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ABSTRACT

This paper describes participant reaction to an informal field test of the Identifying Changes, Exploring Possibilities, and Developing Technology Skills (ICED) Professional Development Model. The theoretical framework for the ICED model is drawn from three sources: (1) literature review of the change process, specifically the adoption of innovation, best practices for the professional development of teachers, and the integration of technology in the professional practice of teachers; (2) direct experience with the design, delivery, and assessment of technology-related professional development for K-16 teachers; and (3) reflective dialogue regarding the conditions that are necessary to integrate technology in a substantive way in professional practice. The paper covers the genesis of the ICED model, an overview of field test conditions and outcomes, setting up the field test, the ICED participants, the theoretical framework of the model, implementation of the model, field test outcomes, reflections, lessons learned, and modification of ICED activities. The Instructional Tool Box Audit, a chart showing the five elements of instruction, is appended. (MES)

The Impact of an Innovative Model of Technology Professional Development

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The Impact of an Innovative Model of Technology Professional Development

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The Genesis of ICED Technology-Related Professional Development Model

This paper describes participant reaction to an informal field test of the Identifying Changes, Exploring Possibilities, and Developing Technology Skills (ICED) Professional Development Model. The theoretical framework for the ICED model is drawn from three sources:

1. literature review of the change process, specifically the adoption of innovation; best practices for the professional development of teachers; and the integration of technology in the professional practice of teachers;

2. direct experience with the design, delivery, and assessment of technology-related professional development for K-16 teachers;

3. reflective dialogue regarding the conditions which are necessary for me to integrate technology in a substantive way in my own professional practice.

My development of the specific stages of the ICED model has been a slow process. It began in the mid 80's while a graduate student at the University of Oregon. The model has been significantly influenced by my studies with Dr. C. A. Bowers, Dr. Mark Gall, and Dr. David Moursund. In 1988 the framework for the ICED model was used to develop the curriculum for The Teaching and Technology Certificate program, at Hamline University, St. Paul, Minnesota. This 10-credit graduate continuing studies program is for K-12 teachers. Its success in helping teachers integrate technology in their professional practice was the basis of my 1999 NECC conference presentation and caused me to believe it could also be effective for professional development. A detailed model describing its three stages, including process activities, was completed in the summer of 1999.

Overview of Field Test Conditions and Outcomes

When the NECC 2001 proposal was submitted it was anticipated that participants would complete all three stages of the ICED model:

- Identifying Changes
- Exploring Possibilities
- Developing Technology Skills.

For two reasons this did not happen. One, there was a request from the principal of the school hosting the in-service to decrease the length of each in-service session from three to two hours. Two, it became necessary to cancel two of the in-service sessions, one in September and one in March. It was not possible to find a convenient time for re-scheduling either. These events significantly reduced the contact time with the teachers and resulted in modifications to the outcomes for each of the three stages.

While the field test was not conducted under optimum conditions it did have definite positive outcomes for both the participants and myself. First, participants expressed a desire to learn *Inspiration*, a software program integrated with in-service activities completed in Sessions 1 and 2. Teaching the ICED teachers the skills required to use Inspiration occurred in Session 3. At Session 5 three teachers reported concrete successes using *Inspiration* as an instructional aid with their students.

Another positive outcome for the participants was identification of a technology tool, for online writing assessment, that could assist them in dealing with an emerging issue in the 6th grade social studies department. The issue is maintaining consistency in using a rubric writing assessment. One ICED participant added the exploration of this online writing assessment tool to a meeting of the district's social studies department chairs.

The primary outcome for me resulted from being reflective about the difficult, time consuming nature of complex change and designing the ICED model to be an emerging process. With the limited contact time available I was unrealistic as to how many activities could be accomplished per session and did not allocate sufficient time for processing the activities we did complete. It was also clear to me that having one-on-one time with the ICED participants to deal with their individual technology issues would enhanced the ICED model.

My reaction to the Identifying Changes stage was also a complete surprise. As someone who embraces the constructivist model of teaching, I was unprepared for how difficult it was to let the choice of technology skills evolve rather than be pre-determined prior to the in-service. As the facilitator I became impatient with the process and uncomfortable with not knowing which technology skills were going to be "taught."

These intense periods of wanting to teach specific technology skills caused me to doubt the effectiveness of the ICED model. I wondered if it was possible to create technology-related staff development relevant to the evolving needs of the participating teachers. Looking back, with the limited amount of contact time I am extremely pleased with the positive outcomes we reached. Further, I believe that these outcomes provide support for the fundamental assumption of the ICED model; teachers are more likely to integrate technology if they have linked its use to their professional practice.

Setting Up the Field Test

All models need to be tested in the field and in June 2000 an opportunity to complete one presented itself. I was contacted by a part-time teacher in Hamline University's MAEd program, who is also principal of an elementary school, located in a first ring suburban of a Minneapolis/St. Paul metropolitan area. The principal, whom I will call Dr. Smith, wanted articles describing effective technology-related professional development. Dr. Smith was interested in providing these articles to her school's technology committee. During the conversation my work with the ICED model was discussed along with my desire to conduct a field test. Dr. Smith was intrigued and asked for a proposal. The proposal called for me to facilitate six 3-hour after-school in-service sessions between September 2000 and May 2001 (total of eighteen hours) and to facilitate three to four hours of virtual dialogue. Dr. Smith's teachers would participate in data collection and have

the option of registration for two graduate continuing studies credits (paid for by the teacher). There was no funding to compensate the participants or me.

Dr. Smith's reaction to my proposal was pragmatic. To make this attractive to her teachers, which she wanted to do, Dr. Smith reduced the length of the after school in-service sessions from three to two hours and limited the data collection process. Dr. Smith provided her staff with copies of the revised proposal. Six teachers, in addition to Dr. Smith volunteered to participate. Scheduling conflicts resulted in moving the start date to October eliminating one of the six face-to-face sessions. Having only five shorter sessions reduced the proposed eighteen hours of face-to-face time to ten hours. In March 2001 another of our five sessions was cancelled due to the death of my father. The field test ended with a total of nine contact hours (eight hours face-to-face and one hour online); (see Table 1). There was also one unanticipated bonus for the ICED teachers.

Following the first session Dr. Smith became extremely excited about the software program *Inspiration*. So excited that I was able to convince her to purchase six copies. Following Session 3, each participant was given a copy of *Inspiration* to use on the computer located in their classroom.

Field Test Session Description

Dates	Session Content	ICED Stage	Session Content	Time
10-10-00	- Review Objectives - Brainstorm changes - Demo Inspiration/ discuss applications	- Identifying Changes	1) Presentation software 2) Carousel Brainstorming (using Clarisworks) 3) Jigsaw using Inspiration software	2
11-14-00	- Refine and prioritize changes - Select change for exploration - Explore using Internet	- Identifying Changes	1) asynchronous conferencing 2) Internet	2
12-1 to 1-31-01	- Online Discussion	- Exploring Possibilities	1) email 2) asynchronous conferencing	1
2-13-01	- Teach Inspiration and brainstorm classroom applications	- Identifying Changes - Developing technology skills	1) Presentation software 2) Inspiration 3) Internet	2
3-20-01	Cancelled			0
5-8-01	- Review demo software related to invention	- Exploring Possibilities	1) Demo software	2

Table 1: ICED Field Test In-service Session Description

The ICED Participants

The Background Information Survey was completed by the six teachers who participated in the ICED field test, but not Dr. Smith. Survey results indicated that this was a mature group of teachers with an average of 25 years of classroom teaching experience. Three were in the 41-50 age category and three in the 51-60 age category. The number of years teaching ranged from a low of 11 to a high of 31 years. Table 2 summarizes the background information for all six participants who are referred to using pseudonyms.

Table 2: ICED Participant Background Information

ICED Participant Background Information				
Participant Name	Age	Years Teaching	Teaching Assignment	Previous Tech. Professional Development Experience
Arianne	51-60	31	Grade 6	Longer term (2-5 days) provided by school district.
Emma	51-60	27	Grade 7-8, English	Short (1 day or less) provided by school district
Mary Ann	51-60	25	Grade 8, English	Short (1 day or less) provided by outside source
Barbara	41-50	29	Grade 7, English	Longer term (2-5 days) provided by school district
Lynn	41-50	28	Grade6: English, Reading, Math	Short (1 day or less) provided by school district
Maddy	41-50	11	Grade 6, Science	More than 5 days provided by school district.

The ICED teachers also responded to two open-ended prompts about their previous experience and general thoughts regarding technology-related professional development. All but Arianne responded to at least one of the prompts. Their responses (Table 3) indicated that everyone had participated in some form of technology-related professional development. Five of the six teachers (Emma, Mary Ann, Barbara, Lynn, and Maddy) made specific references to software and hardware applications that had been the focus of these previous experiences. In particular Barbara had an extensive background with a large number of technology applications and expressed the need for on-going professional development to remain an effective teacher. Emma was the only one of the six teachers who described a negative reaction to previous technology-related professional development. Their descriptions supported the conclusion that their previous technology professional developments had focused on the teaching of specific technology skills

Participant Responses to Open-Ended Technology Questions		
Participant Name	My experience with technology-related professional development is...	When thinking and/or hearing about technology-related professional development I ....
Arianne	Blank	Blank
Emma	- it is too fast, too little practice, too boring. I have had far more fun figuring things out on my own.	Blank
Mary Ann	Blank	- think of power point, digital cameras and internet access

Participant Responses to Open-Ended Technology Questions		
Barbara	- district in-service on Hyperstudio and Grade Machine - in-service by Holt-Rinehart on CD-ROMS available with out literature & writing series - graduate credit classes (years ago) on word processing, spreadsheets etc. - recent "crash course" on SASI, our new computer reporting system	- am open to knowing more - feel like a dinosaur - feel frustrated (easily) when I hit a technological "speed bump" - realize I need the training to continue to be an effective teacher for students of this new century
Lynn	- limited - I had one class on using the Internet, but haven't had much time to actually explore the Internet.	Blank
Maddy	- piloted technology standard 6th grade - currently taking Internet in the Classroom	Blank

Table 3: Participant Responses to Open-Ended Questions Background Information Survey

Theoretical Framework for ICED Model

The ICED model is based an non-linear, iterative process with a primary goal to help teachers create links between their teaching, their students' learning, and technology. The ICED model is built on the assumption that technology integration is accelerated by addressing the "cultural" notions of teaching and learning held by all teachers. This assumption is supported by the work of the Apple Classroom of Tomorrow (ACOT) Project (Fisher, C. & Dwyer, K. Y. , 1996) which found that ACOT teachers were effective in finding strategic ways to use technology in their classrooms. In their ten year review of the ACOT project Sandholtz, Ringstaff, and Dwyer (1998) support the idea that the speed and direction of the ACOT teachers' evolution was closely tied to changes in their beliefs about learning, about teacher-student roles, and about instructional practice. In my experience these ideas are frequently omitted in technology-related course work or professional development.

My experience is support by an informal survey I conducted with seventy-five NECC '99 participants. When asked to describe the "titles" of typical technology-related professional development offerings in their districts all but five responded "Using or Learning [put in the name of a piece of software or hardware]. When asked to elaborate these NECC '99 participants described the primary focus of professional development in their district was the teaching of specific technology skills.

Sandholtz et al. (1998) go on to describe how having a primary focus on the teaching of technology skills by themselves often fails to make lasting change in the classroom. These authors believe that if you want teachers to integrate technology in a substantive way then staff developers must take the following into account.

- Technology skill is necessary but not sufficient for successful technology integration.
- Technology skills taught in insolation are soon forgotten.
- Teachers learning technology skills must also be immersed in a setting that builds connections between the technology skills, teaching, and learning.

- Lasting change, that is change where the technology is not abandoned over time, only occurs if there is a corresponding changes in teachers' beliefs and values about their practice.

The ICED model acknowledges the importance of all these observations and incorporates proactive ways of addressing cultural notions about teaching and learning in each of its three stages: (1) Identifying changes, (2) Exploring possibilities and (3) Developing technology skills.

Implementation of ICED Model

Identifying Changes. This stage requires that teachers be immersed in the process of creating connections between their teaching, learning in their classroom, and technology. Various in-service activities are completed with the goal of focusing teacher experimentation/change in one or more of the following areas: assessment, curriculum design, classroom management, or teaching strategies. The facilitator uses information generated by these activities to help the individual teachers reach one of the primary outcomes for this stage, i.e. identifying something to experiment with and/or change in their professional practice.

Ideally the Identifying Changes stage also initiates the personal process of making explicit teacher's beliefs about the nature of teaching and learning by conducting an audit of their "instructional tool box." This audit is based on David Perkins' (1992) view that while learning environments are complex they can be divided into five elements or components (not all of which are always present). The following list describes each of the five components.

1. Information Bank is any resource that is a source of explicit information about topics. Examples include dictionaries, encyclopedias, and teachers.

2. Symbol pad is any surface for the construction and manipulation of symbols to support the learner's short term memories. Examples include pieces of paper, notebooks, pads, pencils, pens, white board.

3. Phenomenaria is an area that presents in miniature phenomena such as an ecosystem or other complex dynamics. The phenomenaria make phenomena and complex dynamics accessible to the exploration and manipulation of learners. Complex dynamics can include chemical reactions or exponential growth. Examples include aquarium, terrarium, ant farm, simulation games, SimCity, and Microworlds.

4. Task manager is the part of the learning environment that set tasks to be undertaken in the course of learning, guide and sometimes help in the execution of those tasks, and provide feedback regarding purposes and product. Examples include teachers in their role as managers, text-books, computer-assisted and computer-managed instruction.

Perkins also believes that by auditing a given learning environment to determine which of the components are present or absent, anyone can create a picture of the general structure and style of that specific teaching environment. In doing so, the person conducting the audit can also learn a great deal about their assumptions regarding the nature of teaching and learning. The complete process for conducting this audit is described in Appendix A.

To adjust to the reduced amount of contact time available, I eliminated the audit of the participants' instructional tool box. This is the foundational activity for addressing two of the four recommendations made by Sandholtz et al. (1997) for creating a professional development environment that

- connects the technology skills, teaching, and learning
- supports the evolution of teacher's beliefs and values about their professional practice

Not completing the audit of their instructional tool box, the primary activity for facilitating the explication of teachers' beliefs, weakened the focus on self. I believe this was the primary reason the ICED teachers choose an external focus, reading and writing, for Stage 2 Exploring Possibilities. In conversations during Session 2 the ICED teachers linked this decision to ensuring high quality results on the mandatory basic skills assessment. This outcome meant that the teachers entered the next stage of ICED with less focus than I hoped for and with fewer connections to the work they do in their own classes.

Exploring possibilities. In the ICED model this stage is meant to be the brainstorming or fact-finding phase. Teachers in an ICED experience, along with the facilitator, are in the role of seekers and evaluators of information about technology options that can help them in experimenting with or changing their professional practice. During this stage the teacher is encouraged to use both face-to-face and virtual conversations to obtain and share information. This stage is meant to be both expansive and inclusive.

Another constrain of this field test was that the virtual dialogue set for this stage was truncated. The teachers were volunteers and while attendance at our face-to-face sessions was high, in-between session participation was low. Participants described in emails, telephone calls, and in person how difficult it was to find time to explore during the school day. Dealing with the daily necessities of teaching took precedence over time for exploration. When several of the teachers were able to make the time, technology road blocks frequently caused them to abandon their exploration.

The first road block was that the majority of ICED teachers' did not have the skills to narrow their Internet Searches, most of which produced thousands of "hits". However, several ICED participants persisted even though they found sorting through the search results overwhelming. These teachers found sites describing software that might address their special needs with reading and writing. The second technology complication is that many of these sites now distribute demos by requiring the user to download them from the Internet School network security protocols prevented all the ICED teachers from doing a download. The prerequisite task of previewing software that might have helped these teachers actually experiment with their instructional environment was so absurdly time-consuming that it was abandoned. In the end I requested and provided the desired demo CD's from all the vendors identified by the teachers for use in Session 4.

The cancellation of Session 4 required using time in the last session to preview software instead of sharing participants evaluation of selected software. We quickly ran out of time for the third stage, developing hardware and software technology skills. However, we were able to situate a technology, in this case some computer-managed instruction software, in a learning context of importance to the teacher.

These teachers did identify software that they believed could help them make specific improvements in their professional practice. I was pleased that this software was not singled out due to my influence or my view that it was "the need" to be addressed or the "best solution." These teachers themselves had talked about common needs that they all faced daily and found promising tools. They had created personal reasons for moving to the stage of exploring the technology but not for learning and using it. A foundational assumption of the ICED model is that teachers become willing to expend energy to learn technology skills when they have created their own personal reasons for using it. Not having the time for the teachers to create their own personal motivation prohibited them from moving into Stage 3, except for one tool, *Inspiration*, which I had modeled during the first two sessions.

Developing the technology skills. In the third and final stage of ICED, the teacher selects a technology and learns how to use it. My role during the field test was to facilitate the learning of a technology identified as useful by the teachers and, if requested, technologies I had modeled during the in-service sessions. If for example, during the field test the teachers had selected a piece of software they were interested in learning, my role was to facilitate that process. My roles included obtaining the software and then designing an in-service session to assist them in learning to use it. Another role was to be an advocate and collaborate in problem solving when the teachers found an approach or a technology they that wanted to include in their professional practice. This was important because all six of the ICED teachers consistently talked about how there was no funding in their district to support technology innovation and seemed unsure of how to advocate for obtaining funding for their technology needs.

Field Test Outcomes

During Session 1 I used a carousel brainstorming activity to start the process of creating links between ICED participants' teaching, learning in their classroom, and technology. In this brainstorming activity pairs of participants were seated at one of four computer stations. Each station displayed a different open-ended statement. Each statement started "Brainstorm ways you would like to experiment in your classroom with" and ended with one of the following: (1) "curriculum" (2) "assessment" (3) "classroom management" and (4) "teaching strategies". For the first round of the carousel each pair was given eight minutes to respond to the statement at their station using Clarisworks word processing. At the end of eight minutes each pair rotated to a new computer and were asked to do the following: (a) read what had been written by the previous group; (b) indicate statements that they agreed with by placing a computer generated check next to it; and (c) add any new thoughts or explorations of previous thoughts.

Prior to Session 2, I categorized the results of the carousel brainstorming looking for larger themes that went across categories of assessment, classroom management, curriculum, and teaching strategies. The results of the carousel were surprising in that there was little consensus among the group except in one area: the desire to find an automated assessment process that identified the entry level reading and writing skills of their students. I felt it important during Session 2 to seek further clarification of their responses to the carousel.

The first half of Session 2 was spent having the ICED teachers elaborate on their meanings and then they prioritized the results. During the process, the group of teachers, in the presence their principal of Dr. Smith, expressed tremendous frustration about not starting the school year with a current assessment of the entry level skills of all their students in these two core areas, reading and writing. They believed that under the current system, by the time they had useable and reliable identification of these skills a significant period of instructional time had been lost. Further, these teachers felt the need for an assessment tool that would also generate individualized learning plans for each of their students. I was professional stunned. This was an innovative and energetic group of teachers. I heard and appreciated their descriptions of innovative curriculum and assignments in completed their classrooms. But, they were adamant this was the central topic to focus on. To be true to the primary assumption of the ICED model, that the technology must address a need identified by a teacher, we focused the next stage on exploring computer-managed instruction software.

This exploration could have taken many directions. I made available relevant issues of several technology journals, such as *Learning and Leading with Technology*. In addition, I suggested talking with other teachers and searching the Internet. Internet was the mode of exploration selected by all of the teachers. The second half of Session 2 was spent familiarizing the teachers with The Center@Hamline, an asynchronous conferencing system, that we would use to share the results of our exploration.

Session 2 ended with the group having made significant changes in the goals of the Identify Changes Stage. Rather than identify a change each teacher would make in their own classroom, it was a group decision to focus on exploring the Internet for software to assess and plan individualized instruction in reading and writing, specifically grammar. In retrospect, I might have anticipated this by direction by paying closer attention to the Background Information Survey completed during Session 1.

On this survey three of the six teachers described themselves as English teachers and one described herself as a English, Reading, and Math teacher. Combine this with recent changes that require every high school senior in Minnesota to pass a Basic Reading and Writing test in order to obtain a diploma. Students first attempt at passing these Basic Skills Tests takes place when they are eight graders. Announcing the 8th grade testing results is a front page media event throughout the state. In retrospect it seems obvious that teachers under such public security would combine their intrinsic interest with some way to address the "no one hides" Basic Skill Tests.

This group of teachers wanted to teach reading and writing so that their students' would pass this test and wanted to explore how technology might help them do that. As a facilitator, their decision was disappointing because it was not the direction I had hoped they would move toward. I had anticipated that the results of Stage 1 would permit me to introduce inquiry-based uses of technology rather exploring what was available in computer-managed instruction (CMI) or computer-assistant instruction (CAI). However, I was committed to following the lead of the teachers and we began the next stage, Exploring Possibilities.

During this stage the group identified two software programs that had potential for meeting their needs in teaching a heterogeneous group of students in reading and writing. Demonstration copies of this software were obtained for preview in Session 4. However due to its cancellation the previewing took place in Session 5. While neither of these products was "the answer," each had features that appealed to the teachers. My sense is that by exploring what was readily available and previewing it the teachers gained a clearer sense of how instructional technology can be effective and its limitations. In effect, the teachers felt the software offered more than it actually delivered. However it was not a dead-end exercise. This group of teachers definitely had clearer sense of their requirements and what was available. They also expressed a desire to explore the Holt-Rinehart CD-ROMS that were part of the literature and writing series that had been adopted by their district the previous year.

One thing I found it interesting that this software had been in the building for almost a whole academic year. One of the ICED teachers had attended a workshop on it provided by the publisher. Yet none of the ICED teachers, including the person who attended the workshop, had taken at look at the software prior to the ICED in-service. I speculate that the work of Session 1 and 2 had helped these teachers identify an area of their professional practice where technology might make a substantive difference. Now they had a personal reason for wanting to explore its possibilities. This outcome provides support for the importance of creating links between technology and what teachers do in their classroom.

Another positive outcome of the Exploring Possibilities stage resulted from my exploration. During this stage I invested significant time conducting Internet Searches and posting questions on Listservs asking educators for suggestions to address the concern describe by the ICED teachers. As a result I found a product that looking interesting and described it at Session 3. The description of this online writing assessment tool, *E-rater*, from ETS Technologies, got Maddy, who is also the chair of the social studies department extremely excited. She immediately felt that this online service might help solve an emerging issue in the district.

The challenge is that all of this district's 6th grade social studies students must complete a performance packet, part of the Minnesota Graduation High Performance Standards, that includes

responding to a writing prompt. Unfortunately, few of this district's middle school teachers are trained in assessing student writing using rubrics. This raises the concern that this lack of experience will lead to inconsistencies across buildings in the assessment of this essay. While *E-rater* was an exciting product, I felt that the ICED teachers would dismiss it because of its recurring financial cost. Surprisingly, the expense factor was not taken as an insurmountable problem.

There was a completely different reaction for the group. They did not reject *E-rater* out of hand, but instead brain stormed ways in which the district could cover the expense. By collaborating across schools it was possible to find the funds and Maddy added E-rater as a discussion item to the end of year district wide meeting of social studies chairs. This had never happened in previous sessions.

In past sessions within the first five minutes of discussing an interesting technology or application of a technology (*Inspiration*, other pieces of software, buying magnetic paper to create poetry words, etc.) someone would ask about cost. Upon learning the cost the ICED teachers' excitement generally evaporated. These teachers were convinced that their school did not have the money for any technology purchases they might be interested in. Was their willingness to keep an open mind and engage in problem solving around the funding of *E-rater* because the teachers had ownership of this issue? I think the answer is yes.

A final positive outcome is that one of the technologies modeled during the field test was incorporated as an instructional tool. At our final May meeting three of the six teachers shared different ways they had used *Inspiration* with their students since the February training session. From this information it appeared that they used *Inspiration* and were getting positive results.

My Reflections

Under less than ideal conditions, some of the ICED program meet its objectives. The ICED participants identified areas they wanted to improve with technology tools (reading and writing instruction). No technology skills related to reading and writing were actually taught because we ran out of time.

A potential technology solution for a problem that arose out of the lived experiences of the ICED teachers was also discovered. Again, while no skill instruction was provided, an ICED teacher continues the exploration process with others in the district.

Finally, three of the ICED participants began to use and integrate *Inspiration* in their classroom instruction. *Inspiration* was a software that was heavily modeled in the first two ICED sessions. In those early sessions, following each use of *Inspiration* the ICED teachers brain stormed ways it might enhance their professional practice. During Session 3 some of the ICED teachers were trained (three were absent) how to use *Inspiration*. This skill training resulted in these participants using *Inspiration* in their classroom.

What I have learned

Anyone interested in helping teachers integrate technology in their professional practice must heed the warnings of Michael Fullan (1982,1983) complex change takes time and is difficult. While the initial proposal called for 18 hours of contact time, I now believe it would take 30-40 hours over a 12 month period to complete a full field test of the ICED model. While having additional contact time is essential, one must also carefully consider the setting for in-service sessions. In other words don't, ask teachers to initiate a difficult process at the end of a full day of work. The journal entry of Mary Ann eloquently describes her energy level and its impact on the activities.

> Of course, my first thought is how tired I am. Secondly, I had to avoid thinking too negatively as I was working with Arianne. My mind truly felt blocked by fatigue. At the same time it is exciting to look around the room and see what other colleagues are here and know that I have respect for each of them..... Hopefully I won't be this tired every week! I need sugar!

Initiating the process of complex change when teachers are tired is not reasonable (even though I thought it was). This field test etched in my brain the need to establish certain conditions before trying to assess the effectiveness of the ICED model.

Conditions

- Need 30 - 40 hours of contact time. This is a significant time commitment and teachers need to be compensated. I propose a combination of cash stipend and technology for use in their classrooms.
- Schedule the Identifying Changes Stage on a professional development release day or during the summer.

In addition to establishing general conditions for an effective professional development experience feedback from the field test has caused me to modify some of the ICED activities and add a new one.

Modifications of ICED Activities

Carousel brainstorming. The first activity in Identifying Changes Stage can be improved in two ways. One, first help the participants view experimentation in a broad sense. Provide some examples that relate to professional practice. For example, experiment with sharing the responsibility for assessment with the learners; or experiment with strategies to encourage independent learning. Be clear that the experimentation is something related to the general assessment, curriculum, instructional strategies, or class room management. Have the participants put any thought about technology on hold for the purpose of this activity. Doing this before the carousel activity may help participants think more broadly about the idea of experimentation and prevent a participant like Emma who describe "going blank" during the carousel activity because of a perceived limited technology vocabulary. She wrote:

> My mind is numb. I was awed that when given the chance to have a perfect world situation, I could not come up with much. I have no tech vocabulary; I didn't know much of the terminology that others had placed on the machine. Much of my focus is on getting the kids engaged in THINKING! There is so little involvement in the learning process and a certain lack of discipline. How do we instill that in kids?

The journal entry clearly describes a desire to be more effective at engaging learners; this desire was not an idea put forth by Emma during the carousel. My sense is that if the idea of engaging learners had been articulated the majority of other ICED teachers would have indicated their agreement as too its importance. Having this as part of the carousel response would have enabled me to model some inquiry-based technology enhanced activities.

A second modification to the carousel is changing the sentence stem participants respond to. Instead of using "Brainstorm ways you would like to experiment in your classroom with . . . .", the

prompt should be modified to include a reference to increasing student achievement. As Gall and Renchler (1985) state one crucial condition for effective professional development is a focus on student achievement. The effectiveness of the ICED model would also be strengthen by including and individual learning plan (ILPs) as describe by Bray (1999).

Individualized learning plan (ILP). In her article *"Technology Staff Development that Works"* Bray describes eight steps for effective technology-related professional development. They are:

1. Create a team

2. Set your goals and vision

3. Identify your needs

4. Define where you are now

5. Develop a list of opportunities

6. Design and implement an action plan

7. Design and support individual learning plans (ILPs)

8. Evaluate and address the effectiveness of your action plan (p.15)

Step 7 is design and support individual learning plans (ILPs) which Bray does once teachers are aware of the on- and off-site staff development opportunities (Step 5 Develop a list of opportunities). Bray describes how using data collected about teachers perceptions of technology (attitude, skill level, personal visions, etc.) it becomes possible to make individuals aware of the staff development opportunities that best fit their needs. While I think creating ILPs is a great idea, it would be implemented differently in the ICED model.

First I will integrate the ILP in the Identify Changes Stage. Once teachers have selected a focus for their experimentation they would record in a systematic manner new skills, if any needed to engage in the experimentation; current expertise they have that supports the experimentation; and what materials support they require during the experimenting. I would also include a column for use during the Exploring Possibilities Stage. This column would be used by teachers to note technologies that could be used to facilitate the experimentation. Adding this activity to will strengthen the ICED in two ways.

One creating ILPs has the potential to provide participants involved in an ICED experience with another opportunity to create links between technology skills, teaching and learning. Two, adding a reflective component to the ILPs can also provide ICED participants additional time for making explicit their beliefs and values regarding teaching and learning. This may facilitate the changes in teacher beliefs about their practice that Sandholtz et al. (1997) belief to be essential in making permit change.

In closing I want to thank the ICED participants for providing me the opportunity to work with them. They willingness to take on the role of pioneers for intrinsic reward only was truly gratifying. Being able to work with this group of teachers, under less than ideal professional development conditions, and still achieve the positive outcomes we did, has re-affirmed for me the power of co-constructing with the learner. As Dr Smith writes in her journal from Session 2:

This session was exciting and inspiring. It was a great discovery to use the data from the previous session to generate themes and ideas to target areas of interest and need. It brought the group

together as a learning community stimulating common purpose (I liked the flocking approach). It created a curiosity and a wish to learn more about the technology resources and the sharing that will be possible with each other.

I couldn't agree more.

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Appendix A

Instructional Tool Box Audit

To conduct the audit the teacher first familiarize themselves with Perkins' (1992) Five Elements of Instruction (Figure 1). Perkins believes that while learning environments are complex they can be divided into five elements, not all of which are always present. Auditing a given learning environment to determine which of the elements are present or absent allows anyone to create a picture of the general structure and the style of that specific teaching environment. In doing so the person conducting the audit can also learn a great deal about their assumptions regarding the nature of teaching and learning. The Five Elements are described below.

Five Elements of Instruction	
Element	Description
Information Bank	An information bank is any resource that is a source of explicit information about topics. Common examples found in classrooms include dictionaries, encyclopedias, and of course teachers.
Symbol Pad	A symbol pad is any surface for the construction and manipulation of symbols to support the learner's short term memories. Examples include pieces of paper, notebooks, pads, pencils, pens, white board.

Five Elements of Instruction	
Construction Kit	A construction kit is a collection of prefabricated parts and processes with emphasis on creating structures and actions. Examples include Legos, Tinker toys, Erector Sets, Distillation Apparatus, and Lincoln Logs.
Phenomenaria	Phenomenaria is an area that presents in miniature phenomena such as an ecosystem or other complex dynamics. Examples of complex dynamics are chemical reactions or exponential growth. The phenomenaria makes phenomena/complex dynamics accessible to the exploration and manipulation by students. Examples include aquarium, terrarium, ant farm, simulation games, SimCity, and Microworlds
Task Manager	These are the elements of the learning environment that set tasks to be undertaken in the course of learning, guide and sometimes help in the execution of those tasks, and provide feedback regarding purposes and product. The best and most common examples of task managers are teachers and text books. Recently we have also seen a growth in the use of computer-aided instruction.

Figure 1. Five Elements of Instruction

Once the teacher knows what they are looking for they complete the following chart (Figure 2).

Instructional Tool Kit Auditing Sheet		
A: Element of Instruction	B: Examples found in classroom	C: What does the presence or absence of these element indicate to you about your assumptions regarding teaching and learning.
1. Information Bank		
2. Symbol Pad		
3. Construction Kit		
4. Phenomenaria		
5. Task Manager		

Figure 2: Instructional Tool Kit Audit Summary Sheet

Column A lists the element of instruction, Column B provides a place to write down examples of elements that a teacher currently has in their classroom or that they have access to. Column C is for teacher reflection. The ICED process requires teacher to think about how the results of the audit are outward symbols of their basic beliefs about the nature of teaching and learning. Once the audit has been completed the teacher can identify areas of their instructional tool box that can be enhanced.

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