prescient observations remain academic (“just theory”) without the machinery to act on them. By joint work on materials, teachers and administrators share the considerable burden of development required by long-term improvement, confirm their emerging understanding of their approach, and make rising standards for the work attainable by them and by their students.

Teachers and administrators teach each other the practice of teaching.’

Only two of the six schools in Little’s study evidenced a very high percentage of these practices, but no more convincing picture of the conditions for developing meaning on the part of individual teachers and administrators could be portrayed than in the passage just quoted.” (Fullan, 1991, p.78).

Ritchie (1996) states that schools are still having difficulty effectively identifying and implementing educational technologies in the classroom and that reasons for this include the following: “a lack of administrative support, inadequate staff development and technical support, failure to allocate a technology coordinator to help train teachers” Of all these, he says that lack of administrative support may be the most crucial. (p. 43)

D. Providing Models And Images Of Successful Projects In Order To Stimulate Teachers’ Interests

The Galileo Network maintains an extensive web site of successful inquiry projects that provide examples for teachers who are beginning to explore inquiry-based learning ideas for their students. Rogers (1995) defines relative advantage as the degree to which the innovation is perceived as being a better idea than the one it supersedes. Teachers must see some benefit for themselves and or their students in order to be persuaded to adopt an innovation in practice. The projects published on the Galileo server offer multidisciplinary and cross-grade examples of how inquiry-based learning looks in practice. An innovation’s incompatibility with a school’s or teacher’s cultural values can block its adoption (Rogers, 1995).

Trialability is the degree to which an innovation may be experimented with on a limited basis (Rogers, 1995). Gradual and graduated – many initial conversations between Galileo and lead teachers and classroom teachers start with an examination of projects that are online.

The exemplars on the Galileo web site (www.galileo.org) provide models of what other teachers have done, and the type of student work that was produced. The conversation proceeds with a Galileo teacher to discuss how this type of project might be reshaped for one’s own classroom. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 1995).

Often, the Galileo Network initially supports the technical publishing of the project so that the teacher needs to only focus on implementation with support. The Galileo teacher works with the classroom teacher to design evaluations for student work. Once the teacher has had a successful experience with one project, they can take on more responsibility for design and development of another project. This approach is used to reduce the complexity and increase the trialability of inquiry-based learning with technology.

Observability is the degree to which the results of an innovation are visible to others (Rogers, 1995). Inquiry-based learning is a new approach for many teachers. Integrating technology is also a new approach to learning for many teachers. One of Galileo Network's approaches to increasing teacher awareness is to share exhibits of inquiry-based projects and examples of student work with teachers. Once teachers see what the kids are able to do, they become a lot more interested in how they might achieve similar results in their classroom.

RICHARD GASKELL: Once teachers see the way that students are engaged in the work that they're doing for a project, *they want it – now!* When teachers see what a selected group of students can do in the 'first round', they say, "Oh...hold on a second...I think I'm getting what you want now...I want my kids to look like *that*."

BARB MARTIN: As the inquiry-based work starts happening within a school, other teachers will begin to inquire about the design process. If you don't have images of what is possible, teachers have a tendency to not understand the possibilities.

BARB MARTIN: ...there are teachers working on projects in every school who then become mentors - their projects become models for other teachers. They are not formally identified as lead teachers but they have the capability of being one.

BARB MARTIN: One key in successfully bringing this type of initiative to other school divisions would be to have images of inquiry-based work that shows effective integration of technology.

The literature notes the importance of modeling by lead teachers, not only in what they display but also in their own teaching example. Change starts with the individual teacher, who, upon catching the vision, is willing to take risks, to experience...confrontations or encounters (Gardner, 1991), in rethinking teaching and learning, and to model for and be a mentor to peers (Earle, 2002).

Catalysts In The Realm Of Teachers' Professional Development

This section is organized by two key factors:

- a. *Professional Development Primarily Taking The Form Of Ongoing "Peer-Coaching" In A Classroom Setting, Rather Than A "Workshop" Setting*
- b. *Hard Work And Much Practice, Both Of Which Are Characterized By Many Trials, Errors And Small Successes*

A. Professional Development Primarily Taking The Form Of Ongoing "Peer-Coaching" In A Classroom Setting, Rather Than A "Workshop" Setting

Barb's approach to whole school work.

I start to identify teachers who want to work with me to learn about designing inquiry-based projects. We identify a topic, curricular area or technology tool that interests or intrigues the teacher and then we begin the process of talking and designing. We create tasks, assessment rubrics and activities that will demonstrate understanding and have a strong sense of inquiry. Some teachers want me to lead teach in the classroom so that they have a vision of what questioning techniques look like or how you go about getting kids to think in different ways. My work varies according to the needs of the teachers.

TONY HAMPSHIRE: In the classroom, often I'll be a guest teacher or a co-teacher, or I'll come in and do a demo for the class and the teacher, which is actually quite effective, I find. For the teacher, we might meet in a lab...I'll often be invited in as a colleague with teachers at a classroom level. I think at the school level I'm generally seen as a consultant. So people are quite free about coming in and asking questions, or making suggestions about things, or asking for advice about various things.

Teachers value the individual and personalized support they receive with planning, implementation and evaluation of inquiry-based projects.

TEACHER: Previously had after school workshops on learning different programs like power point etc. but that was where it ended – difference is that now there is someone there to help you when you need it (2001 Interviews).

TEACHER: Personalized professional development includes the funds to take a half day here or there throughout the year to work with Richard on learning software, or Barb (2001 Interviews).

Technology workshops that focus on computer applications are like junk-food – convenient, short-term, cheap and fun to eat, but with little nutritional substance and lasting value. Worse, junk-food makes you fat. Galileo's approach to professional development is more like getting nutritious food that is good for us and sustains our well-being: our fruits & veggies, meat and milk, fibre and vitamins.

TEACHER: Last year the school board had offered a half day PowerPoint presentation, and I thought it was great. And I came back and I thought there's no way I can do this. I just... I don't know enough about it and I don't know where to use it and I don't know how to use it. So I never did use it. I thought I'm not sure number one where this would fit in with what I'm doing. Number two, I would need to practice this a lot before I would ever use it from a teacher's standpoint to teach. You know, use it as a tool in the classroom. And number three, I'm sure not going to have students mucking around in the computers if they don't have a clue what they're doing and I don't know what I'm doing (2001 Interviews).

TEACHER: And it just wasn't a very workable thing, because if you're not there constantly, we would do a workshop with teachers and they'd get all enthused and they'd do a little bit, but then it would kind of stop at the end of the workshop (2001 Interviews).

In some schools, the entire staff committed to a shared vision about their educational mission for the year.

BARB MARTIN: When a staff is committed to looking at teaching practice and effective integration, this encourages shared, reflective conversation. You have the opportunity to have discussions with teachers who are all trying to figure out the same "stuff". Everyone is in it together. They are focused for the year. School development days and individual growth plans have connection and purpose.

Jay Pritchard emphasizes the importance of ongoing, sustained access to onsite expert teachers for successful educational reform:

Sustained, on-site consultation seems to be the best way to get this work done. It works! We do do other things – summer institutes, pathways PD sessions throughout the year, involvement and participation in appropriate conferences, encouraging appropriate reading and being learners ourselves – all of these things seem to help.

Some have confessed that their practice is changed forever. One year of involvement seems to get people on board. Two years of involvement seems to develop commitment. Three years seems to precipitate confidence, independence and the courage necessary to sustain their changed practice. So exciting, don't you think?!

The literature confirms the necessity for teachers to receive ongoing support and mentorship from specialist peers: “No matter how much advance staff development occurs, it is when people actually try to implement new approaches and reforms that they have the most specific concerns and doubts. It is thus extremely important that people obtain some support at the early stages of attempted implementation. Getting over this initial critical hump represents a major breakthrough for working toward more though change (Huberman, 1981)” (Fullan, 1991, p. 85).

“They are effective when they combine concrete, teacher-specific training activities, ongoing continuous assistance and support during the process of implementation, and regular meetings with peers and others. Research on implementation has demonstrated beyond a shadow of a doubt that these processes of sustaining interaction and staff development are crucial regardless of what the change is concerned with. The more complex the change, the more interaction is required during implementation. People can and do change, but it requires social energy. School districts and schools can help generate extra energy by developing or other wise supporting continuous staff development opportunities for teachers, administrators, and others” (Fullan, 1991, p. 86).

“Embedded professional development is ‘focusing on the teachers’ own curriculum through coaching, co-planning and co-teaching” (Feldman, Coulter, & Konold, p. 45).

The Chicago reform project recognized the need for teacher training during schools hours, as well as Saturday and during the summer. They provided a 5 day release from classroom duties during the first year of the project (Wisniewski, 1999).

B. Hard Work And Much Practice, Both Of Which Are Characterized By Many Trials, Errors And Small Successes

BARB MARTIN: Excitement is first as you want to try things. Then you realize how difficult this process of thinking and planning is, you go through a period of time where you wonder if all the effort is worth it. It is hard work - teaching and planning in this way is very hard work but the depth of understanding that is an outcome makes it all worth it.

Case studies cited in the literature confirm that it takes time for success to emerge from new teaching practices: “In summary, the “fit” between a new program and district and/or school needs is essential, but it may not become entirely clear until implementation is underway....early rewards and some tangible success are critical incentives during implementation” (Fullan, 1991, p. 69).

“Learning by doing, concrete role models, meetings with resource consultants and fellow implementers, practice of the behaviour, and the fits and starts of cumulative, ambivalent, gradual self-confidence all constitute a process of coming to see the meaning of change more clearly. Once this is said, examples of successful training approaches to implementation make sense (Huberman & Miles, 1984; Joyce & Showers, 1988; Louis & Miles, 1990; Marsh, 1988; Stallings, 1989)” (as quoted from Fullan, 1991, p. 85-86).

“Deeper meaning and solid change must be born over time. With particular changes, especially complex ones, one must struggle through ambivalence before one is sure that the new vision is workable and right (or unworkable and wrong.) **Good change is hard work**” (Fullan, 1991, p. 73, emphasis mine).

Part 5: A Showcase of Nine Technology Enhanced, Inquiry-Based Projects in Foothills School Division

This section serves as an exhibit of successful projects that have emerged as a result of the Galileo Network and Foothills School Division educational reform initiative. By way of introduction to the exhibits described below, it is necessary to point out that they illustrate an inquiry-based approach to learning and education. Far from reflecting a “lone ranger teacher” approach to curriculum design, the successful inquiry projects emerged out of an inclusive, responsive and collaborative professional development process of building upon diverse individual strengths and views about teaching practice and student learning.

The emphasis for inquiry-based learning is not on finding the ‘single correct answer’. Rather, “the inquiry task is an iterative and disciplined cycle of research, reflection, writing, and revising one’s knowledge and understanding... The iterative cycle of inquiry is not ‘done’ when the project, or product, or paper, is finally presented to the group...It is impossible to ‘know all’ about a subject or topic. There is always more to know...” (Jacobsen, 2001b, p. 19). Questions that are worth understanding must be enduring, be at the heart of the discipline, be potentially engaging, and require uncoverage versus coverage of the curriculum (Wiggins & McTighe, 1998).

Two broad characteristics describe inquiry-based learning, and are used to frame the subsequent section:

- 1) increased students’ involvement with their own learning
- 2) a change in teachers’ professional development.

A change in students’ involvement with their own learning. A previous investigation (Jacobsen, 2001a) whose main focus was the Galileo Educational Network itself, provided a number of indicators that describe the “nature of change that occurs when meaningful partnerships are formed between learners and digital media”:

- Student questions versus teacher questions; the individual interests and passions of learners are valued as an integral component of inquiry-based learning.
- Interest grouping rather than ability grouping
- Learners share their ideas and knowledge with the community, not just with the teacher.
- Just-in-time learning of technology in service of learning tasks and goals, not in service of technology tasks and goals.
- Mini-lessons with groups, instead of whole class, teacher-directed instruction.
- Computers at hand, wherever and whenever they are needed, rather than going to a lab for a booked amount of time.

- Students trusted to work where they need to be for learning tasks.
- Instead of “all students doing the same thing, at the same time”, student are working in groups of chosen projects.
- No sticky eyeballs – meaning, students are working in groups, on structured tasks, instead of listening and watching the teacher present curricular information and ideas.

A change in teachers’ professional development. In describing how the Galileo Network contributes to the transformation of teaching practice, Jacobsen’s (2001a) findings provided the following descriptions of the Galileo approach to professional development with teachers:

- Worked with teachers, both individually and in teams, across all grade levels;
- Worked with teachers to plan instruction, to plan demonstrations for the community and the press, and to organize celebrations of student work;
- Modeled pedagogical methods with children (both singly and in teams) to enable the teachers to be a participant observer;
- Worked with technology support staff in the school and at the district level as advocates and leaders;
- Observed and worked alongside teachers using new methods and discussed the results with them afterwards;
- Worked with teachers to design appropriate assessments of student work;
- Gathered, organized and shared resources (often from the Galileo Network’s own collection of books and articles, and also from collections of websites) with teachers and students;
- Led professional conversations, day-long seminars, and multi-day institutes to build and extend teachers’ understanding of fundamental teaching and learning issues;
- Provide scholarly and intellectual mentorship by sharing and contributing to published and emergent knowledge in theoretical and research-based sources;
- Supplied on-going, on-site support, both pedagogical and professional, for risk-taking and innovative practice;
- Provide multiple levels of support with the technology infrastructure, such as server planning, maintenance, software support, and application development;

- Operated as a diverse learning organization that invested in their own ongoing professional development and growth in order to provide innovative and creative services and solutions for teachers and students.

Exhibit #1: People of the Plains: Past and Present (Millarville School)

A Grade 2 teacher in Millarville School helped her class frame some “essential questions” regarding other cultures, with the intent to discover how they could be answered. The questions were the following: “How can stories help us to learn to understand, appreciate and respect other cultures?” and “How can a study of Plains First Nations communities in the past and present help us to increase our knowledge and empathy?”⁹

The ways in which they decided to get authentic answers for these questions were 1) for the grade 2 class to create their own trickster/legend stories, after having familiarized themselves with Plains Aboriginal traditions; and 2) sending these stories, along with additional questions, to Aboriginal students at Longview school in order to “convey respect for and appreciation of Stoney First Nations culture” and “to receive firsthand, authentic knowledge” from the Longview students themselves.¹⁰ Pat Clifford, Sharon Friesen and Barb Martin¹¹ facilitated and supported the teacher through the entire project with their involvement and consultation.

The student tasks involved in the first part of the project included learning about Plains life through books and Web resources (including articles, illustrations and videos); researching a topic within Plains life for the purpose of creating their own story; and finally, writing and editing their story (using MS Word) and drawing their own map which is “visually portraying the story/journey setting”.

In the second part of the project, students e-mailed their stories, along with additional questions, to their Aboriginal “e-pals” at Longview School; received and read the Longview students’ responses; revised and edited their own stories to include the suggestions that the Longview students gave them; and finally, created a “visual tool” which would be used to present to each other – in the classroom - what they learned.

The assessment strategies which were used by the grade 2 teacher included 1) a formative assessment, where students gave written reflections of their new insights and personal learning strategies, both at the “three-quarter” point and at the end of the project; 2) a summative assessment, in which students showed their understanding – through a pictorial chart - of how Plains life in the past could be compared and contrasted with both Plains life in

⁹ “Integrated Grade 2 Project: People of the Plains – Past and Present”: Patti Thorne, 2001 (<http://136.159.139.15/schools/millarville/plains/index.htm>)

¹⁰ *ibid*, (http://136.159.139.15/schools/millarville/plains/teacher_corner.htm)

¹¹ most of the facilitation was done by Barb. The teacher took a U of C course from Pat and Sharon but they did not really facilitate the project.

the present and “Millarville” life in the present; 3) a knowledge-based quiz intended to evaluate students’ understanding of information acquired throughout the project; and 4) a checklist used “to track students’ growth in the use of the various technologies involved in the project”.¹²

The final results of the project provide a strong indication of how effective inquiry-based learning, facilitated by technology and the support of the Galileo network, has been. The results are best expressed by the Grade 2 teacher:

“Throughout the project, which was spread over a 3 month period, formal and informal observations indicated that most students demonstrated a growing comfort and proficiency with a variety of technologies; significant interest in and knowledge and appreciation of Aboriginal culture; growth in fluency in reading, analyzing and comparing differing story elements in the trickster, legend and folk tale genre; purposeful desire to revise and edit own writing; increased use of specifics in self-evaluation; and noticeable collaborative participation.”¹³

Exhibit #2: Multimedia Poetry Collaboration Project (Foothills Composite, Highwood and Oilfields High Schools)

As a way of stimulating an appreciation of poetry among English 20 students, a group of teachers - Tim Bonner, Sam Burke and Gerhard Dyck – were led by Jerry Blake, a lead teacher in the AISI/Foothills ICT initiative, to invite volunteer students from three high schools to take part in a new project. The project had three stages. The first stage involved students discussing poetry with parents and adult friends, getting answers to the question, "Is poetry useful?", and then emailing findings to teachers from home. The findings had to include the range of answers, tags of poems remembered, and one poem in its entirety that parents had mentioned.

Then the second part involved bringing a personally selected multimedia image and poem together, in order to create “one vivid image” through which the students could “begin to see the linkages between poems and images”.¹⁴ More specifically, they would “begin to understand how to ‘read’ a picture (that is, look for the 'story' implications in it) and how to see a poem (after the initial reading comes the ownership of the entire poem so a reader/student only then can begin to 'see' or understand the poem).”¹⁵ In order to complete these activities, students would “become acquainted with the technical issues (web search, cut

¹² *ibid.*, (<http://136.159.139.15/schools/millarville/plains/rubrics.htm>)

¹³ *ibid.*

¹⁴ Jerry Blake, Unpublished document: “Poetry-Multimedia Collaboration Unit for English 20” (May 13, 2002)

¹⁵ *ibid.*

and paste, graphics editing, converting Word or PowerPoint files to graphics, screen captures, etc.)”.¹⁶

By carrying out the process described above, the students discovered answers to the first essential question posed by the teachers: “Is poetry useful?”¹⁷

The teachers then came up with a second essential question: “How can we define poetry in such a way so that the components of meter and metaphor are not only included, but explained in relationship to each other?” Towards this end, students were asked to enrol in an online community through which they could share their ‘creations’ with students from the other high schools. “The essential focus here is on sharing creations publicly, and on exposure to shared reflective thinking about the multimedia poems students have created. Also, this will allow for a metacognitive understanding of the essential components of poetry, the prosodic elements and the image elements.”¹⁸

The third ‘essential question’ posed by the teachers was, “How do we construct meaning from images and pictures?” In response to this, students chose one form of poetry, and through the use of this form they created their own poem. After this, they took another multimedia image - which was best suited to their poem - and merged it together with the poem. They were also invited to add an ‘audio’ element to the final image.

After having received online ‘feedback’ or ‘input’ from each other about their new creations, the students went back to edit or revise their pages. Finally, the teachers invited the students to present their images at a Celebration Day meeting in person. The students made their presentations “in a variety of ways -- oral readings, audio recordings, reader's theatre, dance, etc, -- again reflecting the multimedia understandings that have been achieved.”

The strategies used by the teachers to assess the students’ work included 1) rubrics which appraised students’ efforts and quality of work in the following four areas: *online discussion, found poem/image, created poem/image, and presentation*; and 2) a “feedback” form upon which students could share their reflections about the ‘*pluses*’ of the project, its ‘*minuses*’, and further questions they had which could be used for future consideration if the project is repeated.¹⁹

Regarding the project’s evolution and progress, Jerry Blake said that it “is still exploratory in the sense that we (*i.e. the teachers*) have to do a bit of it to find out how well the technology works”, but also that it is one which “I’m really excited about and proud of.”²⁰

¹⁶ *ibid.*

¹⁷ *ibid.*

¹⁸ *ibid.*

¹⁹ Jerry Blake, Unpublished document, “English 20: Poetry and Multimedia Collaboration Feedback”, n.d.

²⁰ Interview with Jerry Blake, April 17, 2002.

Exhibit #3: Heritage Homes of Okotoks: Past, Present & Future (Dr. Morris Gibson)

The Alberta Social Studies Curriculum requires Grade 2 and 3 students to study a community. Since the town of Okotoks features many heritage buildings which are still standing today, the teachers of two Grade 2/3 split classrooms at Dr. Morris Gibson School decided to use this situation to their advantage by having their students undertake a project that was both “on-site” and “online” in nature. For the online component they received the support of Galileo’s Pat Clifford, Richard Gaskell and Barb Martin.²¹

The Grade 2/3 students at Dr. Morris Gibson were asked the following “essential questions” by their teachers: 1) What would it be like to visit all of the heritage buildings in the past?; 2) What changes have been made to the buildings from the past to the present?; and 3) What changes do you imagine will happen to these buildings in the future?²² The “on-site” component comprised of the students’ visits to the buildings, and the use of their five senses, to glean information about the buildings. An additional visit to a sandstone quarry and a museum helped students imagine what it would have been like for people to live and work in these buildings in the past. Students were then asked to look at these buildings as they truly were, i.e. “in the present”, and ask themselves what changes have been made to the buildings from the past until now. Finally, the students were asked to imagine what future changes would occur in these buildings in the future. The “online” component was featured for the purpose of having students write their reflections (by using MS Word); display photographs of the buildings which they saw (by using a digital camera); and display photographs and/or maps of the buildings as they appeared in the past (by using a scanner). With the help of the support people mentioned above, the teachers and students were able to post all of their writings, photographs and maps on a web page. The assessment strategies used by the Grade 2/3 teachers included 1) observations of the students’ teamwork and communication; 2) growing abilities to use computers, write reflections and revise them; and 3) taking note of the feedback which students gave them throughout the course of the project. Some of the students’ feedback is noteworthy. It reinforces the high value of learning in an inquiry-based, technology-facilitated manner:

- “Is having more better?”
- “Doing this project was like having cork in water; every time I thought I had it figured out, I would think of a new question.”
- “Working with technology made it easy to change my mind about writing.”
- “I liked having a digital picture of the house so that I could remember what it looked like.”
- “I would like to live in the past.”²³

²¹ Abrahamowicz, K. and Harsch, N. (n.d.) “Welcome to Okotoks!: Past, Present and Future” (<http://partner.galileo.org/schools/gibson/community/index.html>) The facilitating work of designing the project was done mostly by Barb Martin. Richard Gaskell facilitated the work of two University of Calgary students in the Masters of Teaching program, Abrahamowicz and Harsch, who were the web-site authors.

²² *ibid.*, (http://partner.galileo.org/schools/gibson/community/our_story.html)

²³ *ibid.*

Exhibit #4: Poetry Field Trip of Southern Alberta (Dr. Morris Gibson School)

For the purpose of fulfilling Alberta Learning's requirement that Grade 4 and 5 students study Alberta's geography, two teachers from Gibson planned "a study of natural resources in an inquiry base" for their fourth and fifth graders.²⁴ The students' main objective in this study was to "gain a strong understanding of the natural resources of Alberta and how they are impacted by the geography and the climate."²⁵ In a manner similar to division one students in the Okotoks Heritage Home Project, Exhibit #3, the older students personally visited a number of areas, and responded to them through written reflection (in this case, taking the form of poetry) and the production of digital pictures. Both the writing and pictures would be featured in a website also created by students. Support for the website's construction was given by the two teachers, by Richard Gaskell and by Barb Martin. Specific tasks carried out by the students involved visiting the following sites in the Crowsnest Pass area: Head Smashed-In Buffalo Jump, Lundbreck Falls, Old Man Dam, Cowley Ridge Wind Turbines, Leitch Collieries, Frank Slide Walk, Frank Slide Interpretive Centre, Hillcrest Mine Disaster, and the Bellevue Mine. While exploring these places, the students took digital photographs and wrote notes of their feelings and impressions of what they observed. Upon returning to the class, the students took these impressions and turned them into their own poems. Then they displayed these poems on their own created website, along with their digital pictures of the Crowsnest sites. The following student poems were written in response to the site visits.

*If you're not from Head Smashed In,
You don't know the reality,
You can't know the reality.*

The Skulls

Natives chasing the buffalo
off the steep cliff.
Falling, falling, hearing them proudly hitting the rock
bottom.
Natives celebrating at their sacrifice.
Leaving nothing to waste
not even the buffalo brains.
That was not a tragedy.

But soon the white man came
with guns and gunpowder.
Powerful, no one could stop them
taking only the warm fur of buffalo for profit.
Thousands upon thousands of buffalo slaughtered,
left to rot on the prairie.
Now that was a tragedy.

Now the skulls are displayed for all to see
that the buffalo disappeared for eternity.

*If you're not from Cowley Ridge,
You've not heard the wind,
You've never heard wind.*

Swoosh (Wind Turbines)

Row upon row,
of lonely towers stand upon the ridge.

Their powerful 80 foot blades
continue to spin through the cold breeze.
Trying to push us away.
Turning their heads towards the gusts of wind,
as they changed direction.

Stopping only to rest for a calm minute.

²⁴ Barb Martin, interview from March 8, 2002.

²⁵ Barb Martin, personal e-mail correspondence.

The poems provide an affecting picture of, in Barb Martin's words, "what it really felt like to be there"²⁶:

The initial assessment strategies used by the Grade 4 and 5 teachers were anecdotal in form. Then they proceeded to form rubrics which would be used throughout the project to evaluate the level of students' engagement in their tasks.

Exhibit #5: Welcome to The Renaissance (Dr. Morris Gibson School)

When the Grade 4 students who carried out the Poetry field trip study above entered the fifth grade, they did a project in which they studied various kinds of paintings from the Renaissance era. After they learned some basic facts about the paintings, the students used them as a basis upon which to surmise the reasons for the paintings' creation, write their own stories, and make their own works of art from the "one-point" perspective that was very common during the Renaissance. The students then took all of their work – pictorial and written – and included it in a website which was also their own creation. This website was the creation of the teachers and Galileo staff (Barb and Richard). The students had input and worked on their own content, but the teachers and Barb and Richard did the design.

An amusing example of the students' reflections upon Renaissance artwork can be found in this explanation of why the Mona Lisa smiled:

If he (Leonardo Da Vinci) could capture this sad but beautiful look, it would be one of his greatest accomplishments. "Sit down", he said, "and I will fill my canvas with the beauty of your face." Mona Lisa said that she had to go to town to get food for her family. Leonardo was so afraid that she might leave, he offered her a great sum of money to pose for the picture. Mona Lisa knew this would help her family when he painted her (so) she couldn't help but smile.²⁷

The outcome of the project was the students' realization that "change is inevitable, especially for a civilization, which virtually remained the same for 800-900 years."²⁸ This insight was then "used as an introduction to the study of explorers, so that the students (could) understand why the explorers did what they did."²⁹

The assessment strategies employed, like those from the Poetry Field Trip project, were anecdotal and ongoing.

²⁶ Barb Martin, interview from March 8, 2002.

²⁷ http://www.galileo.org/schools/gibson/4-5_fp/renaissance/monalisa.html

²⁸ Barb Martin, personal e-mail correspondence.

²⁹ Ibid.

Exhibit #6: The Egyptian Hieroglyphics Project (Dr. Morris Gibson School)

The Grade One curriculum requires students to begin the process of “construct(ing) meaning from texts”³⁰. As a way of facilitating this, the first-grade teacher in Gibson sought to take a new, creative approach for the learning of reading and writing by exposing her students to symbolic Egyptian language. The teacher’s rationale for doing this is best explained by Barb Martin:

When...reading we are really just breaking a code. We wanted the kids to study another culture where codes (hieroglyphics) were used to tell stories. As they are beginning readers and writers, they also have to break codes when they read and write. If the code is mixed up, then the story is not the same or cannot be read by others.³¹

Towards the end of understanding the way in which codes have to be “broken” in order to be understood – and, by doing so, building more self-confidence in their own ability to decode English words – the first graders found a hieroglyphic Egyptian alphabet online³², and familiarized themselves with it. Then they created their own symbols, through which they were able to make their own messages, by using the Egyptian alphabet symbols. Finally, the students posted their symbolic dictionaries and stories on a website with the help of their teacher and Barb Martin. Assessment strategies were carried out by the teacher through anecdotal observations, rubrics, and sessions which students explained their symbolic writing through oral story-telling.

Barb cites this project as an example of “uncovering” the curriculum in contrast to the usual pedagogical procedure of “covering” the curriculum. By “uncovering” she means that “through inquiry-based project work...the students and teachers learn and work together.”³³

Exhibit #7: Salt Lake City Olympics Travel Project (Okotoks Jr. High School)

The Winter Olympiad in February 2002 provided a great opportunity for students taking the Tourism module in Career and Technology Studies to undertake a very special project during the preceding months. This activity would combine their understanding of tourism concepts with their use of skills required by the ICT curriculum.

After securing the involvement of Tony Hampshire, the Foothills ICT Project Administrator, as well as Richard Gaskell and Barb Martin of Galileo, the Tourism teacher “involve(d) the students in some actual trip planning using ICT tools.”³⁴ He worked with Tony, Richard and

³⁰ http://www.learning.gov.ab.ca/k_12/curriculum/bySubject/english/elaK-9.pdf

³¹ Barb Martin, personal e-mail correspondence.

³² Provided by the Royal Ontario Museum: <http://www.rom.on.ca/egypt/hiero/hiero.html>

³³ Barb Martin, interview from April 17, 2002.

³⁴ Tony Hampshire, personal e-mail correspondence.

Barb to create a scenario in which the students envisioned themselves to be managers of travel companies/agencies. The students had to develop group travel packages for specific target groups, each of which “had a budget limit and very specific needs/desires for accommodations, food, travel and activities while in Salt Lake.”³⁵ In an effort to stimulate motivation and interest in the students, the teachers created groups of fascinating and often amusing characters, whose profiles and pictures were placed on a website. Two such characters were the youngest child and family dog of the McSnard clan. One can see why Tony admits that “Barb, Richard and I probably had too much fun with this...”³⁶:

Hermie McSnard: age 6, grade 1 student. Loves to collect used gum. Really wants to go to Salt Lake and get some U.S. samples to add to his collection. MUST get to events where he can find gum wads. Hermie is pleased that his sisters think he is “a disgusting little creature”.

Wrigley McSnard: age 11. Purebred PrincerPoo Retriever. A trained CIA plastic explosives sniffer dog, retired to live with the McSnards. Loves to explore for gum wads with Hermie. He MUST go on the trip because no kennel or neighbour will look after him.³⁷

By the use of Web resources and MS Office tools, the students made a PowerPoint presentation or website through which they could “sell” the package to their particular group.

For assessment purposes, Tony and the Galileo personnel helped the Tourism teacher make a rubric that merged ICT and CTS Tourism outcomes together. Their combination would provide a thorough evaluation of how effectively students were able to meet the needs of their imaginary clients. In addition, “the teacher also assessed weekly class progress for students.”³⁸

Tony says that, as a result of this project, “students gained a much clearer understanding of what it's like to work in the planning end of the tourism industry... ICT became a means to achieve broad curricular goals rather than an end in itself.”³⁹ He also notes that “this was an enjoyable and engaging project for all.”⁴⁰

³⁵ Ibid.

³⁶ Tony Hampshire, personal e-mail correspondence.

³⁷ <http://www.galileo.org/schools/oj/olympics/family.htm>

³⁸ Tony Hampshire, personal e-mail correspondence.

³⁹ Ibid.

⁴⁰ Ibid.

Exhibit #8: Japan Project (Blackie School)

A Grade 7 Social Studies teacher at Blackie had his students focus on the changes experienced by Japan after World War II. However, rather than taking a “textbook” approach to the matter, the teacher asked the students some open-ended questions about Japan’s perspective on its own loss, and how things may have different if nuclear warfare had not been used against it. Toward the end of answering these questions in an inquiry-based fashion, the students were invited to research the Web for primary resources that provided a window into Japan’s viewpoints on the war. Then the students were asked to make a PowerPoint presentation through which they would present their findings to each other.

The means of assessment used by Grade 7 teacher was a five-point rubric. The highest point of the rubric was awarded to those students who showed an “excellent understanding of the information contained within the presentation” and “excellent use of the features of PowerPoint.”⁴¹

Tony Hampshire, the ICT administrator for Foothills, facilitated the technological component of this project. His comments regarding the transformation of attitudes that occurred in the minds of two teenage students are worth quoting at length, for they reinforce the high value of technology-enhanced, inquiry-based learning:

Bill opened it up to them and said, “OK, I want you guys to build something... around this idea of Japan changing after WW II, or as a result of...” These guys chose Hiroshima, and when Bill asked them why, they said, “Well, we think these nukes are really cool.” It was just the weapon – and that’s where they were. And to Bill’s credit, I think he said, “Okay...keep going. Come back and we’ll talk about it.” So then he asked me if I could sit in with them because they were kind of a little bit “at sea” to start out with, so I did. I used a question approach with them: “Well, why do you think the nukes are cool?” They answered, “Well, because they’re so powerful.” So then I asked... “What was the story...why did they do that?” After they said, “I don’t know”, I replied, “Would you like to find out?” Then they said, “Yeah...let’s find out.” They did legitimately want to find out... We used IT tools to actually find primary resources... and all this gets into the PowerPoint slides, and this is like, a *month* later...by this time the conversations that I’m now having with these guys aren’t about “nukes are cool”... They’re starting to bring up the conversation, “Well, geez, I don’t know...should the Allies have *done* that?” When they saw the images of Nagasaki and Hiroshima and read the accounts and the diaries – and they’re *horrific* pictures – they would say, “We’re not putting *that* in – that’s too gross.” They weren’t saying that they thought it was silly; they were really *repulsed* by it. And they were starting to ask questions like, “Well, why didn’t they do a demo?”, which I think is brilliant. Indeed, why didn’t they? I’ve often wondered that. They said, “Do you know what they should have done? They should have dropped it down on this island over here, and then say, “Tomorrow at noon, we’re going to drop this...you guys in Japan come up and watch this, and if you don’t surrender that’s what’s going to happen to one of your cities.” And these guys are, twelve years old, thirteen years old!... There was a lot of technical stuff that I had to find out about, in order to make it all work; but in the end, they fired it up in the classroom, put it on, and there was just *silence* when it was done. One of those really *powerful* silences. And then Bill, the teacher, stepped in and said, “Well, *this* is worth talking about. *Should* this have happened? What effect did *that* have on those people?” I showed this to teachers that

⁴¹ Bill Cunningham, unpublished document: “Rubric for PowerPoint Presentations”

P.D. day, and it had the same impact. And they asked, “Can we have that for our classes?” Finally, I went back to these guys and I said, “Can the teachers at Senator Riley have a copy of your Hiroshima PowerPoint?” And they said, “Sure, *yeah*”, quite sincerely. So it became an instructional resource that these guys had built! So from the beginning of their project until the end was about 6 weeks, but it started with that teacher, having the foresight to give these guys some room, and to allow them to construct some meaning around that event in a way that was important to them, that was *relevant* to them. To me, that’s one of the best examples of a successful project. It really sticks in my mind.⁴²

Exhibit #9: Coming to Answers in Different Ways: A Math Project (Millarville Community School, Dr. Morris Gibson School, Red Deer Lake School)

With the help of Barb Martin from Galileo Educational Network, teachers from each of the three schools invited their students to divide into groups and collaborate with groups of students from the other two schools for the purpose of providing answers to practical math problems. “They wanted to write a real life question . . . that could actually happen in the area where the children lived. . . the math that they wanted to discuss to gain an understanding was area, perimeter, scale, fractions, and geometric shapes.”⁴³

One group “started the conversation and their role was to keep the conversation going by answering questions and posing new ones. (All of) the students would log on twice a week and either start a new email or respond to a previous email that had been sent.”⁴⁴ It was the responsibility of the other groups (i.e. the ones not initiating the correspondence) to produce a plan by which the problems would be solved, and send it to the initial group. In turn, the first group was expected to post a compilation of the different threads which comprised the entire discussion. “The teachers also took part by responding to emails, talking part in the discussions of the math and checking to see if proper etiquette and respect was being used.”⁴⁵

It was the teachers’ intent to “create the assessment criteria and tools together with their students so that they are meaningful and generate knowledge.”⁴⁶ The criteria involved “presenting students with an authentic task, project or investigation and then observing, interviewing or examining their artifacts and presentations to assess what they actually know and can do.”⁴⁷ The teachers made the following reflections after having carefully observed their students’ efforts in the project:

⁴² Interview with Tony Hampshire, April 17, 2002.

⁴³ <http://www.galileo.org/schools/millarville/math/project.htm>

⁴⁴ *ibid.*

⁴⁵ *ibid.*

⁴⁶ *ibid.*

⁴⁷ *ibid.*

We really felt that the students gained a strong understanding of the math that we were focusing on. They were able to talk about what they were doing and why they were doing it. They were also writing new questions that came out of the questions that had been posed. They did not want the process of learning to stop.⁴⁸

Additional Samples of Students' Work

The interested reader who wishes to view additional samples of students' inquiry-based learning, many of which are described above, is invited to access the websites listed in Appendix A. For those exhibits that are not yet featured on a website, the email address of the lead teacher involved in the project is provided.

⁴⁸ *ibid.*

Part 6 : Conclusions And Recommendations

At its heart, this educational reform initiative is about shared vision, engagement and relationships. Foothills School Division and the Galileo Educational Network share a common vision about needed reforms in children's and teacher's learning opportunities. The partnership between a Foothills School Division school and the Galileo Network is based on a shared commitment to question fundamental issues to do with teaching, learning and leadership, to examine and reconceptualize conventional teaching practices, and to embrace inquiry-based approaches to technology integration. The two learning organizations believe in engaging leaders, professional developers, researchers, teachers and learners in a community of inquiry focused on problem posing and collaborative problem solving. Finally, they share a vision and moral purpose about cultivating mutually beneficial relationships among relevant stakeholders.

It is clear from this investigation that flexible and responsive professional development that involves teachers directly in planning, implementing and evaluating changed teaching practices is crucial for successful educational reform. The Galileo Network approach to professional development is flexible and responsive to individual contexts rather than being a pre-set training model that is "delivered" to teachers.

There must be some relative advantage (Rogers, 1995) for teachers to pursue a reform on behalf of learners. The Galileo Network offers images of practice online as case studies of meaningful, engaging and challenging student work that provides teachers with the initial confidence to consider changes to their own practice. Galileo teachers have a high level of credibility because they have taught in ways that these teachers want to teach. Galileo teachers bring experience with inquiry-based approaches to working with children and technology, and work side-by-side with classroom teachers to design, implement and evaluate each step and next step in response to the local classroom context.

Galileo Network's mentoring approach is to work alongside willing teachers as they design and implement inquiry-based projects, rather than dropping in once a week for a status check and to give the next set of instructions. "One of the reasons that peer coaching works so effectively is that it combines pressure and support in a kind of seamless way. Successful change projects always include elements of both pressure and support. Pressure without support leads to resistance and alienation; support without pressure leads to drift or waist or resources"(Fullan, 1991, p. 91).

The changes being sought are revolutionary; moving from curriculum delivery to curriculum design, and moving from first order uses of technology as tool to second and third order uses of technology for knowledge construction, representation and design (Moursund, 2002). The desired changes to teaching practice require hard work, sustained conversation and collaboration among teaching professionals, attention to design, implementation and evaluation of educational innovations, and finally, no small courage.

This educational reform initiative builds in many ways on the connection with the University of Calgary and the University of Lethbridge with regard to research, teacher preparation and graduate education. Student teachers apprentice with classroom teachers involved in the

technology integration initiative, and classroom teachers are given opportunities to pursue graduate credit for classroom-based, action research and reflection on innovative practices.

Conclusions

The main conclusions that have emerged throughout this study are the following:

- 1) The Galileo Network and AISI initiatives' implementation has been very successful at the elementary and junior high levels. The work has become self-sustaining for some Foothills School Division elementary school teachers, and several elementary teachers have become technology leaders among staff. So, not only are these teachers sustaining the inquiry-based approaches to learning in their own classrooms, they are mentoring other teachers in how to plan, implement and evaluate inquiry-based technology projects in other classrooms.
- 2) The technology integration and inquiry-based learning initiatives have faced significant barriers in senior high schools. Among the many explanations for this increased challenge is the emphasis on curriculum coverage in high school, conventional scheduling and organizational structures, and the influence of provincial exams makes it more difficult to persuade secondary teachers to adopt and sustain inquiry-based learning and technology enhanced approaches to student learning.
- 3) While the initiative's success is due in a large part to the endorsement and encouragement it has been given by all stakeholders across the educational spectrum, it is particularly due to the support it has received from Galileo Network and from the Associate Superintendent, Jay Pritchard. The two organizations share a common vision about needed changes in children's and teacher's learning opportunities.
- 4) An effective technological infrastructure has been maintained in Foothills School Division schools. Reliable access to technology for staff and students is enhanced by the technology support department with much ingenuity and innovation, despite limited resources. Technology support is targeted to the vital and imperative services needed by the majority rather than the wants of early adopters.
- 5) Teacher awareness about inquiry-based learning has been increased, and involvement in inquiry-based, technology-enhanced projects has been increased, because of the images of practice shared via exhibits, websites, and classroom visitations by the Galileo Network staff and the Foothills School Division lead teachers.
- 6) The initiative's success thus far is in part due to the Galileo Network's innovative professional development approach with teachers. It is a personalized model where the lead teachers and classroom teachers form ongoing, respectful and collaborative "in-class" relationship beginning with the classroom teachers' needs and continuing in a face-to-face approach. Galileo Network also provided just-in-time, onsite technological support that was highly valued by teachers while they were pioneering. The combination of Galileo Network and Foothills onsite technological support was a

crucial factor for teachers' comfort with making changes to their practice.

- 7) A key factor in the success of the educational reform initiative in Foothills School Division has been the enthusiastic involvement of district and school leaders. There is a relationship between widespread evidence of inquiry-based learning projects for students and school leaders who reward, recognize and encourage teachers for their participation in technology enhanced projects.
- 8) Success has not come without an enormous amount of time and energy spent by all involved in the initiative, particularly by the Galileo Lead Teacher and Galileo Network staff, the Foothills School Division lead teachers and the technology support department. The positive side to this conclusion is that the demand from teachers for support in working in inquiry-based, technologically enhanced ways with children is increasing with each year of this educational reform initiative.
- 9) Finally, given that a primary goal of the initiative is on the emergence of new and more effective teaching and learning practices, part of the initiative's progress can certainly be attributed to the fact that all of its main facilitators, from the Galileo Network teachers to the lead teachers to the school principals to the technology support administrator, come from classroom teaching backgrounds.

Recommendations

The following recommendations have emerged as a result of this study:

- 1) If the initiative is to be fully successful as originally intended – i.e. new practices emerging from all 17 schools – then a sustained relationship should be sought between the Galileo Network and each school. This study has revealed that Galileo Network's involvement with Dr. Morris Gibson School exemplifies the nature of a successful educational reform relationship, because many of the teachers from Dr. Morris Gibson have become leaders in technology integration after partnering with Galileo Network for three years. Given that AISI funding is term-certain, sustainable sources of funding need to be sought to support the ongoing professional development needs of teachers.
- 2) Given that requests for Galileo and Lead teacher support with professional development needs have increased over time, and given Fullan's (2001) estimate that it takes 6-8 years for an educational reform to "take" in a school district, it is recommended that some means be sought to increase access to the type of responsive, flexible and ongoing professional development support offered by Galileo Network that is highly valued by teachers.
- 3) Currently the lead teachers who are not actively a part of Galileo Network have fewer prospects of working with their schools at the same level as the Galileo Lead teacher at Gibson, Red Deer Lake and Millarville. It is recommended that every possible

measure be taken to give the lead teachers expanded opportunities to work closely with the Galileo Network and with applying the Galileo approach in schools.

- 4) Since the initiative is making only limited progress in Foothills' School Division senior high schools, it is recommended that Galileo's work in high schools of other school divisions be examined, the literature on specific challenges in high schools be analyzed and summarized, and that these findings be shared. Such examination will uncover successful projects, strategies and organizational models, and therefore, all those involved in the Foothills initiative in secondary schools could glean valuable insights from the research and experiences elsewhere.
- 5) In order for the Technology Support Department to fully realize the ICT vision within the Foothills School Division, the Technology Support Department will need to have its *funding increased* for personnel and ongoing professional development for technical support staff and FSD staff (i.e., to increase opportunities for onsite support people to build and expand upon their skills). Ultimately, the strategic use of the personnel and technology present in place can only go so far. As more teachers become involved with inquiry-based approaches to technology integration, the technology support and professional development needs will *increase exponentially* rather than remaining stable. Therefore, last year's budget for the Technology Support Department will not be sufficient for the increased number of teachers who are enthusiastic and becoming involved this year.

Ideally, the increased funding will come from Alberta Learning in recognition of the increased demands placed on the technology and support infrastructure, rather than by reducing budgets for other Foothills School System priorities and initiatives.

- 6) In order to develop a fuller understanding of how successful the Galileo and AISI initiatives have been in Foothills School Division, ongoing external research is needed. For example, in the 2002-03 instructional year, interviews with parents and students should to be conducted, along with ongoing research with classroom teachers, leaders and technology support staff, in order to fully understand the impact of the educational reform initiatives in Foothills School Division (See Appendices E and F for draft survey instruments and interview questions).

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Appendix: A

Websites & Email Contacts for Technology Enhanced, Inquiry-Based Projects in Foothills School Division

FSD School	Title of Project	Grade	Pages (URLs) Where Project Work is Featured
<i>Millarville (Galileo)</i>	Math: Coming to Answers in Different Ways	?	http://www.galileo.org/schools/millarville/math/math_problem1.html
	The Inuit of the Canadian Arctic	3	http://www.galileo.org/schools/millarville/pam/index.html
	Mystery Stories	6	http://www.galileo.org/schools/millarville/artfulmysteries/index.html
	Our School is More Than A Building	1	http://136.159.139.15/schools/millarville/school/index.htm
	People of the Plains: Past and Present*	2	http://136.159.139.15/schools/millarville/plains/
<i>Okotoks Jr. (Galileo)</i>	Experience the Olympics: Salt Lake City 2002**	?	http://www.galileo.org/schools/oj/olympics/index.html
<i>Dr. Morris Gibson (Galileo)</i>	Ancient Greece: Archaeological Time Travel	6	http://www.galileo.org/schools/gibson/greece/index.htm
	China in the News	6	http://www.galileo.org/schools/gibson/china/index.htm
	An Introduction to Symmetry	?	http://partner.galileo.org/schools/gibson/symmetry/
	Studies of the Inuit	1/2	http://www.galileo.org/schools/gibson/north/north.htm
	Canadian History: Explorers	4/5	http://www.galileo.org/schools/gibson/4-5_fp/explorers/index.html
	Okotoks: Past, Present and Future	2/3	http://partner.galileo.org/schools/gibson/community/
	Literacy thru Art: Symbolic Language and Artifacts*	?	http://www.galileo.org/projects/literacy/indexs.html
	Inquiry-Based Learning*	4/5	http://www.galileo.org/schools/gibson/4-5_fp/
	Partnership	?	http://www.galileo.org/schools/gibson/partner-ship/index.html
	Regions of Canada	4/5	http://www.galileo.org/schools/gibson/canada/student_work/regions_of_canada.htm
	Southern Alberta Tour	4/5	http://www.galileo.org/schools/gibson/4-5_fp/tour/index.html

*mentioned by Barb Martin in interview #1

**mentioned by Richard Gaskell in interview

FSD School	Title of Project	Grade of Students	Pages (URLs) Where Project Work is Featured
<i>Red Deer Lake (Galileo)</i>	All About our School	1	http://www.holyspirit.ab.ca/st.basil/aaos.htm
<i>Senator Riley</i>	Canadian History	8	http://webacc.fsd38.ab.ca/schools/SenRiley/grade8ict/index.htm
	Muliculturalism in Canada	7	http://webacc.fsd38.ab.ca/schools/SenRiley/Webquest/index.htm
	Riley's Race: A Ratio Race for Math	8	http://webacc.fsd38.ab.ca/schools/SenRiley/rileysrace/index.htm
<i>Blackie School</i>	Japan project	7	For info, contact Tony Hampshire [HampshireT@fsd38.ab.ca]
<i>Oilfields High School</i>	Multimedia Poetry Collaboration Project	Sr. Hi	For info, contact Jerry Blake [BlakeJ@fsd38.ab.ca]
<i>Highwood High</i>	Multimedia Poetry Collaboration Project	Sr. Hi	For info, contact Jerry Blake [BlakeJ@fsd38.ab.ca]
<i>Foothills Composite High</i>	Multimedia Poetry Collaboration Project	Sr. Hi	For info, contact Jerry Blake [BlakeJ@fsd38.ab.ca]

Appendix B

Interview Questions from the Present Study

CONTEXT

The following questions are part of a case study of a large rural school district, Foothills School Division, that participated in the third year of a major educational reform initiative in conjunction with Galileo Educational Network. A focus for this study was to uncover the essential conditions for moving an entire school jurisdiction forward with an education reform agenda for effective technology integration, professional development and leadership. The multiple ways in which the two organizations, Foothills School Division and Galileo Network, work together to coordinate funding sources and leverage the impact of each other's efforts to support teachers and students in their classrooms was examined, and the essential conditions for division-wide reforms were sought.

General Manager – Galileo Network

- Could you describe your position and the role it plays in the fulfillment of Galileo's vision?
- Could you describe how the overall ICT initiative of the Foothills School Division corresponds with the Galileo objectives?
- How do you get people within the FSD to 'buy into' and get involved with this initiative?
- What type of support is provided to teachers regarding P.D. for the purpose of having time to work with Galileo?
- What are some of the challenges facing the FSD as they implement their technology integration plan?
- Ever since starting this initiative with the FSD, what kinds of changes have you had to make in the way it is carried out?

Galileo Network and Foothills School Division Teachers

Galileo Leadership

- What are your roles within each school?
- With whom do you do most of your work?
- What projects have you worked on that have been most successful and why? What were essential conditions that made the project possible?
- How well is the technology integration initiative/Galileo project supported within the schools? Division? Community? What do the general public/parents know about it?

Professional Development

- What is the focus for P.D. activities? Who decides what P.D. will be provided and how? Where does P.D. occur? How is it organized (locally/division wide)?
- What types of P.D. opportunities have been provided for the teachers/tech support people? What is done for non-Galileo schools?
- What type of support is provided to teachers regarding P. D. ie – time to work with Galileo

Leadership

- How are the technology leaders and lead teachers in the schools selected?
- What are the backgrounds of these leaders?
- What does leadership in the area of technology look like from the teacher's perspective? What do the teachers need from them? What kind of things are they asking for?

Technology Infrastructure/Support

- What type of support do you receive from the tech support people?
- How do you see the tech support role working within the school division?
- How well does the tech infrastructure work to support the classroom work of teachers within the schools?

General Perspectives on the project

- How do you persuade people to buy in and get involved?
- What are the positive /negative effects of the system which is in place on the classroom instruction?
- How does the overall initiative in the Foothills school division work with together with the Galileo objectives?
- What are some of the challenges facing the Foothills School Division as they implement their technology integration plan?

Associate Superintendent, Foothills School Division

Background

- Thinking back to the beginning of this relationship, what made you think that a partnership with Galileo Network might be beneficial for moving technology integration forward in FSD?
- What initiatives were already in place in FSD to support technology integration?
- In what ways did you see the Galileo Network complementing and extending technology integration efforts in FSD?
- What factors originally convinced you to invest the necessary time to build a relationship with the Galileo Network?
- What factors motivate you to continue the relationship between Galileo and FSD?
- What indicators, if any, convince you that the Galileo initiative in FSD is a success?
- How well is the Galileo Network initiative supported within the schools? Within the Division? Within the Community?
- What do the general public/parents know about Galileo in FSD? If they do know about it, what is their perspective?

Leadership

- What is your vision for technology integration in Foothills School Division?
- In what way(s) does involvement with Galileo Network help you to achieve this vision in the Foothills School Division?
- Do you manage to build a common vision for technology integration in spite of the distance between schools in FSD?

- What is your role in moving the Galileo Network initiative forward in FSD?
- In what ways does your approach to technology leadership provide a ‘model’ for the technology leadership you wish to see develop in FSD?
- In what ways have you encouraged technology leadership among key FSD staff?
- How are the technology leaders and lead teachers in the schools selected?
- How do you get people to buy in and to become involved in the Galileo Network initiative?
- What are some of the KEY CHALLENGES facing the Foothills School Division as they implement their technology integration plans?

Professional Development

- In what ways do you support FSD and Galileo staff in providing professional development and leadership for technology integration in FSD?
- How has the Galileo Network initiative impacted teaching practices for some FSD teachers?
- What are the positive /negative effects of the Galileo initiative on classroom instruction?
- Over the past three years, what kinds of Galileo ideas and initiatives have been adopted enthusiastically by Foothills staff? Which ideas have yet to be embraced? How do you account for any resistance?
- What are some examples of the ‘new images of teaching, learning, student capabilities and staff development’ that you have observed?

Technology Infrastructure & Support

- How have you encouraged and supported the development of a robust technology infrastructure within FSD?
- What role, if any, does the Galileo Network play with regard to technology infrastructure?
- What type of support do you provide to the technology leadership and support staff?
- How do you see the technology support role working within the school division?
- How well does the current technology infrastructure work to support the classroom work of teachers and students within schools?

Technology Coordinator, Foothills School Division

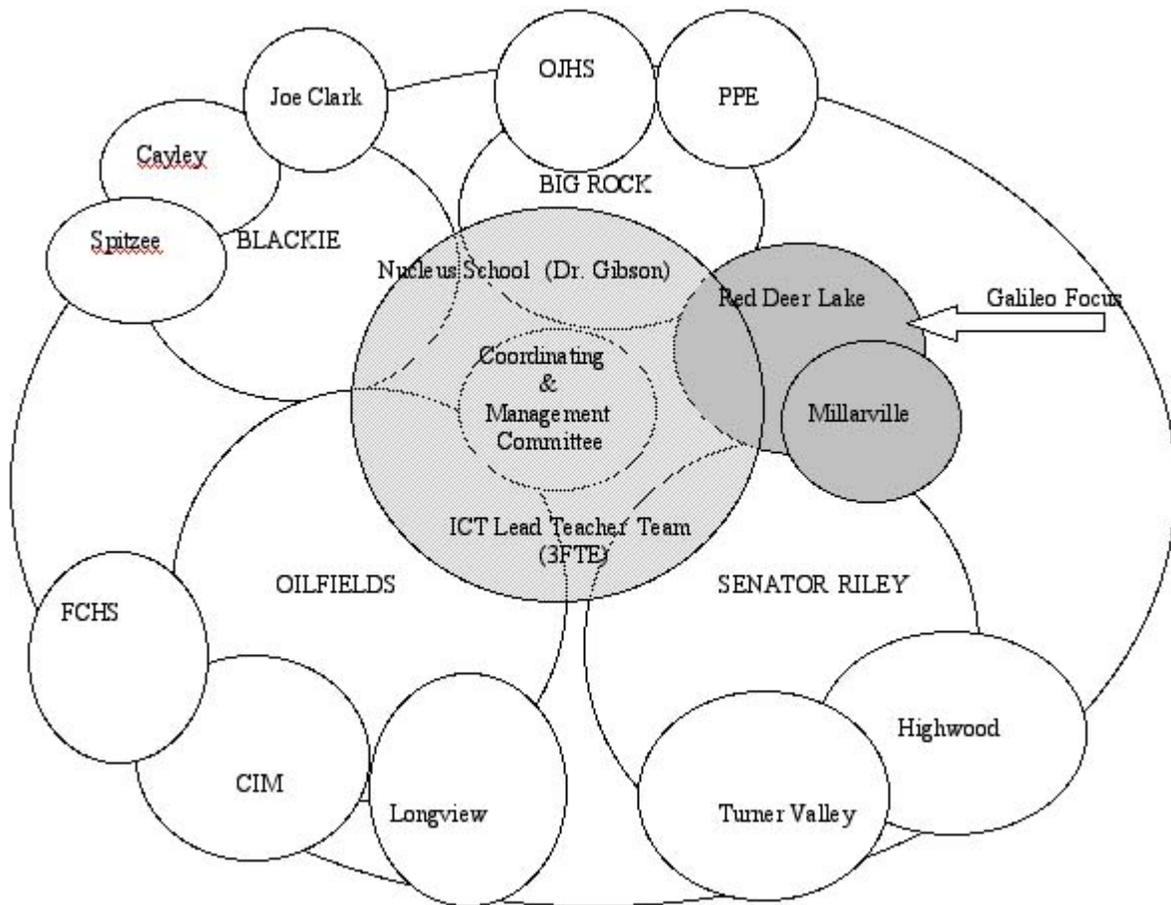
- What is your role in the FSD, and how many staff do you have?
- What are the challenges of having to deal with as many as 17 schools?
- How has your position changed over the past two years? What challenges are you facing now that you hadn’t faced then?
- What kinds of training do you provide for your tech support staff?
- What is your overall plan for tech support and maintenance in the FSD?
- What contributions has Galileo Network made to this plan?
- What challenges has Galileo Network presented for this plan?
- Whom do you work most closely with in Galileo Network?
- What is the extent of your working relationship with teachers themselves?
- In talking with others in the FSD, I’ve heard how you’re involved in the “Evergreen” plan. Just what is this plan and what kinds of progress have been made in it?

Appendix C
Final Draft June 2000
Foothills AISI: ICT Project
Connecting Teaching and Learning Through Technology

Overall goal

An integrated project that will encourage teacher growth and development in order to implement the new ICT curriculum with particular emphasis on student's use of technology as a tool for thinking, collaborating and communicating.

Model



Project Goals

1. To facilitate adult learning to allow teachers to more successfully implement the ICT Program of Studies in their schools.

2. To foster change in teaching practice toward a more constructivist, inquiry-based approach
3. To increase teacher fluency and confidence in implementing the ICT Program of Studies
4. To increase students' ability to perform the Assessment Tasks provided by Alberta Learning
5. To increase the effectiveness and relevance of university and field collaboration by successfully completing a pilot for a new model of pre and post degree programs.

Implementation Model

Schools self select which year they wish to devote to on site work with the ICT team. The following are schools groupings for years 1, 2 and 3:

Year One ("Orbit 1") Schools 2000-01

Red Deer Lake Millarville Big Rock Blackie Oilfields Senator Riley
Dr. Gibson

Year 2 ("Orbit 2") Schools 2001-02

PPE OJHS Foothills Composite C.I. McLaren Highwood

Year 3 ("Orbit 3") Schools 2002-03

Joe Clark Spitzee Longview Turner Valley Cayley

Measures and Data Collection

Two surveys are currently being used to collect data from teachers using a pre-post methodology:

- ICT Implementation Survey (developed locally)
- North Central Regional Educational Laboratory (NCREL) *Survey of Engaged Learning* www.ncrel.org

Both surveys are administered in Sept./October, and again in May/June of each year.

*Please contact **Mr. Tony Hampshire**, AISI ICT Project Administrator, Foothills School Division, for more information about the Project, and Year 1 and 2 Results.*

Coordinating Committee

- Representation from Galileo Network
- Representation from Learning Services/Tech Services
- Representative of Administration (Jay Pritchard)
- FAA (as needed)
- Overall direction and management of the project
- Deployment of resources (allocation/deployment of ICT Lead Teacher Team)
- Selection of schools for each orbit

- Liaison with University and schools re: Interns, on site courses etc
- Preparation, development of learning sessions (Summer Institute etc.)
- Arrange for the collection and analysis of project assessment data.
- Coaching, support and interactive development of ICT Lead Teachers.

ICT Lead Teacher Team

- 3 FTE ICT Lead Teachers (One from Galileo, two seconded teachers)
- In year one the TST would provide support to the Nucleus school and 5 orbit one schools (Nucleus and two other schools with Galileo and two others per Lead Teacher)
- The schools would all be the same except that those where Galileo is working would have a greater commitment to having interns and students in Graduate Programs. The allocations of Substitute days, PD Activities, Capital Equipment etc. would be fundamentally the same.
- In year two this would move out to include initial work with orbit 2 schools while remaining linked to orbit one. In the third year the majority of the work would involve orbit 2 schools. In all three years the workshops (summer and monthly/bimonthly) would be available to all schools as well as opportunities to observe and partner with schools/classrooms in the active orbit.

The Role Of Galileo Educational Network

- To provide direction and support to three schools though several staff members (equivalent to one FTE) to the nucleus school and two other schools over a three year period.
- To work as part of the Coordinating and Management Committee to provide overall direction to the project. As a part of this to provide direction to the ICT Lead Teacher Team and together with them and Learning Services develop and provide PD activities, (Workshops, in-class support, team planning, mini sessions as required etc) to the entire project and the three designated schools.
- To provide liaison with the Universities for the deployment of interns and graduate students.
- To interact with the universities around research projects related to this initiative.

The Role of Technology Services

- To work as part of the Coordinating and Management Committee to provide overall direction to the project. As a part of this to provide direction to the ICT Lead Teacher Team and together with them and Learning Services develop and provide PD activities, (Workshops, in-class support, team planning, mini sessions etc) to the entire project and the three designated schools.
- To provide technical support and liaison with the Technology Council and the Technology Services Department.
- To facilitate the purchase and installation of any equipment needed for the project.

- To facilitate any physical equipment or software adjustments needed to facilitate the project.

The Role of Learning Services

- To work as part of the Coordinating and Management Committee to provide overall direction to the project. As a part of this to provide direction to the ICT Lead Teacher Team and together with them and Learning Services develop and provide PD activities, (Workshops, in-class support, team planning, mini sessions etc) to the entire project and the three designated schools.
- To support/encourage the day to day work of the ICT Lead Teacher team.
- To liaise with Learning Services Department to provide logistical support for the project. (Budgets, Data Collection, Meeting Organization, Notices, Coordination with Administration and Schools, Coordination with other PD activities, Interface with other AiSi Projects etc.)

The Role Of Schools

Nucleus School

- Serve as project centre and demonstration site for orbit one schools.
- Host learning sessions (summer institutes etc.)
- Work with the Galileo Educational Network to provide a demonstration/ research site for university projects, interns etc.

Orbit 1 (2000-2001)

- To develop a school team who will be responsible to coordinate and operate the project within the school.
- The school team will use their school ICT Plan as a basis for developing the implementation steps in their school.
- The school team will select 2 or 3 members who will attend the initial Year One Summer Institute (August 23-25, 2000 and develop initial project(s) to begin in the school.
- Over the course of the year the team will select and develop further projects in conjunction with the ICT Lead Teacher Team.
- Serve as a demonstration sight in subsequent years for orbit 2 schools.
- Team members will be selected to attend the regular leadership meetings and return to the school with projects and activities which they will implement in the school.
- The school team will assist the Coordination and Management Committee and the ICT Lead Teacher Team to assess the effectiveness of the project in meeting the AiSi goals.
- For those schools particularly associated with the Galileo Network – willingness to host interns, graduate students and research projects jointly with the universities.

Orbit 2

- The school will develop a school team who will begin planning – based on their ICT Plan – to implement some aspects of the ICT Curriculum.

- The school team are welcome to send individuals and groups to some of the Leadership Activities provided by the ICT Lead Teacher team.
- The school team should begin to identify projects they wish to implement in the second year. (2001-2002)

Overview of Implementation Process

Year One Work with nucleus and initial work with orbit one schools

- Year begins with an intensive initiation activity before school begins (August 23-25, 2000). This will develop the foundation principles and each Orbit One school will develop an initial project based learning activity which the ICT Lead Teacher will support via demonstrations, coaching and providing feedback for over the first six weeks of school.
- Schools in orbit one will identify the initial teacher team (2 or 3 teachers) who would work in the summer initiation workshops and develop the first set of projects.
- During the year the school teams and the Tech Support Team will meet every 6 weeks (about 5 times per year) for a more intensive workshops and project development days.
- Orbit One schools will be allocated 23 sub days for these workshops and work with the Tech Support Team (If PD days are used the extra days are at the disposal of the school.)
- Orbit 2 schools receive awareness raising activities by participating in some of the 5 days of workshops provided to the Orbit One schools (6 sub days per school)

Year two The shockwave moves out one ring to provide support to Orbit Two schools

- Nucleus school receives only peripheral support
- The epicentre moves out to Orbit One.
- Continued work with Orbit One schools
- Begin more intense work with Orbit Two schools
- Each ICT Lead Teacher works with 2 or 3 Orbit 2 schools
- 22 sub days per orbit two and three school (3 teacher teams times 5 days plus 7 days for initial workshop) Sub days in lieu to participating teachers.

Year Three Continued work with Orbit One and Orbit Two schools

- Similar to year two (Initial workshop and intensive work every 6 weeks)
- The epicentre of the work would be in Orbit 2 with a lower level of support to level one.

Appendix D

ICT AiSi Project Lead Teacher Description

Job Description

The Project Lead Teachers for Information and Communication Technology are a team of three teachers who will work together closely with the Coordinating Committee to provide support to classroom teachers and schools to implement the Alberta Program of Studies in ICT.

- ✓ Create, develop and conduct staff development for teachers and administrators.
- ✓ Work with parents and students to provide background learning experiences
 - Teacher training includes a Summer Institute and monthly training sessions
 - Parent workshops are often held in the evening.
 - Administrator workshops will be spaced throughout the year and/or included with summer and fall institutes
- ✓ Provide on-site classroom support, in-class modeling, peer coaching, mentoring, curriculum and lesson design, planning and implementation for infusing technology into the curriculum.
 - Work with “resident expert teachers”
 - Provide in-school “quick shops”
 - Develop in-school “each one, teach one” processes
- ✓ Provide support for use of technology in classrooms
 - Entry level troubleshooting hardware and software
 - Pedagogical processes which support constructivist learning.

Teachers who apply for these positions must be available to take some training in Brain-based Learning, Co-operative Learning and Learning With the Brain in Mind during July and/or August.

Teachers will receive direct support from the Galileo Network, Foothills School Division Learning Services and the Universities of Lethbridge and Calgary.

The successful candidates will represent a collaborative team with diverse backgrounds (subject and grade levels) who are in tune with constructivist approaches to learning. While they may not be experts with technology they will have a high level of interest and enthusiasm for using technology as a tool for learning. Since the project will involve a cluster of schools the successful candidates must be willing to travel between schools and work with diverse schools and learners.

Appendix E

Draft of Parent Survey for 2002/2003

Information Communication Technology (ICT) Implementation at _____ School
In partnership with Galileo Educational Network

The purpose of this survey is to better understand the impact of the technology integration efforts on your child's experience at the school.

ICT refers to the use of such technologies as computer hardware & software, computer networks, the Internet, robotics, digital cameras, video, scanners, projectors, etc.

1. Please indicate the division/grade level your child is in
 Grades K - 3 Grades 4 - 6 Grades 7-9 Grades 10-12

2. At the end of this school year my child will have been in the Foothills School Division for:
 Less than 1 Year 1 Year 2 Years 3 or More Years

3. My child is able to use Information Communication Technologies, including the computer and the Internet, at home.
 Yes No

4. If I answered "yes" to #3, my child is able to access the school network from home.
 Yes No

5. If I answered "yes" to #3, my child spends _____ hours on the computer at home.
 1-5 hrs a week 5-10 hrs a week 10-15 hrs a week 15+ hours a week

6. Please rate the extent to which you are satisfied with how your child uses Information Communication Technologies to complete school assignments, conduct research, and/or communicate information from home.

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied
1	2	3	4	5

7. Please rate the extent to which you are satisfied with the technological resources that are provided for your child when he/she is using Information Communication Technologies at school.

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied
1	2	3	4	5

8. Please indicate how often you access your child's school's website.

___ never ___ rarely ___ sometimes ___ usually ___ always

9. Please indicate how often you access the Foothills School Division website.

___ never ___ rarely ___ sometimes ___ usually ___ always

10. Please rate the extent to which you are satisfied that your child is receiving the *opportunity* to learn with Information Communication Technologies in school.

Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
1	2	3	4	5

11. Please rate the extent to which you are satisfied that your child *actually uses* Information Communication Technologies to complete assignments and conduct research and/or communicate information in school.

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied
1	2	3	4	5

12. Please rate the level of improvement that you have observed in your child's *competence* with Information Communication Technologies.

No Improvement	Little Improvement	Neutral	Improvement	Significant Improvement
1	2	3	4	5

13. Please rate the level of difference that Information Communication Technology is making in the *quality* of your child's work and / or projects.

No Difference	Little Difference	Neutral	Difference	Significant Difference
1	2	3	4	5

14. Please rate the extent to which you are satisfied that your child uses Information Communications Technology for communicating, inquiring, decision-making and problem solving.

Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
1	2	3	4	5

15. Please rate the extent to which you are satisfied that Information Communications Technology is being used at school to prepare your child to live, learn and work in the 21st century.

Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
1	2	3	4	5

16. The degree to which I support teachers' postings of my child's work on the web is indicated below.

I don't support it
 I am neutral

I support it with some reservations
 I fully support it

17. The degree to which my child's teacher(s) gives him/her the opportunity to use technology for the purpose of project-based learning is indicated below.

never rarely sometimes usually always

Comments about Galileo Educational Network at _____ School

Other Comments

Appendix F

Draft Interview Questions for Parents & Students for 2002/2003

Parent Interview Questions

- How has the use of technology at school affected your children's desire to learn?
- How has inquiry-based learning affected your child's desire to learn?
- What is your perspective on the value of technology for learning?
- What is your perspective on the value of inquiry-based learning?
- To what degree do teachers make you aware of the technology-enhanced projects that your students are doing?
- From your perspective, has technology-enhanced, inquiry-based learning been successful? If so, what kinds of things account most for its success?
- Can you give some examples of learning projects involving technology that your child has participated in at school?
- Is your child(ren) able to access the school network from home?
- What kinds of activities do your children carry out on the internet, whether or not they are on the school network?
- How much time does your children spend on the computers at home?
- To what degree are you satisfied with the technological resources that are provided for your children when they are using the computers at school?
- What kinds of activities do your children use the computer and Internet for at school?

- How often have you volunteered your services for your child's elementary classroom? If so, what have you observed regarding the time spent by students on the computers?
 - For what purposes have the students used the computers?
 - When the students have used the Internet, what kinds of sites have they accessed?

- In your opinion, what are some of the challenges facing the FSD as they implement technology for learning?

- What responsibilities do you expect the following stakeholders to fulfill in this initiative:
 - Principals
 - School technology leaders
 - District leaders
 - Classroom teachers
 - Parents
 - Students

- How successful have they been in fulfilling these desired roles?

Student Questions (To be used in focus-group and interview formats)

- What technology projects have you been doing? Which ones have you enjoyed doing most? Why are these the most enjoyable?
- Does technology make learning more interesting for you? How?
- How would inquiry-based learning compare with the other kinds of learning that you do?
- How does your teacher help make your projects interesting?
- Are there any challenges that learning with technology presents for you? Have you had any frustrating moments?
- Are you able to access your technology work at home?
- What kinds of learning projects would you still like to see teachers give you the opportunity to do?

APPENDIX G

Statistics Canada. (1996). Statistical profile of Canadian communities. Retrieved July 25, 2002 from the world wide web: <http://ceps.statcan.ca/english/profil>

Table 1. Population of Okotoks, High River, Calgary and Alberta

	Okotoks	High River	Calgary	Alberta
1996 Population	8510	7359	768,082	2,696,826

(Statistics Canada, 1996)

Table 2. Age of residents of Okotoks, High River, Calgary and Alberta

	Okotoks	High River	Calgary	Alberta
Average age	29.4	36.9	33.7	33.7
0-4	630	480	53,350	194,235
5-14	1,940	1,175	109,230	420,250
15-19	770	525	48,225	191,445
20-24	385	385	55,470	185,505
25-54	3,980	3,025	378,660	1,235,530
55-64	380	585	54,885	202,955
65 -74	255	630	41,425	156,550
75+	170	550	26,840	110,355

(Statistics Canada, 1996)

Table 3. Gender Distribution for Okotoks, High River, Calgary and Alberta

	Okotoks	High River	Calgary	Alberta
Male	4,270 50%	3,625 50%	380,130 49%	1,336,540 50%
Female	4,210 50%	3,735 50%	382,660 51%	1,332,655 50%

(Statistics Canada, 1996)

Table 4. Percentage of First Language Speakers in Okotoks, High River, Calgary and Alberta

	Okotoks	High River	Calgary	Alberta
First language (Eng or French)	8150 96%	6900 94%	614810 80%	2231865 83%

(Statistics Canada, 1996)

Table 5. Ethno-Cultural Characteristics of Residents in Okotoks, High River, Calgary and Alberta

	Okotoks	High River	Calgary	Alberta
Aboriginal	150 1.7%	90 1.2%	14,500 1.8%	122,835 4.5%
Visible Minorities	80 0.9%	265 3.6%	126,050 16%	269,285 10%

(Statistics Canada, 1996)

Table 6. Percentage Immigrant Population in Okotoks, High River, Calgary and Alberta

	Okotoks	High River	Calgary	Alberta
Immigrant Pop	705 (8.3%)	685 9.3%	165,300 (21.5%)	405,140 15%

(Statistics Canada, 1996)