

## *Gathering Strength*<sup>1</sup> through *Teknannajii*<sup>2</sup>: Toward a Socio-Culturally Grounded Technology Infusion Strategy in a First Nation Ojibway School

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### **Abstract**

We are seeking support for a second iteration of an emergent technology infusion effort called *Gathering Strength through Teknannajii* (GSTT), to improve opportunities for learners at Mikinaak Onigaming school. This K-12 school is a Native Band operated Ojibway school, located at Onigaming First Nation, Ontario Canada. This collaborative research and development project with HGSE, partnering with the Onigaming First Nation, aims to foster socio-cultural conditions and educational designs to support Onigaming's comprehensive school improvement initiative. GSTT's overall strategy is to foster a community of intentional innovators capable of managing, utilizing and innovating with new technologies to support the school's mission and vision. The GSTT strategy entails five interrelated components: (1) pedagogy, (2) classroom practices, (3) community events, (4) school management, and (5) teacher portfolios. Given that we work in a setting where variables emerge and cannot be controlled, GSTT has adopted a design research methodology that allows us to continuously refine our practices according to the local response. This feature of the design entails an ethnographic stance that invites feedback from multiple perspectives. Such feedback enriches our practice and theoretical approach.

### **Acknowledgements**

This proposal outlines the goals of a second phase of the *Partnership Forum for Educational Excellence*, between the Harvard University Graduate School of Education (HGSE) and the Onigaming First Nation. The purpose of this partnership is to support Onigaming's school improvement. This initiative is part of broader program, *Gathering Strength*, led by the Indian and Northern Affairs Canada to improve the quality of education in First Nation schools. A partnership has been entered into by Onigaming First Nation and the Ontario Regional Office of Indian and Northern Affairs Canada (INAC). As a key component of the overall school improvement plan, HGSE, in partnership with the Onigaming Mikinaak School, Effective Schools® consultant Dr. Roger Bordeaux, and Motorola Inc, has provided a test-bed for exploring the development of a First Nation, student centered, technology infused, networked school. This work is supported by the Indian Northern Affairs Canada (INAC).

The HGSE team is working directly with community leaders (including the Chief and members of the Band Council), the school principal, a designated project coordinator, and with the dedicated teachers of Mikinaak Onigaming School.

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<sup>1</sup> This project has been funded in part through "Gathering Strength" an initiative of Indian and Northern Affairs of Canada intended to improve the quality of education in First nation Schools and the academic achievement of First Nation's students.

<sup>2</sup> Teknanaagi is the Anishninaabemowin (Ojibway Language) term invented by a local teacher at Onigaming to define and co-opt technology to reflect Onigaming's developing vision of new technologies.

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## **Background of the project**

European contact and assimilation policies have had a profound effect on the education of North American Aboriginal people. This effect is particularly evident in the conflicted role formal education plays in the lives of the Anishinaabe of Onigaming. The school is charged with a dual purpose. One is to provide youth with grounding in their Anishinaabe cultural heritage: to know their history and traditions, their language, and their ancestral connection to the land. The second is to prepare them with the skills, tools and knowledge necessary to have access to professional and academic opportunities outside of Onigaming reserve life.

Since 1974, after community members defiantly pulled their children from government mandated and controlled Provincial and Parochial schools, the native Band has been operating the school. This set the historical precedent of an Ontario First Nation Reserve regaining jurisdiction and control over their children's education. However, Band operated and controlled education has proven to be challenging. Onigaming is united in the realization that their school "faces serious challenges and [an] uncertain future." Community education leaders concur that it is necessary to "initiate educational change and implement significant school improvement to help children to learn the high order skills as well as the basic skills."<sup>3</sup>

In 1999 the Mikinaak Onigaming First Nation and the Ontario Regional Office of Indian and Northern Affairs entered into a partnership to develop and implement a plan for educational excellence for the Onigaming First Nation. In August 2000, Onigaming, in cooperation with Indian and Northern Affairs, contacted the Harvard University's Native American Program (HUNAP) to explore how Harvard University could facilitate the work on school improvement.

In 2000 HUNAP introduced an approach to school restructuring that utilizes the Effective Schools Correlates® model. The HUNAP team facilitated visioning activities, shared management strategies, the prioritization of school improvement goals, and the development of a school mission and vision. The team provided research-based tools, literature and concepts to support native, student-centered learning, and engaged the community in recognizing that the school is an important resource for the greater Onigaming community. Significant challenges to the school and the overall improvement project included the need to address Onigaming's school leadership, bridge school-community communication, and develop instructional leadership.

In 2001, the Harvard Graduate School of Education (HGSE) became a project partner in exploring the applicability of technology to catalyze school improvement. Four lines of work were proposed: enriching curriculum, strengthening thoughtful instructional approaches, developing an infrastructure, and creating capacity to sustain innovative change to meet the needs of Onigaming learners. It was proposed that technology infusion into school practice would serve as a tangible, manageable challenge to facilitate the development of a community of innovators grounded in the needs of Onigaming Mikinaak School and empowered towards action.

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<sup>3</sup> Kelly, John P. (1999), *Searching for the System that Works – Final Report and recommendations to the Chief and Council, Onigaming First Nation*, May 15, 1999

## **Technology Infusion as a Strategy for School Improvement**

Today the Mikinaak Onigaming School provides employment, Internet access, adult education opportunities, a gymnasium, a small under-funded library, as well as formal education for its members. The school currently serves approximately 120 k-12 Anishinaabe students, operating with 10 teachers in multi-grade classrooms. In recent years the school has been acquiring computers that are located in two labs: one for elementary and middle school, and one for the high school. The school board had approved a plan to invest in technology with the objective of making students computer-literate.

Leveraging the desire of Onigaming to create a technologically proficient school, the HGSE team proposed to create convergence between technology integration and the school improvement goals set forth by the community. This process, defined as “technology infusion,” was pioneered by TERC and the Hanau Model Schools partnership.<sup>4</sup> The HGSE team also drew on the work of the Educational Development Center’s collaboration with the Union City Board of Education<sup>5</sup> and HIID’s work in Bogota, Colombia<sup>6</sup> and San Salvador, El Salvador.<sup>7</sup> These projects strongly suggested that school reform and technology implementation can be mutually supportive processes, entailing coordinated shifts in the professional culture of the teachers, educational practices and resources, management, leadership, and school-community relations.<sup>8</sup>

HIID’s work in San Salvador demonstrated that educational reforms often call for fundamental shifts in pedagogy, assessment and school organization. However, these shifts cannot be implemented unless they are translated into clearly defined pedagogical frameworks and effective professional development programs for teachers.<sup>9</sup> After policy oriented research in El Salvador demonstrated that its national educational reform had not been implemented in the classrooms, HIID tested the *Teaching for Understanding* (TfU) framework<sup>10</sup> to infuse technology into two urban schools of San Salvador. Based on constructivist learning theories, TfU guides teachers in picking topics, setting goals, planning activities and ways to assess student progress by placing “understanding up front.”<sup>11</sup> Results demonstrated that TfU can be an effective and efficient way to achieve the dual goals of reform at the level of teaching and learning and technology integration.<sup>12</sup>

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<sup>4</sup> *Using Technology to Support Systemic Education Reform*, (1998) McNamara, E., Miles Grant, C., & Wasser, J. (available on line <http://modelschools.terc.edu/modelschools/TEMPLATE/Publications/Publications.cfm>)

<sup>5</sup> *Perspectives on Technology and Education Research: Lessons from the Past and Present*, Margaret Honey and Katherine McMillan Culp, EDC/Center for Children and Technology, EDC/Center for Children and Technology, and Fred Carrigg, Union City New Jersey Board of Education, 1999. Available on line <http://www.ed.gov/Technology/TechConf/1999/whitepapers/paper1.html>

<sup>6</sup> Bielaczyc K, Hua H and C. Laserna, 2000, “Diagnostic Evaluation of the District of Bogota’s Technology Program (PIE)” HIID report submitted to the District of Bogotá, Colombia (particularly section on “the golden rules of professional development”)

<sup>7</sup> Laserna, Catalina and Carrasco, Alvaro, 2001 a. “La tecnología al Servicio de la Reforma Educativa” (Information Technology at the Service of Educational Reform), HIID report submitted to the Ministry of Education of El Salvador

<sup>8</sup> Wasser, Judith Davidson McNamara, Elizabeth (1998) *Professional Development and Full-School Technology Integration: Description of the Professional Development Model of the Hanau Model Schools Partnership* The Hanau Model Schools Partnership Project, Cambridge, MA TERC. August 1998

<sup>9</sup> Laserna, Catalina and Carrasco, Alvaro, op. cit.

<sup>10</sup> Wiske, M.S (Ed) 1997, *Teaching for Understanding: Linking Research with Practice* Jossey-Bass

<sup>11</sup> Blythe, T & Associates (1997) *The Teaching for Understanding Guide*, Jossey-Bass.

<sup>12</sup> Laserna, Catalina and Carrasco, Alvaro “Enseñando para la comprensión con tecnología informática- estudios de caso” (Teaching for Understanding with Information technology-case studies) 2001, HIID report submitted to the Ministry of Education of El Salvador

The literature on technology infusion also suggests that, to be able to sustain the complex change processes associated with technology infusion, schools need to operate as organizations that, guided by a shared vision, promote active learning and exchange of resources and information. Only in such a flexible environment that these learning organizations engender, can people accept and adapt to new ideas.<sup>13</sup>

Based on these ideas, the HGSE team began to design a technology infusion strategy called *Gathering strength through Teknannajii* (GSTT). Co-designed with Mikinaak Onigaming School, the GSTT strategy focuses on fostering an intentional community of innovators committed to improving the learning opportunities at the Onigaming school. Last year, the GSTT strategy entailed three main components, which we expand to five in the current proposal. The first component introduces teachers to the TfU framework. Professional development around TfU is provided through a combination of distance education courses (offered through Harvard's WIDE initiative), and on-site support. The second component entails exploring specific educational software to address the learning needs of the students. The third component entails the organization of culminating events designed to disseminate and celebrate the accomplishments of the two previous components with the greater community. The fourth component addresses the need for a governance school structure capable of sustaining the change process at the school. A fifth component entails using teacher portfolios as the main source of data for the GSTT project.<sup>14</sup>

## **Methodological Approach: Design Research**

The GSTT strategy calls for a flexible methodological approach that allows for an interactive process of designing, testing and re-designing its components. We selected the *design research* approach because it focuses on how particular educational designs play out in practice.<sup>15</sup> Pioneered by Brown<sup>16</sup> and Collins,<sup>17</sup> a design research process can start with more or less well-specified designs. Regardless of how well-specified the initial design is, the goal of this research is to make the design and its components increasingly explicit. In contrast to an experimental method that seeks to control variables, design research makes no attempt to hold variables constant; instead, its goal is to identify critical variables and how they impact a design's implementation.

To develop, test and refine educational designs, design research encourages active collaboration between researchers and the practitioners. Sabelli and Dede (2001) articulate the necessary relationship of researcher and practitioners in the context of education research when they state:

*What is required from research-minded practitioners is not "action research" along the lines of academic research carried out in classrooms. Rather, it is the more profound experimental ethos of (and support for) data-driven iterative assessment and revision of*

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<sup>13</sup>[http://www.ee.ed.ac.uk/~gerard/MENG/MEAB/learning\\_organisation/definition.html](http://www.ee.ed.ac.uk/~gerard/MENG/MEAB/learning_organisation/definition.html)

<sup>16</sup> Brown A. (1992) Design Experiments: Theoretical and methodological challenges in creating complex interventions. *Journal of Learning Sciences*, 2(2), 141-178

<sup>17</sup> Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New directions in educational technology*. New York: Springer-Verlag.

*classroom practice by practitioners with the collaboration of researchers.*<sup>18</sup>

While the call for an experimental ethos is necessary in the case of the GSTT strategy, it is not sufficient. In our work at the Onigaming Mikinaak School, we frequently work under conditions that have high levels of cultural discontinuity, where researchers and outside teachers do not share the same cultural premises to design innovations and interpret data. GSTT thus calls for an explicit ethnographic ethos that allows participants to stretch their interpretative lenses beyond the boundaries of their own socio-cultural assumptions. Such ethos is a key component of a broader *ethnographic stance* that leads to richer data and interpretations, in turn orienting future action and theorizing.

### **GSTT's Overarching Design: Fostering an Intentional Community of Innovators**

Given the need for a two-way socio-cultural exchange between the local Anishinaabe culture and educational designs imported from non-native cultures, GSTT entails fostering “an intentional community of innovators.” This overarching design builds on the sociological theory of “communities of practice,”<sup>19</sup> and it’s specific educational expression in the design of intentional communities that foster communities of learners<sup>20</sup> and knowledge builders,<sup>21</sup> and the principles associated with the effective design of learning communities.<sup>22</sup>

As part of building the current proposal, Mikinaak Onigaming and HGSE came together and developed a set of principles, or *Willingness Goals*, that are to frame how our collaboration would proceed. In the Anishinabe tradition, willingness goals represent the seven teachings of the Grandfather and define the Anishinaabe people. The seven goals are as follows:

- **WISDOM** to recognize valuable, authentic teaching practices that acknowledges Anishinaabe philosophy in meeting the educational goals of Mikinaak Onigaming School. In other words, develop a pedagogical framework to merge TfU with the Anishinaabe philosophy of learning and teaching.
- **RESPECT** for each other to foster a supportive and constructive learning environment in the classroom, the school, and in Onigaming.
- **COURAGE** to be curious, and innovative in all realms of school practice to achieve the school’s mission,
- **TRUTH** in balancing Anishinaabe wisdom with technology so that our thoughts, creativity, learning styles, teaching practice and school organization are empowered, and opportunities for Onigaming learners are increased.

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<sup>18</sup> Sabelli, Nora. Dede, Chris. *Integrating Educational Research and Practice: Reconceptualizing Goals and Policies: “How to make what works, work for us?”* July, 2001 National Science Foundation publication,

<sup>19</sup> Lave, Jean & Wenger, Etienne (1991) “Situated Learning: legitimate peripheral participation,” Cambridge University Press

<sup>20</sup> Brown, A. L (1992) op. Cit.

<sup>21</sup> Scardemalia, M & Bereiter, C (1996) Engaging students in a knowledge society. *Educational Leadership*, 54(3), 6-10

<sup>22</sup> Bielaczyc K. and Collins, A. (2000) *A Learning Communities in Classrooms: A Reconceptualization of Educational Practice* in C.M. Reigeluth (Ed.): *Instructional design theories and models*, Vol II. Mahwah NJ: Lawrence Erlbaum Associates

- **HONESTY** in assessing ourselves, our goals, activities, and mission with open heart and mind to insure that we are meeting the needs of the students and community of Onigaming.
- **HUMILITY**, for we are all learners, needing to continuously reflect on our past experiences, efforts and actions in order to learn and improve our practice. To improve our practice, we will respect the teachings of others.
- **LOVE** All our efforts, energy and dedication are inspired by what is best for the children, who guide our purpose, mission and dedication. Words and actions support and are supported by loving work.

We view these willingness goals as a first demonstration of how a hybrid design emerges from inter-cultural dialogue and collaborative work. During the academic year 2002-2003, we want to gain deeper insight into how these willingness goals guide the community.

The following sections we describe the five elements of the design. Each subsection includes an account of the specific need that the design element addresses, a description of the design element itself, and the action plan with associated design research questions.

### **First Design Element: Pedagogical Innovation**

*The Need: On-site professional development on pedagogy*

Classroom observations revealed that for most of the day students are engaged in academic activities such as rote memorization and “fill-in-the-blank” type activities. Under such conditions, students invest little cognitive effort in understanding the problem at hand<sup>23</sup> and hence do not apply higher-order thinking skills to school work. While there are pockets of innovation and exceptional teaching practices by native teachers, these remain mostly isolated. Explicit discussions regarding teaching strategies, including relevant Native pedagogy, have not been part of school dialogue; rather the focus has been on behavior management, discipline and attendance.

*The Design: Learning the TfU framework through Internet based courses, followed by implementing TfU units*

Begun last year, this design element entails having teachers learn the TfU framework to plan and implement curricular units in their classroom. Designed to transform teaching, the TfU framework provides processes for co-constructing curriculum topics according to generative topics, defining explicit understanding goals, designing learning activities, called understanding performances, through which student both build and demonstrate their understanding, and assessing students’ performances through ongoing assessments. TfU units strive to move beyond rote memorization of facts and figures, and develop to habits of mind that will serve students

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<sup>23</sup> Scardemalia M. & Bereiter C. Adaptation and Understanding: A case for New Cultures of Schooling. In S. Vosniadou, E. DeCorte, R. Glaser & H. Mandl (Eds.), *International perspectives on the design of technology-supported learning environments* (pp. 149-163). Mahwah, NJ: Lawrence Erlbaum Associates.

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throughout their lives. To a professional community, TfU offers a common language to talk about teaching and learning.

TfU, and related courses, are offered at a distance through the WIDE initiative. The courses are delivered on-line through text-based communication. Participants post their responses to a series of activities and a cadre of virtual tutors moderates their exchanges. Aware that most local teachers had minimal experience with technology, and no experience participating through writing in a virtual community, last year the HGSE team decided to provide additional on-site and on-line support. Based on that experience, the goal this year is to design a process by which our direct on-site support can fade from on-site to distance only. In addition, once the teachers have planned their units, the HGSE team will support their classroom implementation.

### *Action Plan and Associated Design Research Questions*

On the basis of their first acquaintance with the framework last year, the school community decided that, during the current phase of the project, all teachers should attempt to master the TfU framework. During the fall semester, eight teachers will take the WIDE course, *Teaching for Understanding I*, for the first time. Plans for the spring semester will be determined later, and are likely to entail some teachers taking additional WIDE courses, while others will be implementing the TfU units planned during the fall semester. During the spring, the HGSE support will be mostly at a distance.

As teachers become ready to implement TfU units in their classroom, the HGSE team will support them through individual mentoring, as well as organizing activities that help teachers as a group to engage in the transformation of their practice. Individual mentorship will be both face-to-face and over distance. A workshop for all teachers on “looking at student work” will be organized.

Design Research Questions for the WIDE Courses To formulate the design research questions associated with this design element, we borrow the systems model developed by Moore and Kearsley<sup>24</sup> to analyze distance education and their claim that variations in “transactional distance” are the most significant phenomenon when activities associated with learning and with teaching are separated in time and in place. According to this theory variations in transactional distance result from the interplay between structure and dialogue.<sup>25</sup> Given our goal of creating local capacity to take WIDE courses independently from our additional support, we need to characterize the kind of support the HGSE tutors provide, particularly the local tutor.<sup>26</sup> Aside from questions having to do with how teachers participate in the WIDE courses, we have questions regarding how teachers react to and appropriate the TfU framework.

Regarding the appropriation of the TfU framework for planning curricular units, our design research questions fall into the following categories:

**Course content:** How do teachers conceptually appropriate the TfU framework? Which elements are most accessible and why? Which elements are the least accessible and why?

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<sup>24</sup> Moore M. and G.Kearley (1999) *Distance Education, A Systems View*. Wadsworth Publishing Company

<sup>25</sup> Moore M. and G. Kearley op.cit. p.220

<sup>26</sup> Results from last year’s efforts to construct a human bridge between the WIDE courses and the Onigmaing teachers was the topic of two independent studies carried out by Brian King and Sue Mi Kuo.



What conceptual turning points do teachers report in their thinking and in their classroom practice? What evidence do teachers provide to support that claim? How did they learn these (readings, activities, feedback from the local or distance tutor, working with colleagues at the school, etc.)?

**Classroom implementation of elements of the TfU framework.** Oftentimes, as part of the WIDE courses, teachers are asked to implement particular activities in their classroom. For example, they are asked to develop a generative topic, or discuss assessment practices with their students. How do the teachers interpret and talk about such effects? Does the TfU framework support teachers in taking risks with their students and spend the extra time to do so? What changes in the roles and interaction patterns become evident amongst students themselves and in the way they communicate with their teacher?

**The course outcomes:** What TfU unit plans do teachers develop? In what ways do they meet the TfU guidelines? How do they implement different aspects of the framework in the classroom? How do teachers see the match between TfU units and local teaching and learning styles? Where is there resonance and dissonance?

**Uncovering cultural assumptions.** How do TfU terms translate into Anishinaabe idioms? For example, is there an equivalent to a “generative topic?” What are culturally appropriate modes of participation in small and large groups? For example, what is the role of silence in native pedagogy? What are culturally appropriate ways of “disagreeing,” “brainstorming,” “taking risks”? What types of humor are used, and for what purposes? What are the dimensions of a positive learning climate at the school and in public events?

Regarding the distance education dimensions, we will look at:

**Course design:** How well do teachers navigate the online environment? How do they understand the task and participation structures of the course?

**Course delivery:** How do teachers relate to the purely technical aspects of accessing the web-based environments? .

**Course process:** What does the face-to-face tutor need to do in order to get the teachers to actively participate in the WIDE courses?<sup>27</sup> How do teachers feel about participating in a virtual community?

**Local learning environment:** Document the face-to-face support provided by project staff and peers. In what ways does the local community support individual learners? What is the aggregate effect of having so many teachers taking the TfU framework on school climate and the teachers’ professional culture?

**Uncovering cultural assumptions.** How do native modes of communication relate to modes of communication typical to the WIDE courses? Under what conditions does cyber-communication feel safe and real?

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<sup>27</sup> In Moore and Kearsley’s terms, what is the role of the on-site tutor in bridging the transactional distance?

Implementing TfU Units Teachers who already took the TfU course last year, will move on to implement their planned TfU units in their classroom, ideally during the fall. The GSE team will support this implementation, and in doing so, document how the various constructs of the TfU framework are translated into practice. Whenever appropriate, teachers will incorporate digital technologies into their TfU units. For example, the Anishinaabe language teacher developed a TfU unit on beaver trapping and wants students to help create digital videos on the subject. His expectation is that in the process of planning, making and editing the film, students will learn how their language is used in context.<sup>28</sup>

To support collective commitment to focusing on student learning, GSE will organize a workshop on “looking collaboratively at student work.” This workshop will help teachers develop ways of assessing how their instructional practice affects student learning. Teachers do so by analyzing evidence that comes directly from their classroom including samples of student work, observations of students at work, teacher created materials, and so on.<sup>29</sup>

During the spring semester, the implemented units will be analyzed by the HGSE team, Anishinaabe educators, and elders of Onigaming. Based on this analysis, the units will be refined for further testing the year after. Results will be presented at both at the Second Annual Technology Fair and at the teacher conference, which will serve as culminating events for the project. This is an example of how results from one component of the GSTT strategy are linked to other components.

### **Second Design Element: Exploring New Technologies**

*The Need: Finding alternative tools to mediate higher order learning*

Early last year, the school staff and administration communicated their desire to explore the power of new technologies to address issues of low levels of literacy, numeracy, and critical thinking skills amongst students. Given that technology is expensive and its implementation time is consuming, the school needed an effective a process to ascertain which technologies are available, and which ones best match the learning needs of its students.

*The Design: Develop an overview of recommended educational software and opportunities to explore the software*

This design element focuses on having teachers actively explore the ways in which new technologies afford unique learning opportunities. It entails the articulation of three aspects: One, organize a series of formal workshops and non-formal learning opportunities to let teachers explore specific software programs, two, develop a big picture of the domain of educational technology that the school might consider adopting; and three, help to decide on a common set of software for the school, called an electronic toolkit. All three aspects of this element were tested last year. This year we seek to implement improved designs.

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<sup>28</sup> This teacher felt that the TfU framework with its emphasis on performances of understanding matched well native ways of teaching and learning the native language. His experience directing, acting and producing a film in Anishinaabe persuade him that digital media could and should in his language class.

<sup>29</sup> *The Evidence Process at Project Zero*, by the Evidence Project Staff, Harvard Graduate School of Education publication (2001)

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Educational Software Workshops We started these workshops last year as a direct response to the schools' request to have "action on the ground." Based on expert advice, the HGSE team brought a range of software to the school and organized *ad hoc* classroom demonstrations to stimulate the attention of both students and teachers. For example, the school has ample evidence that students have trouble with reading comprehension and writing. We brought *Inspiration®* and *Kidspiration®* as a way to bridge the gap between linear and non-linear forms of representation. We structured this activity as an innovation cycle which started with teachers identifying a learning need of their students; they then explored how particular software tools could address that need. Once the exploration had been completed and analyzed, the group was to come together to share insights and open questions. As teachers explored the affordances of the software, we also encouraged them to use it in their own work. After the teachers had ample time to explore the software in small groups and on their own, we organized a formal workshop around the generic idea of "conceptual mapping tools."

The response to this first attempt at carrying out an innovation cycle was mixed: while some teachers did not complete the cycle, others took off as trailblazers. One teacher in particular got deeply engaged in finding ways to support his own lesson and curriculum planning processes. After experiencing how the software helped him organize his own work, he proceeded to incorporate it into his ecology class as a means to leverage critical thinking and the writing process. This innovation process produced two kinds of products: a more organized and efficient planning practice, and more and better organized writing on the part of students. These efforts were shared with other teachers who felt motivated to also try the software.

Based on last year's experience, this year we seek to improve the design of the educational workshops by: a) bringing the TfU framework to design all activities around workshops; b) explicitly demonstrating how particular genres of software support specific higher order modes of thinking, such as hypothesis testing; c) modeling and reflecting appropriate teaching and learning strategies and tactics. For example, we will examine the use of talk and silence.<sup>30</sup> d) connecting this work with the planning and implementation of TfU units; and e) building in time to have teachers document their learning in their portfolios.

The plan for this year is to provide four workshops, as follows:

1. A workshop on model-based reasoning and systems thinking using *Genscope®*. Teachers will compare and contrast how students learn using textbooks versus the dynamically visually mediated environment of *Genscope*. (Organized and run by Catalina Laserna)
2. A workshop on knowledge building, presenting *Knowledge Forum®* as a tool for collective inquiry. (Organized and run by Catalina Laserna)
3. A workshop on data storage, retrieval and manipulation, presenting *Tabletop®* and *Excel®*, as tools for youngsters and adults. Teachers will learn how to use this software for classroom management and student projects.
4. A fourth workshop, to be determined by the school, is likely to focus on designing and developing web sites (Stacie Green). The group will develop a web site to share resources of common interest.

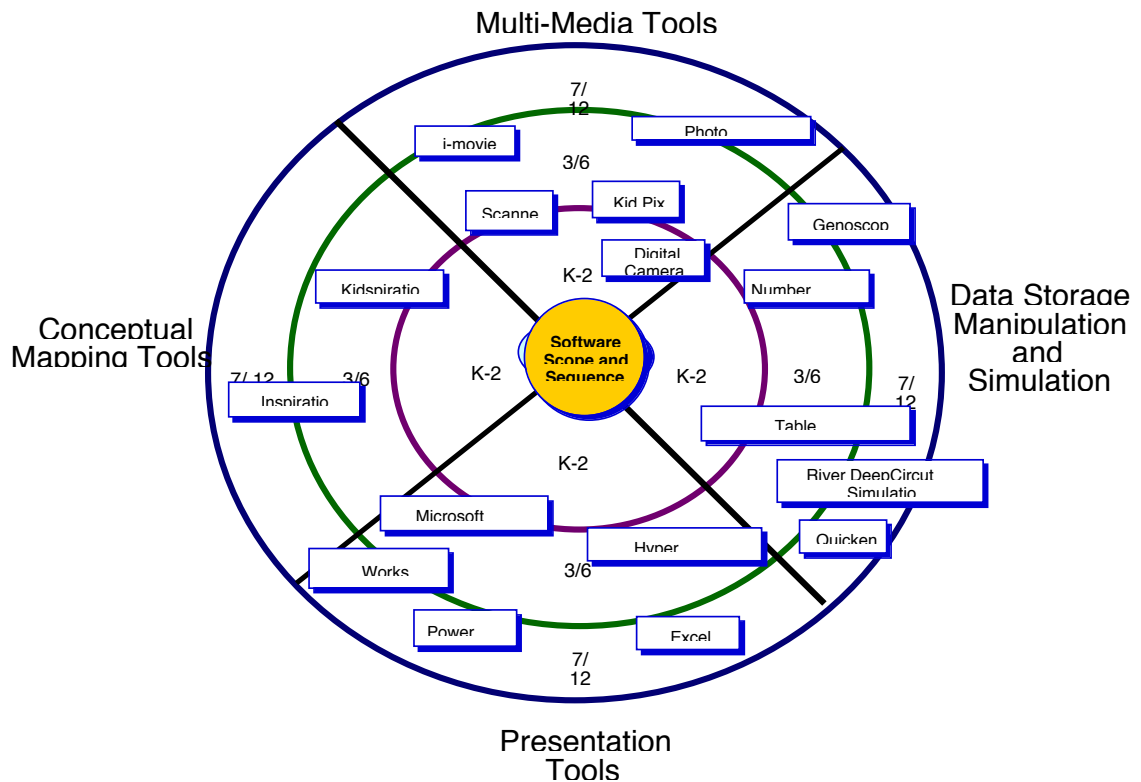
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<sup>30</sup> This emphasis refers to the relation between primary oral communication, literacy and cybercy see Laserna 1997

All workshops will be videotaped and the tapes will be made available for to participants to review aspects of the workshop.

Towards the big picture of educational software: The “Software Mandala” To represent the potential of educational software, the HGSE designed a graphic way of organizing software according to their function and grade level appropriateness — which we nicknamed the “software Mandala.”<sup>31</sup> The sectors identify four different ways of classifying software according to their use. The inner circle identifies software applicable to earlier grades. As the concentric circles extend, software appropriate to more advanced grades is indicated. For example, teachers can see how concept mapping applications such as Inspiration® and Kidspiration® are of the same genre, where the latter is a simplification of the former. Ideally the software mandala should help develop a coherent technology infusion plan across grades.

The Software Mandala



A web based version of the software mandala would include hyperlinks to particular electronic resources and might be developed at the software workshop on web site creation described earlier. As local teachers produce examples of how they use particular software in their work, these resources would be linked to the software mandala. Video clips of the workshops would also be linked. This is an example of how the sharing of resources fosters community cohesion and innovation

<sup>31</sup> This is a provisional term, borrowed from the Hindu symbol system and may have to be re-translated into the symbolic idiom of the Anishinabee.

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School-wide Software Toolkit A key component of the technology infusion strategy developed by TERC in Hanau, was to develop a “basic toolkit” to be used by everybody at the school. Having a critical mass of users ensures that they supported each other in integrating the various tools into everyday administrative and academic practice. The HGSE team has spoken to the school about adopting this strategy and the HGSE team will help determine the set of tools to be adopted as a common platform. This decision requires an analysis of the needs teachers have, as well as issues of support and the cost of site licenses.

### *Action Plan and Associated Design Research Questions*

We cluster the design research questions associated with this design element along four dimensions: the use of educational software, the impact of the TfU in framing workshop related activities, the role of the software mandala in fostering cohesion and cooperation between teachers, and emerging themes regarding cultural discontinuities.

#### *1. The use of educational software*

- When interacting with specific software, what affordances do teachers first perceive, how do they talk about them and, over time, what other affordances do they perceive and use?
- How do pairs of teachers support each other through the exploration process? (Last year we implemented a buddy system that did not work very well. This year we need to redesign this aspect.)
- What connections do teachers make between how their students learn and the affordances of the software?

#### *2. The impact of the TfU framework*

- How effective is having the TfU framework to plan and implement the workshops? Does it support teachers in taking risks with their students and spend the extra time to do so?
- All workshops will ask teachers to design and implement activities, we ask: Do their designs reflect elements of the TfU framework? Are these elements integrated into a system? How do teachers talk about their classroom innovations?
- What changes in the roles and interaction patterns become evident amongst students themselves and in the way they communicate with their teacher?

#### *3. The role of the software mandala in fostering cohesion and cooperation between teachers.*

- In what ways does the creation and use of the Software mandala affect the way technology is integrated into TfU units and, more broadly, technology integration across grades?

*4. Emerging themes regarding cultural matches and discontinuities*

- How do the modes of thinking presented at the workshop, for example, model based reasoning or knowledge building, relate to native ways of knowing?
- What different kinds of narratives do teachers produce to share their knowledge with teachers and students?
- What participation structures encourage everybody to express his or her views, fears, and questions?

**Third Design Element: Bringing Community and Knowledge Together**

*The Need: Strengthen the technology infusion strategy through explicitly leveraging the community's cultural and social capital.*

As the willingness goals around the GSTT express, from the communities perspective, it is critical that the school's change process be informed by the wisdom of the elders. Their active engagement enriches the various activities at the school; for example, elders will help develop curricular material around the Anishinaabe language and traditions. While their individual guidance will be sought out throughout the change process, community events, such as pow-wows and other ceremonies, are traditional ways of bringing the community together to share and celebrate. (There is a need to keep the community informed.) To share the lessons satisfies two needs: for the community to find out what the school is doing, and for the school community to get feedback and recognition for their efforts.

*The Design: Culminating events to share and celebrate local innovation*

A common feature of all learning and knowledge building communities is the organization of culminating events designed to bring together the interests, resources and expertise of the community.<sup>32</sup> Last we year we designed and successfully implemented two such events: the first was a technology fair, the second a teacher conference. This year we propose to refine their design and implement a second iteration of these events. The initial concept for an Annual Mikinaak Onigaming Technology Fair was proposed by Motorola, who also assumed leadership in organizing the first one in the Spring of 2002. Upon Motorola's request, the Harvard team suggested that, aside from the exhibits demonstrating emergent technologies, the fair should also showcase the work of local organizations, including the school. Teachers and students organized panels and stations to present their work to the local and wider community at the tech fair.

Much was learned from this experience, and we intend to use these lessons to re-design this year's fair. We learned, for example, that the student body greatly benefited from being involved in the preparation and running of the fair; we thus plan to deepen their involvement. We have learned also that for some elders the fair was overwhelming; thus we will plan a way to guide visitors through the fair. The theme for the 2003 fair has been agreed by the community to

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<sup>32</sup> Bielaczyc and Collins op. cit., Ann Brown, op cit.

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be “Finding the Balance between Technology and our Connection to the Earth.” The fair will be scheduled during Earth Week 2003.

The second culminating event planned for this phase of the project, is the First Professional Teachers’ Conference for area teachers. Last year, a seed event was organized for only the teachers at the school. This year we will extend this event to include teachers from other First Nations and provincial schools. Preparing for this event will require the HGSE’s continuous support and encouragement. One very concrete way to support teachers is by making sure that in their portfolios and in the school’s software mandala, they include material they can use for presentations at the conference. The HGSE team must ensure that teachers have an opportunity to prepare and rehearse all public presentations.

### *Action Plan and Associated Design Research Questions*

Action Plan: Prepare, implement and evaluate the two culminating events. Associated design research questions are:

- What advantages and strains are felt at the level of the school? (Also at the level of curriculum, professional climate, students and parent participation.)
- By what mechanisms do fair organizers involve not only the school, but also the wider community?
- How do elders react to the fair?
- What is the role of students during the fair, and what do they report as learning experiences?

Parallel questions will be asked about the Professional Teachers Conference.

### **Fourth Design Element: Innovation in School Management**

*The Need: Establish governance structures and processes to make project sustainable.*

The school lacks the governance structures and processes to ensure that this emergent Anishinaabe community of innovators can be sustained after this project winds down. During this year, we expect to refine the design of many innovation processes and products, such as TfU units, the software mandala, etc. One of our mandates this year is to figure out how this process can be sustained.

*The Design: Introduce the “Understanding for Organizations” framework*

The Understanding for Organizations (UfO) framework emerged precisely out of the interest of school and university administrators to extend the TfU way of thinking to administrative practices. The key concepts of generative topics, understanding goals, understanding performances, and ongoing assessment have been adapted for the purpose of transforming the governance structures of knowledge intensive enterprises. A key construct is that of identifying how individual and groups projects can be related to the overall knowledge needs of the organizations. The aim is to increase synergy amongst different parts of the organization while at the same time generating knowledge that impacts the way the work being

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carried out. For example, the computer teacher focuses on how to make his or her work more coherent with the understanding goals of the institution. In addition to these projects, the UfO offers a series of protocols to transform normal institutional activities such as meetings, report writing, reading and reviewing, and periodic performance evaluations, into opportunities to better understand and improve the administrative work while addressing the knowledge goals of the institution.<sup>33</sup>

### *Action Plan and Associated Design Research questions*

The school leadership is interested in exploring how the UfO might guide the reorganization of management and leadership at the school. The HGSE team will provide an initial and final workshop on UfO for the school personnel. In the intermediate process, the team will also advise individual or group projects related to the framework.

Associated with the implementation of the UfO are the following design research questions:

- In what ways do the governance structures evolve towards being more coherent with the goals of the school? In what arenas does the process work effectively? And which arenas are there barriers?
- Is there transfer from the TfU framework used in classroom to administrative arenas?
- In what sense does the UfO framework foster the constitution of the school as a community if intentional innovators? How do the willingness goals play out?
- What consistencies and inconsistencies exist between the UfO and local modes of organization?

### **Fifth Design Element: Collecting Evidence**

#### *The Need: Establish a data driven innovation culture*

In this community of innovators everyone needs data for different purposes: to reflect on practice, to inform the redesign and re-conceptualization of the overarching design and associated elements. While last year, we collected a large amount of data our approach was not systematic because much of our efforts were focused on getting the innovations going. This year we seek to improve on this aspect of our work by determining early on what kinds of data we need to collect, and establishing a process for rolling analysis.

#### *The Design: Center data gathering around teacher portfolios*

This year, we propose co-design with the teachers a portfolio system that will contain most of the data associated with processes and outcomes of all the GSTT's design elements. The HGSE team will support teachers in gathering, analyzing and reflecting on such evidence for their portfolio, and arrange for opportunities to analyze and reflect on the content of the portfolio. In designing the portfolio, we will seek to collect data to address the design research questions. In

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<sup>33</sup> Carlos Vasco, personal communication



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planning events with and for teachers, the HGSE team will ensure that time for documenting their work is built into the process.

By the end of the year, the teacher portfolio will include three kinds of data

1. Sample documentation of the professional development activities they attended. For example, in the case of WIDE courses, the teachers' portfolio will include samples of their electronic exchanges during the WIDE courses.
2. Evidence of attempts at implementing elements of the TfU framework with students. (Video footage, handouts, students' products and reflections.)
3. A reflective journal. The HSGE team will co-design ways for teachers to analyze their portfolio data, both as individuals and as part of collective reflection. Appropriate prompts will be developed for each design element.

Because eight teachers will be taking the same WIDE course in the fall, it will be easy for the HGSE team to generate uniform probes and questions related to key assignments of the course. For teachers implementing TfU units during the fall, we will develop a plan for videotaping key aspects of the unit and collect students products.

A workshop on "looking collectively at student work" to be given by Tina Blyth in the fall, will demonstrate to teachers how to analyze evidence derived from student activity. Evidence of this work will be part of the portfolio. Some of the skills developed during that workshop should transfer to analyzing their own work.

Portfolio analysis will proceed on a rolling basis, as the various innovation strands are implemented. Intermediate reports will be generated after every major activity has been completed. Early in the project, the GSE team will review some of the best practices around portfolio review, and propose a subset implementation of this project.

Design Research Questions include:

- In what ways does portfolio work support teachers in documenting, reflecting and sharing what they have learned from their efforts to innovate?
- How do portfolios, including the analysis of student work, affect the collegial climate at the school?
- How can portfolio work be made sustainable at the school?

Complementary Data Sources In addition to the portfolio data, the HGSE will collect three other kinds of data:

- 1) Administer evaluation questionnaires at the end of major events.
- 2) Document culminating events to be analyzed according to the appropriate research design questions.
- 3) Organize the equivalent of a "focus group" with elders, parents, students and administrators, in order to complement and triangulate the finding of the portfolio data.

Data Reporting Formal reports will be submitted according to pre-established deadlines.

## **Overall Design Research Questions for the GSTT Strategy**

Educating the GSTT as a coherent technology infusion strategy requires that five components of the strategy be systemically integrated. As described in the previous sections, this year we seek to deepen the connection between all components.

At the level of process, we will extend the TfU framework beyond the WIDE courses to plan and implement all cycles. In addition, based on WIDE courses, teachers will continue to develop and implement TfU units. To increase momentum toward trying out this new pedagogical framework in their classrooms, we will offer a workshop on how to look at student work as evidence for learning. Another idea to create synergy between the pedagogy and school management strand is to introduce the Understanding for Organizations (UfO) as an approach to school management. Since this framework has much in common with TfU's pedagogical approach, we hope to reinforce a local culture where understanding is put "up front." At the level of outcomes, we will seek to make products of particular innovation strands become resources for other strand. For example, lesson plans and other products derived from the WIDE courses enrich and are enriched by the outcomes of the educational software workshops. Participation in the culminating events will provide an incentive to document and pull together the new knowledge as participants exchange experiences, receive feedback and celebrate the accomplishments.

Having presented each of the design elements that make up the GSTT, we need to evaluate the overall strategy with design research questions such as:

- To what extent did the five design elements integrate as a coherent and viable systemic strategy? We will analyze the integration of the design elements at the level of processes and of outcomes.
- What overarching themes regarding cultural matches and mismatches do we identify?
- Does the teacher portfolio serve as a good means to bring the design elements together? In what ways does use of the portfolio heighten teachers' willingness and capacity to act as innovators?
- Going over the willingness goals framing our work we will ask: In what ways did these goals help gather strength to improving learning opportunities at the school? Which of the principles were most and least useful? Do some need to be rephrased, eliminated or transformed?
- What is the role of institutions of higher education, such as HGSE, in creating and sustaining intentional communities of innovators in schools?

The overall outcomes of the project will be both at the level of practice and at the level of theory. At the level of practice the outcome will be a school that operates as an intentional community of innovators, with a robust pedagogical vision, an established way of providing professional development, and a set of TfU units (some already tested and revised, others just being tested for the first time). The HGSE team will also prepare a job description for a person to support technology infusion at the school for at least another three years.

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At the level of theory, the outcomes will be a culturally grounded technology infusion strategy that might be tried by other First Nations schools. A report will document the evolution of the strategy's components and how the research design methodology shaped its development. Based on this year's design research findings, we will distill a set of design research questions to be addressed by the school in subsequent years. We will also reflect on the role of outside institutions, such as HGSE, in technology infusion processes.

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**Calendar of Activities 2002-2003**  
**(See Attached)**

