TEACHERS’ PERCEPTIONS OF THEIR TEACHING STYLE DEVELOPMENT IN
ONE-TO-ONE LEARNING ENVIRONMENTS

A Thesis in
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by
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ABSTRACT

One of the current trends in education is one-to-one computing or “ubiquitous computing”. In order for a teacher to use technology to its fullest, researchers and practitioners believe that teachers engage in a facilitative teaching style. However, the majority of teachers have not experienced the kind of teaching that they are expected to employ. As a result, this study explored seven teachers’ perceptions of their development toward facilitation in one-to-one computing environments. Administrators recommended teachers who were making good progress toward facilitation, created project based learning environments, and were inventive toward their curriculum. Using a comparative case study method, six teacher themes were developed, and insights into administrators’ views were parsed. The themes were: external forces influenced teachers’ perception of classroom needs; beginning small trials reinforced beliefs about teaching and learning; student observations and structural constraints modified instruction; moving toward project based approaches; overcoming hurdles for project implementation; and, teachers developed their identity but were enhanced with professional support. Throughout all themes, teachers had a disposition, which encouraged experimentation. In addition, teachers felt safe to experiment within their schools and benefited from collaboration. From this study, I have gained a better understanding of how teachers transitioned, and what is needed to become a teacher facilitator with technology.
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CHAPTER 1- RESEARCH OVERVIEW

INTRODUCTION

In one-to-one environments, where there is one computer per student, studies repeatedly note that teachers become facilitators of instruction, rather than transmitters of information (Curtis, 2003b; Gulek & Demirtas, 2005; Kalliarekos, 2005; Lemke & Martin, 2004b; Rockman, 2003). This finding is reported with pride since writers of pedagogy have endorsed teachers becoming greater facilitators (Donovan & Bransford, 2005b), and facilitation seems necessary for appropriate technology use (2003; The Nation's Report Card, 2003; Sandholtz, Ringstaff, & Dwyer, 1997; Schofield, 1995). Therefore, examples exist of technology integration (Technology Integration, 2005), the way teachers use the computer in the classroom over time, and obstacles to integration (Cuban, 2002; Hanson & Carlson, 2005). However, researchers have expressed little about teachers’ transition beyond the technology use. There is little about teacher’s thoughts and emotions through the change process though it is widely acknowledged that the teaching profession integrates emotional (Hinde, 2003), intellectual, social (Freire, 1998) professional, and spiritual thoughts into growth (Delpit, 2003; Palmer, 1997a). As Fullan (1993) states, change is a “highly personal experience” (p.127). As a result, this study sought to understand the personal; how individual teachers perceive transitioning their teaching role, from the traditional transmitter style of teaching to the facilitator style of teaching, in one-to-one environments. By utilizing qualitative inquiry methods, I gained an in-depth understanding into the tangle of forces teachers encounter during this process.

Statement of the Problem

Schools are shadowing the societal technology trend by providing greater computer access in the classroom and modifying instruction to include diverse technologies. Some schools
made a greater investment, providing one laptop computer per child (Curtis, 2003a), one-to-one computing. To appropriately utilize the technology, it is believed that the teachers need to become facilitators, and ideally enter the Inventor Stage (Sandholtz et al., 1997) of technology integration. However, evolving from transmitter, the traditional way of teaching, to a facilitator with technology, often becomes a complex process, since facilitating is radically different from traditional education (Sandholtz et al., 1997). This is a process of teacher change. The change involves a change in beliefs, instructional practice, overcoming obstacles, and a change in culture. My study examines teachers who are underway to facilitation, and how the believe they have changed.

One–to–one computing in education is commonly defined as one child to one computer (Carter, 2001). Students use laptops in one-to-one learning environments, which can also be called laptop learning or ubiquitous computing (Carter, 2001; Rockman, 2003). This computing environment contrasts to the 90’s computer availability where advanced schools had two to five children per computer, or classes visited a computer lab down the hall.

As imagined, undertaking the one-to-one initiative takes commitment to overcome the financial hurdles, structural changes, and cross-generational training that is needed for implementation (Bonifaz & Zucker, 2004; Kafai, Fishman, Bruckman, & Rockman, 2002). Many schools in the U.S.A. have accepted this challenge with the hope of improving student achievement, and importantly, preparation of students with 21st century skills (Learning for the 21st Century, 2003) through the use of modern learning tools (Curtis, 2003b; 2003; Lemke & Martin, 2004a, 2004b, 2004c, 2004d).

The use of technology, especially in one-to-one environments, is touted for catalyzing this modern learning (Rockman, 2003; Silvernail et al., 2003). These “21st Century Skills”
Learning for the 21st Century, 2003) require students to solve complex problems, work in groups, and defend answers to problems on researched criteria. The kind of learning described requires a different learning environment for students than currently experienced in traditional schools (Brumfield, 2005). The ACOT study (ACOT - Apple Classrooms of Tomorrow: Changing the Conversation About Teaching Learning and Technology: A report on 10 years of ACOT research, 1995) set up a dichotomy of classroom characteristics needed to achieve 21st century skills by distinguishing between two categories of learning environments: Extend-knowledge construction, and traditional instruction.

Teaching in the extended-knowledge environment differs from the traditional environment. The teacher becomes a facilitator in contrast to the teacher’s role in a traditional classroom as a transmitter. See Table 1, which delineates pedagogy that emphasizes different types of classroom instruction.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Extended (Knowledge Construction)</th>
<th>Traditional (Instruction)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity</strong></td>
<td>Learner centered-Interactive</td>
<td>Teacher centered and didactic</td>
</tr>
<tr>
<td><strong>Teacher Role</strong></td>
<td>Collaborator and sometimes learner</td>
<td>Fact Teller and expert</td>
</tr>
<tr>
<td><strong>Student role</strong></td>
<td>Collaborator and sometimes expert</td>
<td>Listener Learner</td>
</tr>
<tr>
<td><strong>Learning emphasis</strong></td>
<td>Relationships and Inquiry</td>
<td>Facts and replication</td>
</tr>
<tr>
<td><strong>Concept Knowledge</strong></td>
<td>Transformation</td>
<td>Accumulation</td>
</tr>
<tr>
<td><strong>Demonstration of Success</strong></td>
<td>Quality</td>
<td>Quantity</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td>Criteria-referenced and performance portfolios.</td>
<td>Norm-referenced and Multiple choice</td>
</tr>
<tr>
<td><strong>Technology Use</strong></td>
<td>Communication, collaboration, information access and expression</td>
<td>Seat work</td>
</tr>
</tbody>
</table>

Extend-knowledge construction versus traditional education from (ACOT - Apple Classrooms of Tomorrow: Changing the Conversation About Teaching Learning and Technology: A report on 10 years of ACOT research, 1995)
Technology integration means that the teacher’s job becomes vastly different. Teachers become managers instead of didactic transmitters of instruction (Bartels, 1997; Gulek & Demirtas, 2005; Silvernail et al., 2003). Their work methods differ as teachers supply problems rather than presenting the answers in a lecture. Their preparation includes increased time in planning and decreased time for teacher lecturing (Kerr et al., 2003; Lemke & Martin, 2004a, 2004b, 2004c, 2004d).

**Obstacles**

There are many obstacles to teachers’ altered job description (Cuban, 2002; Zhao, Pugh, Sheldon, & Byers, 2002). Studies often cite teacher beliefs as a large obstacle. Facilitation does not match past educational experience and is therefore, rarely modeled (Brouwer & Korthagen, 2005; Eifler, Greene, & Carroll, 2001; Hanson & Carlson, 2005). Carter acknowledges the problem when he states, “One of the biggest challenges to making a laptop program work – one far more complex than theft and machine durability – is that it requires a new approach to teaching and this means lots of extra training” (Carter, 2001, p.45).

Quality training entails learner analysis for the particular group (Perry, 2004; Smith & Ragan, 1999; Zemke & Kramlinger, 1982). In the past, the teacher learner has been identified as a multifaceted person with mixture of beliefs (Brownlee, Purdie, & Boulton-Lewis, 2001; Kuhn, 1999), assumptions (Brookfield, 1990), skills and individual personalities (Achinstien, Ogawa, & Speiglman, 2004; Palmer, 1990). For consolidation sake, I will call these items internal forces since they represent inner workings that determine “who people are.”

Teachers also have to wrestle with external forces, such as the school culture, societal culture, and time (Cuban, 2002; Zhao et al., 2002). It has been show in studies, that a teacher finds it very difficult to change if there is little administrative and colleague support (Skilton-
Sylvester, 2003) for changes. Also, the current testing culture provides a disincentive for teaching beyond the standardized test (Adelman & Walking-Eagle, 1997). Time is addressed separately since it seems to be a specific factor, particularly with technology (Bonifaz & Zucker, 2004; Hanson & Carlson, 2005; Lemke & Martin, 2004d).

Simultaneously, a person’s internal forces interact with external forces (Schofield, 1995), manifesting themselves in teachers’ pedagogical practice, or the way the teacher practices teaching and learning. Inversely, what the teacher practices in the classroom may, in turn, influence the external and internal forces (Covey, 1989; Sandholtz & Reilly, 2004) (See Figure 1 for my graphic summary). As a result, many forces determine whether the classroom culture coincides with technology integration (Brookfield, 1990; Sandholtz et al., 1997).

Figure 1. Interactions that determine a teacher’s pedagogy.

So it is; this nefarious framework makes the transitioning of teacher roles a multidimensional process, which cannot be reduced to a single, variable. It is rather, the process intermingled with internal and externals forces within a specific context.

Teacher Change

Deep change does not happen smoothly. People’s emotions, beliefs (Johansson & Kroksmark, 2004; Kuhn, 1999) and knowledge (Goldring & Greenfield, 2002) integrate as they make conscious and unconscious decisions that cause dissonance. The change process does not
happen in isolation. Rather, many external forces influence teachers’ actions when they implement new ideas, which can further complicate their beliefs.

Nonetheless, moving from a transmitter to a facilitator usually involves valuing multiple representations of reality, or an advanced state of epistemological development (Brockbank & McGill, 1998; Kuhn, 1999). Therefore, learning how to become a facilitator, may involve a change in belief (Brownlee et al., 2001; Carr & Bromely, 1997; Carr-Chellman & Dyer, 2000; Kent & McNergney, 1999).

In attempt to synthesize the theories, I have constructed a diagram to symbolize the individual change process. Like the previous diagram representing the teacher, this diagram illustrates the internal and external forces. The internal forces are composed of things that the teacher thinks, and the external forces are composed of the social cultural factors that influence. Teachers change as they receive different kinds of feedback (Banathy, 1996) based on external forces and internal forces that are interpreted through emotions and rationale.

In an academically focused world, emotions are often regarded as unimportant. However, Hinde (2003) notes that good teaching is emotional, “Emotions combined with rational knowledge are essential parts of the teaching profession” (Hinde, 2003). Therefore, emotion and thought need to be studied when a teacher is in transition. Rationale and emotions filter the interpretation of events to comprise the teacher’s sense of meaning. As the internal forces and external forces change, they influence the way events are interpreted. See Figure 2.
Pedagogy, whether transmittive or facilitative, is determined by the teacher’s design of the classroom environment. A primary step toward comprehending the change process involves awareness of the forces that influence pedagogy.

So, why do teachers change? One explanation, attributes people’s belief changes to social-cultural values that modify over time (Reigeluth, Banathy, & Olson, 1993; Senge, 1990), such as the current global economy which influences values of collaboration and understanding of cultures (Friedman, 2005; Thurow, 1996). Another notes that teachers have natural wonderings, just like scientists, and they should be expected to test the wonderings making their classroom a laboratory (Perry, 2004). Both notions ascribe belief changes to a “disorienting dilemma” or “trigger event” (King, 1999), that forces adults to explicitly examine their own beliefs, then correspondingly, their own actions in relation to those events (Mezirow, 1990).

Technology Integration

When schools distribute one computer to each student, one-to-one, teachers experience a disorienting dilemma (Sandholtz et al., 1997). Studies on teaching with technology claim teachers become more learner-centered. A teacher reports, “It has been the catalyst for a transition from blackboards and textbooks to a method of instruction where students can explore, discover, and construct their own knowledge” (ACOT - Apple Classrooms of Tomorrow:

\[\text{Figure 2. Interactions that determine a teacher’s pedagogical change.}\]
Changing the Conversation About Teaching Learning and Technology: A report on 10 years of ACOT research, 1995, p. 11). In addition, overall studies testify that the increased technology was a vehicle for the change. Although many frustrations have been recorded with training and technical aspects, teachers eventually used the technology to engage the students in higher order thinking, and questioned old assumptions about instruction and learning.

So on the one hand, research has explored the way teachers integrate technology. The Apple ten-year study (1995) for example distinguished stages of growth, and Zhao and Frank (2003) described the evolution in general terms. On the other hand, the ten-year study did not address what happens between the stages, and the ecology perspective did not incorporate teachers’ perceptions about assumptions and beliefs, or how teachers interpret learning when they are evolving. Neither study examined the fears, anxieties, or self-perceived breakthroughs of teachers that had already made significant gains as facilitators. What are the issues that teachers report with their personal assumptions and beliefs, and perceptions of student learning during the process of becoming facilitators?

**Research Framework and Questions**

Since this study aims to understand a process within a real school context, qualitative inquiry is the most appropriate. Consequently, multiple variables will present themselves in studying “what is” (Olson, 1995; R. Yin, 1993; Yin, 2003) resulting in descriptive cases that will seek to answer the primary question, how do teachers perceive their transition from a transmitter style of instruction to a facilitator style of instruction while teaching in a one-to-one environment?

Secondary questions are as follows: Why is a teacher moving toward or away from facilitation? What kinds of professional development have teachers undergone and how have
they impacted the progress of the teacher toward facilitation? In what ways does the federal
requirement of highly qualified teachers, and the mandated testing influence teacher
development? What are the school’s cultures, and how do they influence the teacher’s thinking
and classroom activities? What is the teacher’s natural disposition and how does it interact with
the demand of the one-to-one school culture?

Context

I observed seven teachers that were moving toward a facilitator model of instruction as
observed by five administrators. Teachers worked in various one-to-one schools by ranging in
subject areas, grades, and school socio-economic background. To ascertain the school culture I
spent time with teachers, combined with interviewing administrators. The total time spent with
the teachers and administrators was 35 hours.

Significance of Study

Zucker (2004) outlined a research agenda for studying one-to-one learning. In it, he
designates teacher instructional change as an “intermediate outcome”, in contrast to the primary
outcome. Increasing student achievement serves as the primary outcome that schools hope to
attain with the one-to-one initiative. It is believed that student achievement is linked to teaching
and instruction (Zucker, 2004), and therefore, focusing on instruction provides a step toward
student growth.

Practically, the findings give a clearer understanding of the teacher’s transition, and
hence, professional development can be better informed. From a theoretical perspective, research
on the shift from transmitter role to facilitator role is immature (Creswell, 2003). Current data
explains the various stages (Sandholtz et al., 1997), but no formal research explores the process
of teacher learning between the stages in this modern environment.
Limitations of Study

The goal of thick description within a real context inhibits generalization to a broad population. The research findings do not make such claim. However, using a multiple case study method will allow for comparison of stories (Stake, 1995; Yin, 2003), by providing an example for which others can predict teacher expectations. This goal is similar to history; learning from the past in order to interpret the present and design the future. Therefore, instead of generalization, I create stories that intuit assertions through a systematic and rigorous analysis (Stake, 1995).
CHAPTER 2:
REVIEW OF THE LITERATURE

Facilitator’s Role in Teaching

In many one-to-one studies the words “teachers becomes more of a facilitator” are used repeatedly as an example of the initiative’s impact. However, what does that mean in an educational context? Like many aspects of education, the word facilitation in education is a byproduct of other fields (Cross, 1995). Cross (1995) who analyzed the concept and role of facilitation, shows that operating definitions have evolved, and now go beyond the older definition “to make easier”. The word was first used in the 1600’s with religion, and then, in psychotherapy (S. M. Peck, 1987), and later in education during 1960’s when psychology began to influence education (Gredler, 1997). Since, the word facilitator or facilitating has been used so often in positive description, that it often goes unquestioned.

Not so in the article “Teaching or facilitating: A false dichotomy!” Stewart criticizes the teacher in the facilitator role (Stewart, 1993) when he posits that “facilitating” appeals to moral goodness; it simply sounds nice. Later, he admonishes the role of facilitating in teaching. For clarification, I compare transmittive teaching with facilitative teaching based on teacher’s beliefs, role, learning activities, classroom climate, and assessment.

Beliefs of Educators

Whether teaching within a facilitative or a transmittive environment, it has been argued that education’s goal is to produce thoughtful citizens (Bennett, Finn, & Cribb, 1999; Dewey, 1938). Westheimer and Kahne (2004), define a good citizen as someone who is “personally responsible, participatory, and justice oriented” (p.237). The transmitter and the facilitator have different approaches to achieve their goal.
But, the differences between the teacher facilitator and the teacher transmitter can also be categorized in their beliefs about knowledge, known as epistemologies (C. Chinn, A. & Malhotra, 2002). Schommer (in Howard, McGee, Schwartz, & Purcell, 2000) distinguishes between naïve epistemologies and sophisticated epistemologies.

People that hold naïve epistemologies, according to Schommer, believe that knowledge resides in authorities and doesn’t change; concepts are learned quickly or not at all; learning ability is innate; and knowledge is simple, clear and specific. Naïve epistemologies correspond with transmitter’s beliefs.

Schommer, then identifies sophisticated epistemologies where people believe that knowledge is complex and uncertain; knowledge can be learned gradually through reasoning; and that knowledge can be constructed by the learner. Sophisticated epistemologies align with the facilitator’s beliefs. However, the learning strategies of the transmittive and facilitative environment differ significantly though some beliefs are similar.

*Learning Strategies for a Facilitative versus a Tranmittive Environment*

Both transmitters and facilitators believe that students do not naturally question their assumptions or make judicious judgments (Bennett et al., 1999; Rogers, 1995), which is necessary for productive citizens, but their teaching strategies differ due to opposing epistemologies.

In the transmittive environment the student is expected to learn specific content that has been pre-designated by the teacher, or the curriculum, both of which have a correct point of view. Most of the learning is considered lecture based, and students are supposed to memorize “facts” or replicate precisely what the teacher has shown (Eisler, 2000). In this way, students
learn the correct way of thinking and acting so that they become productive citizens (Stewart, 1993).

This contrasts significantly with the facilitative environment. Since humans blindly approve their own beliefs, facilitation advocates desire to create citizens who question their instinctive thoughts or decisions based upon scrutinized observations.

As a result, teachers’ classroom activities often emphasize student questioning (C. A. Chinn & Malhortra, 2002), which leads to collaboration, discussion, and students as the experts (Bransford, Brown, & Cocking, 2003; McPeck, 1981; Sandholtz et al., 1997) about what is being learned. Students are expected to find answers to questions, question each other, and express what they have learned in a way that is meaningful to the student. These kinds of learning strategies are often termed “student centered learning” (Bransford et al., 2003).

Traditional, transmittive teaching does not value the discussion, or multiple perspectives of knowledge reflected in the above teaching methods. The transmitter tells students about a finished product, the knowledge is static, and there is little room for debate over perspectives (VanSledright, 2002). As a result, the traditional class requires little active participation from the learner (Dewey, 1938, p. 19).

Comparatively, a facilitator’s pedagogy requires active participation since she expects the students to be engaged in challenging discussions with her and her peers while asking questions, and discerning answers.

*Role of the Facilitator Versus the Role of a Transmitter*

Perry notes that all teachers work from the head and heart (Perry, 2004). They are dedicated to their subject matter, mission of teaching students and desire for student success. In addition, teachers care deeply about their students’ comprehension of content, and students’
personal lives (Nolan & Meister, 2000; Palmer, 1997a). Still, the facilitative and transmittive teachers engage the students in different activities; therefore, the teacher facilitator and the teacher transmitter have personified two roles.

Teachers as transmitters assume there is one major way to learn, so their role is to filter complex information for the students and tell the students what is important (Stewart, 1993). Correspondingly, the teacher believes that there is one correct interpretation of information, and gathers the information to convey to students, resulting in the teacher as the primary source of information. She is supposed to supply most of the information the students need for success.

Comparatively, facilitators want to produce individuals who can think, and not merely do what is told (Conley, 1993; Dewey, 1991). Teachers help learners who are less expert by providing minimal aid to the child to complete a task. Through discussion, the instructor discovers the child’s understanding, and provides just enough input so that the child continues to solve the problem, which varies according to the educational goal. The intentional instructional act was coined, “scaffolding” or the “scaffolding process” (Palinscar, 1986). This veteran idea (Bhagavad-Gita, 1986; Krishnamurti, 1974), became an interest in education when it was found that students actually do learn this way (Wood, Bruner, & Ross, 1976). The instructor scaffolding requires immense time since the teacher actively listens to the student’s thinking in order to provide the questions or statements that can build student.

Often the teacher views each student as an individual (Reigeluth, 1999c) and tries to accommodate the students’ unique learning preferences (Gardner, 1999). Facilitative teachers perceive themselves as experts in a sea of other experts, the students. Therefore, the teacher job requires creating activities where students collaborate so both the teachers and students sharpen
each others’ thinking and reasoning skills (Brookfield, 1995b; Dewey, 1991; Lipman, 1991; McMahon, 1999).

Teachers as facilitators and teachers as transmitters ascribe to contrasting notions of themselves, their students, and their view of knowledge. As a result of the different belief systems, both facilitators and transmitters use corresponding different pedagogies for classroom instruction.

_A Climate Necessary for Learning_

Although perhaps unjustifiably so, teachers of transmissive classrooms have been accused of creating a classroom climate where student questions are not valued. Educators believed that students perceived questioning to mean they were “stupid” especially among those in poverty (Sarason, 1982, p.48). In fact, the failure of the 1960’s New Math curriculum has been attributed to classroom culture that lacked questioning and reasoning since in traditional environments students are expected to master answers to question, not to ask them (Sarason, 1982).

Often, when a teacher is a facilitator the mere act of questioning needs to be re-taught to undo assumptions that many students hold toward the schooling environment. Instead of apprehensiveness toward the unknown, students are expected to actively inquire about the unknown. Lipman (1991) calls the classroom environment a community of inquiry. This community “provides an environment in which it (thinking) can be practiced and acquired” (p.3).

The community of inquiry supplies a mentally safe place for students to take control of their learning (Halpern, 2001; Lundquist, 1999; McMahon, 1999). “Students must be in a classroom climate where they are in the decision-making roles: they supply strategies to solve problems; they determine the correctness or incorrectness of an answer based upon data; they
produce and validate; they are involved in setting their own goals and means of assessing accomplishment of those goals” (Costa & Lowery, 1989 p.16). Therefore, a classroom expectation of questioning, needs to be modeled by the teacher, with student risk-taking encouraged.

*Assessment in the Transmitter’s and Facilitator’s Classroom*

There are few things that establish the milieu of a classroom more than the assessment (Krumboltz & Yeh, 1996; Lundquist, 1999). In the facilitative environment the students goals and assessment methods differ from the transmittive classroom environment.

In the transmitter classroom, assessment is a secretive space, where the students vaguely know what is required for success, and students are required to repeat or synthesize the teacher information (Juarez, 1996; Krumboltz & Yeh, 1996; Standord & Sider, 2001; Stenberg, 2003; Sternberg, Torff, & E.L., 1998). As a result, student success is determined by the quantity of facts that a student can restate (Brookfield, 1990; Eisler, 2000). After assessments, students are ranked according to performance compared to one another. Students readily become threatened by thoughts that only teachers will evaluate their academic work (Krumboltz & Yeh, 1996; Lundquist, 1999).

Facilitation advocates ascribe to assessment that aligns with ameliorating the thinking process. Assessments are used to generate further inquiry leading students into negotiations of the criteria for success (Hannifin, Land, & Oliver, 1999; Jonassen, 1999). For example, teachers and students may co-create assessment tools, or peers provide feedback to the assessed student (McTighe & O'Connor, 2005; Wiggins & McTighe, 2005). Students may assess their own progress, and compare their findings with the instructor’s, as a basis for further inquiry; trust is built leading to acceptance of ideas and respect for the individual. In this way, assessment
becomes a collaborative process among the teacher, student, and peers to provide a clearer picture of student progress (Krumboltz & Yeh, 1996; Lundquist, 1999; Schank, Tamara, & Macpherson, 1999).

Assessment proves difficult to transform from traditional approaches, especially in today’s accountability movement (Cardman, 2001b; Gladfelter, 2001). Even teachers that honor diverse thinking and act as facilitators, frequently assess single-minded thought, based only on textbook or standardized test(Cardman, 2001b; Eisner, 2001). In this way, learning and assessment may be misaligned (Dick & Carey, 1996; Gardner, 1999; Smith & Ragan, 1999; Snelbecker, 1999).

Summary

The ACOT one–to–one study (1993) further distinguishes between facilitators and transmitters foci through two stylistic categories “traditional” and “extend-knowledge construction”. Table 2 clearly delineates pedagogy that emphasizes different types classroom instruction, unlike the argument that facilitation is merely one aspect of teaching.

It has been argued that lazy teachers advocated facilitating (Stewart, 1993). In contrast, being a quality facilitator proves to be an arduous process. In one study Billings and Fitzgerald studied a teacher who had been trained four times to use discussion while teaching reading (Billings & Fitzgerald, 2003). She was surprised when she viewed herself on video to find that she talked most of the time. In another study, VanSledright (2002) used the inquiry method in teaching history, and he found some troubling outcomes. After the students systematically examined primary and secondary sources and created their own hypothesis, many students questioned the validity of the textbook. To VanSledright’s chagrin, some student then distrusted all textbooks. The teacher raised issues of age appropriateness of the activity (VanSledright, 2002). Therefore, contrary to the definition, facilitation is not easy.
Table 2

Extend-knowledge construction versus traditional education with roles added – Italics added - from (ACOT - Apple Classrooms of Tomorrow: Changing the Conversation About Teaching Learning and Technology: A report on 10 years of ACOT research, 1995)

<table>
<thead>
<tr>
<th>Pedagogy</th>
<th>Extended-Knowledge Construction</th>
<th>Traditional Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Learner centered-Interactive</td>
<td>Teacher centered and didactic</td>
</tr>
<tr>
<td>Teacher Role</td>
<td>Collaborator and sometimes learner</td>
<td>Fact teller and expert</td>
</tr>
<tr>
<td></td>
<td><strong>Facilitator Role</strong></td>
<td><strong>Transmitter Role</strong></td>
</tr>
<tr>
<td>Student role</td>
<td>Collaborator and sometimes expert</td>
<td>Listener Learner</td>
</tr>
<tr>
<td>Learning emphasis</td>
<td>Relationships and Inquiry</td>
<td>Facts and replication</td>
</tr>
<tr>
<td>Concept Knowledge</td>
<td>Transformation</td>
<td>Accumulation</td>
</tr>
<tr>
<td>Demonstration of Success</td>
<td>Quality</td>
<td>Quantity</td>
</tr>
<tr>
<td>Assessment</td>
<td>Criteria-referenced and performance portfolios.</td>
<td>Norm-referenced and Multiple choice</td>
</tr>
<tr>
<td>Technology Use</td>
<td>Seat Work</td>
<td>Communication, collaboration, information access and expression</td>
</tr>
</tbody>
</table>

Being a facilitator means developing student content knowledge and students’ thinking process (Achinstein et al., 2004; Brouwer & Korthagen, 2005). The effort is supported by research that demonstrates students taught “analytically, creatively and practically substantially outperformed students who were taught in standard ways” (Stenberg, 2003, p.6; Sternberg, Torff, & E.L., 1998; Sternberg, Torff, & Grigorenko, 1998). Consequently, it is agreed upon by many in educational writings (B. C. Anderson, 2003; Bransford et al., 2003; Brooks & Brooks, 1993; Eisler, 2000) that student centered learning environments provide the preferred learning atmosphere. These environments require teachers’ role to be a facilitators.
However, I have established a dichotomy between the facilitator and transmitter that is unrealistic. It is rare for a teacher to subscribe to all the pedagogical actions of a facilitator due to multiple influences, and it is increasingly rare for a teacher to demonstrate all actions of a transmitter. It is more realistic to assume that most teachers are a mix among the two, and the facilitator-transmitter maybe two points on a continuum. However, becoming a facilitator may entail changing one’s transmitter action and beliefs. For that reason, studying teacher change and the change process becomes central to understanding the one-to-one facilitative movement.

Teacher Change

In the body of educational systems literature, macro change such as moving an organization or school district constitutes a multidimensional process. Theorists have sought to explain the change process each giving emphasis to a slightly different perspective. Emphases include: stages of educational change (Fullan & Steigelbauer, 1992; Rogers, 1995) analysis of stakeholder variables (Peck & Carr 1997, Hutchinson, 1996; Conley, 1993), and conditions to facilitate innovations (Ely, 1999; Rogers, 1995). However, regardless of the scale of the change, researchers agree that “there can be no meaningful change in groups, organizations, and systems unless individuals change” (Duke, 2004 p.5). This study is about individual change – teachers transforming their teaching style.

A Multidimensional Process

A transition from the transmitter to facilitator pedagogy also becomes a multidimensional process. In an attempt for practical comprehension, education authors have begun to describe the teacher by amalgamating behavioral and psychoanalytical interpretations of a teacher’s actions. A teacher’s behavior can be viewed as her pedagogical practice, which is influenced by less observable forces such as a teacher’s beliefs, assumptions, personality, and skills. Brookfield (1995) contends that we are our
assumptions. The inward notions of “who we are” verges on psychoanalytic interpretations of actions (S. M. Peck, 1987), as discussed in the previous section of facilitation.

A teacher’s actions are affected by external influences as well. Fullan (1992) describes the teacher’s environment, drawing attention to the context in which teachers operate. He highlights the pressures apart from the innovation and notes that teaching is a highly stressful field (Sarason, 1982) full of expectations from parents, administrators, students (Brookfield, 1999) and the government (Brumfield, 2005; Dutro, Fisk, Koch, Roop, & Wixson, 2002), with very little time allotted to growth and introspection, combined with excessive paperwork, much of which has little immediate impact on student progress (Standord & Sider, 2001; Sternberg, Torff, & E.L., 1998; Sternberg, Torff, & Grigorenko, 1998). In addition, teachers are people; they are influenced by their personal belief system that may be included their larger belief or religious community (Delpit, 2003; S. M. Peck, 1993). These external forces affect the teacher’s pedagogical practice.

Figure 3. Interactions that determine a teacher’s pedagogy.

The teacher view presented thus far is static, yet teacher change represents a dynamic process. Like Schommer (in Howard et al., 2000) Kuhn describes a developmental epistemology influenced by behaviors and observations over time (Kuhn, 1999; Sandholtz et al., 1997). She calls the most advanced stage of development evaluative epistemology, which involves judgment, evaluation and argument.
Change in Belief

When epistemological change occurs, a specific type of learning takes place that Argyris and Schon (in Brockbank & McGill, 1998 p.43) classify as double loop learning which differs from single loop learning. Single loop learning does not require a change in belief, such as learning new software. In contrast, double loop learning entails changing assumptions, and that threatens personal values. Double loop learning transforms perspectives where old values wane and new values emerge resulting in a new worldview. This learning is often referred to as a paradigm shift (Senge, 1990) and Brockbank and McGill (1998) call it as “deep learning”.

Change Happens with Emotions

Deep learning involves changing beliefs, which can be problematic because this change involves emotions (Borko, 2004; Perry, 2004). The educationalist Bloom (in Dick & Carey, 1996) noted that learning may involve feeling and emotion when he categorized learning into three domains: the cognitive (knowledge), the connotative (action), and the affective (feelings). Until now, the proposal has addressed cognitive learning by describing how facilitators reason versus transmitters reason, and referred to the connotative domain by addressing what a facilitator does compared with a transmitter. The proposal has forgone mention of the affective or feeling part of learning.

It is known that people are emotional beings. Emotions supply fuel for actions and can often override our espoused rationality (Brockbank & McGill, 1998). Brookfield acknowledges the emotional aspects of learning (Brookfield, 1990), and notes that teachers discuss their own learning in terms of how they react to it. Emotions run the gamut of satisfaction, anxiety, and excitement to intense anger (Covey, 1989; McLaren, 2001; S. M. Peck, 1987). Learning is rarely experienced devoid of emotion (Brookfield, 1990).
Change Involves Mental Wrestling

Academics tend to revert to sterile ways of describing the individual change process, but the verbiage harbingers something else. Deep learning is described with verbs such as wrestle, pull, push, and threaten, or with nouns, such as tension, threat, and mental gymnastics (Brockbank & McGill, 1998; Palmer, 1990, 1993b, 1997a) or, a personal favorite, the transitional mambo.

The transitional mambo (Brookfield, 1995a, p. 52) refers to the non-linear, non-sequential learning as teachers begin to discard some old assumptions and reframe beliefs to fit into new experiences. For example, when Parker describes changing his teaching toward a facilitative style, he identifies an inward struggle, “A voice urges me to do what I was trained to do: fully occupy the space with my knowledge, even if doing so squeezes my students out” (Palmer, 1997b p. 6), even though Palmer’s new belief tells him otherwise. The new knowledge, connotative and cognitive somehow threatens personal identity that defines who he thinks he is, and how he reacts in situations (Brookfield, 1990).

In another example, Johansson and Kroksmark (2004) studied the intuition of teachers. They found that teachers plan a new implementation, but rely on the instincts in a teaching scenario. “When the teaching situation no longer stays within the teacher's frame, a pedagogical breakdown of the teacher’s preparation happens” (p.370). Sometimes, teachers revert to old habits that reflect the old beliefs, therefore the process of change can be long, taking “two steps forward, and one step back” (Brookfield, 1990 p.52).

Eventually, when people discard their old assumptions, and become entrenched in uncertainty (Nolan & Meister, 2000) of ways to act, a pedagogical void (Hinde, 2003; Sharma, Gursoy, Morales, & Sockman, 2003) exists with the emotion of the loss and grieving (Brookfield, 1990).
Lasting Change is Consistent with Cultural Values

Even so, initiatives move forward if the teachers begin to alter their teaching method and if the change is consistent with cultural values (Ely, 1999; Fullan & Stiegelbauer, 1992; Hutchins, 1996; Klein, 1996; K. L. Peck & Carr, 1997; Reigeluth et al., 1993; Rogers, 1995). For example, in the last 100 years, the institution of education often modeled society’s values. Over great controversy and debating, schools began building a literate society in the 19th century, and later, added a high school with greater subject varieties, and race integration to contend with 20th century issues. Now, in the 21st century, schools are marked by another societal movement: globalization and individual learning capabilities significantly due to the advances of technology (Friedman, 2005) which call for more creative teaching pedagogies (Sternberg, Torff, & Grigorenko, 1998). Nonetheless, simultaneously teachers face the NCLB guidelines in a high stakes testing environment. And, values of high stakes testing may clash with the facilitative pedagogies (Browne & Freeman, 2000; Brumfield, 2005; Cardman, 2001b; Gladfelter, 2001), launching teachers into a difficult transitional mambo.

In addition to the emotional issues, teachers have competing priorities that can result in resistance to any change. Zaltman and Duncan, (in Ellsworth, 2000) elaborate on four resistance factors that influence implementation: cultural, social, organizational and psychological factors may clash, providing incompatibility between the values (Klein, 1996). Cultural factors encompass the values and beliefs incompatibility with a change. Social factors deal with how individual adopters react as members to a social system, such as conformity to norms and approach to conflict. Organizational factors include the threat to power and influence, and technological barriers for resistance. Finally, psychological factors to resistance include a person’s perception, commitment, and personality compatibility with the innovation (Ellsworth, 2000).
In the following statement, Sarason (1990) touches on the four factors of resistance, “Our usual imagery of a classroom contains the adult who is ‘in charge’ and the pupil who conforms to the teacher’s rules, regulations and standards” (p. 78). The embraced teacher image becomes a cultural and social icon (Sarason, 1990) that teachers do not want to release. Also, in this position, teachers are in a place of power (Freire, 1998) by being set apart from the children, an organizational factor. Finally, teachers often have not experienced a facilitator environment, nor have they taught in this environment (Johansson & Kroksmark, 2004; Perry, 2004) leading to psychological dissonance as to a teacher’s classroom role. Therefore, taking the time to understand learning and facilitation in the mist of an accountability movement, becomes increasingly difficult due to time needed for learning (Adelman & Walking-Eagle, 1997; Kent & McNergney, 1999).

Summary

Deep change does not happen smoothly. People’s emotions, beliefs (Johansson & Kroksmark, 2004; Kuhn, 1999), and knowledge (Goldring & Greenfield, 2002) integrate as they make conscious and unconscious decisions that cause dissonance. The change processes do not happen in isolation. Rather, many external forces influence teachers’ actions when they implement new ideas, which can further complicate their beliefs.

Nonetheless, moving from a transmitter to a facilitator role usually involves valuing multiple representations of reality, or an advance state of epistemological development (Brockbank & McGill, 1998; Kuhn, 1999). Therefore, individual learning, how to become a facilitator, may involve a change in belief (Brownlee et al., 2001; Carr & Bromely, 1997; Carr-Chellman & Dyer, 2000; Kent & McNergney, 1999).
In attempting to synthesize the theories, I have constructed a diagram to symbolize the individual change process. Like the previous diagram representing the teacher, this diagram illustrates the internal and external forces. The internal forces are composed of things that the teacher thinks, and the external forces are composed of the social cultural factors that influence. Teachers change as they receive different kinds of feedback (Banathy, 1996) from the external forces and internal forces that are interpreted through emotions and rationale.

In an academically focused world, emotions are often regarded as unimportant. However, Hinde (2003) notes that good teaching is emotional “Emotions combined with rational knowledge are essential parts of the teaching profession” (Hinde, 2003). Therefore, emotion and thought need to be studied when a teacher is in transition. Rationale and emotions filter the interpretation of events to comprise the teachers’ sense of meaning. As the internal forces and external forces change, they influence the way events are interpreted.

Figure 4. Interactions that determine a teacher’s pedagogical change.

Pedagogy, whether transmittive or facilitative, is determined by the teacher designing a classroom environment. When discussing teacher change, awareness of the forces that influence pedagogy is a primary step toward comprehending the change process.

So, why do teachers change? One explanation, attributes people’s belief changes to social-cultural values that modify over time (Reigeluth et al., 1993; Senge, 1990), such as the
current socioeconomic and global economy available through technologies (Friedman, 2005; Thurow, 1996). Another notes that teachers have natural wonderings, just like scientists, and they should be expected to test the wonderings making their classroom a laboratory (Perry, 2004). Both notions ascribe belief changes to a “disorienting dilemma” or “trigger event” (King, 1999), that forces adults to explicitly examine their own beliefs, then correspondingly, their own actions in relation to those events (Mezirow, 1990).

**Process of Technology Integration**

When schools distribute one computer to each student, one-to-one, teachers experience a disorienting dilemma (Mezirow, 1990). As teacher Paula Fistick said, “As you work into using the computer in the classroom, you start questioning everything you have done in the past, and wonder how you can adapt it to the computer. Then, you start questioning the whole concept of what you originally did” (ACOT - Apple Classrooms of Tomorrow: Changing the Conversation About Teaching Learning and Technology: A report on 10 years of ACOT research, 1995, p.15). With one-to-one computing the way teachers teach, and the way students learn can be reshaped to utilize the new computer tools in what is called technology integration.

The not-for-profit Edutopia website (www.edutopia) defines technology integration with three criteria. One, “Technology integration is the use of technology resources (computers, digital cameras, CD-ROMs, software applications, the Internet) in daily classroom practices, and in the management of a school.” Two, “Technology integration is achieved when the use of technology is routine and transparent.” Three, “Technology integration is achieved when a child or a teacher doesn’t stop to think that he or she is using a computer or researching via the Internet” (What is Technology Integration?, 2005). Since teacher change takes time, the transformation to into a technology - integration will also take time and development as the
school realigns itself, to a one-to-one environment (Curtis, 2003c).

**Stages of Integration**

The earliest study of computer integration, was conducted under Apple computers, and ran from 1985 - 1995 (*ACOT - Apple Classrooms of Tomorrow: Changing the Conversation About Teaching Learning and Technology: A report on 10 years of ACOT research*, 1995). Every student had access to a desk top computer. Researchers focused on the affect of the computer and identified five stages of development that teachers undergo when teachers have access to one computer per child (Sandholtz et al., 1997).

They found in fact, that teachers did gradually change their roles while moving through the five stages in their relationship to technology in the classroom: Entry, adoption, adaptation, appropriation, and invention. In the remainder of the literature reviewed for this study, I will discuss each stage in further depth by intertwining findings from other studies that have coincided with the teacher development stages of the ten-year study.

**Entry and Adoption: Gaining a positive disposition toward technology through skill development**

According to Sandhotz (1997) the entry and adoption stage are the first stages in technology integration, and characterized by including technology into the lesson plans while teachers maintain a transmitter style of instruction. While technology met classroom needs, teachers gained positive dispositions, including confidence and a positive attitude toward computers.

Positive attitude, which happens to be emotional learning, is often considered the primary step needed for teachers to accept technology. Quantitative studies have tried to harness this learning (D. K. Anderson & Reed, 1998; Ross, Hogaboam-Gray, & Hannay, 1999; Sullivan & Keating, 1998; Yildirim, 2000). For example, Rosen (1995) conducted a study by surveying
over 200 secondary and elementary teachers in the science and humanities. During that time, approximately 45% were found techno-phobic or having a fear of computers, with the greatest percentage among elementary and humanities teachers. This fear inhibited greater integration.

As expected, researchers found that with training and use, teachers did grow in confidence and acceptance, as the fears of the unknown were quelled (D. K. Anderson & Reed, 1998; Ross et al., 1999; Sullivan & Keating, 1998; Yildirim, 2000). Mostly, studies administered surveys taken after a university course or organizational training. For example, Yildirim found that in survey of 114 pre-service and in-service teachers, attitudes toward computers improved with a computer literacy course. Teacher anxiety decreased as confidence increased (Yildirim, 2000).

During this stage, teachers may incorporate customizable software that allows teacher to quickly notice the benefits, increasing computer appreciation. Customizable programs diagnose a child and correspondingly prescribe computer activities. Also, with the current high stakes testing era there are many computer programs that cater to students’ test taking skills. Students complete computerized practice tests, and the computer scores the input based on the state’s standards. As a result, school districts can predict their outcomes based on the data received about each child (i.e. www.brainchild.com). This becomes very appealing to districts whose funding and reputation are based on student achievement, and simultaneously decreases teacher resistance to technology integration. “Skill and drill” work may be offloaded to the computer, releasing the teacher for more creative instruction.

**Adaptation: Integrating Technology into Traditional Classrooms**

During adaptation, teachers are comfortable incorporating daily computer activities into lesson plans, and students’ productivity increases (Sandholtz et al., 1997). Sometimes, students willing extend
classroom requirements, and begin to initiate learning (p.99). Surprisingly, student initiative received mixed reviews from teachers. Some teachers wanted to keep students from “going to far” and other teachers encouraged students to do more (p.99). Here, Sandholtz transcribes a few teachers’ words, but is vague about their meaning. It seems reasonable that a teacher wants students to go ahead, but why would a teacher desire a student to remain at the basic classroom pace? As predicted by change literature, teachers ascribe to particular beliefs.

Pierson and Cozart (2005) noticed the trepidation that was illuminated in a case study of eight pre-service teachers over one year. Although the researchers intended to study the way that the pre-service teachers saw their role with technology, they found that the pre-service teachers did not question their role. They did not change from the traditional transmitter view of themselves (Pierson & Cozart, 2005). Instead, the pre-service teachers focused on designing lessons that integrated computer skills that they knew by amalgamated word processing, presentations, and some with digital cameras with typical transmitter style lessons. Pre-service teacher concerns revolved around technical issues, and child misuse of the computer access.

This study seems consistent with recent impact studies of technology use in schools that report technical aspects as the primary concern of teachers (Lemke & Martin, 2004a, 2004b, 2004d). However, could concerns about technical issues be linked to maintaining control, as done in a transmitter’s setting? Could other organizational factors of computer integration resistance be attributed to belief obstacles that teachers hold?

Although teachers maintain transmitter roles, the adaptation stage should not be minimized. It is here that teachers and students begin to see ways to manipulate information and the value that technology can afford them (Carr & Bromely, 1997; D. H. Jonassen, 1996). Most technology involves school curriculum. For example, classes may learn ways to gather lots of science data in spreadsheets to
draw more stable conclusions, or use the Internet to create a research paper, or create presentations to engage in different kinds of learning.

Like all developmental stages, there is not a clear distinction between them but a blending as seen with the adaptation stage and appropriation stage. According to Sandholtz, it is not until the appropriation stage that teachers engage the students in group work, projects, and activities that could be labeled learner centered (Sandholtz et al., 1997). However, Schofield (1995) found that in a qualitative study, teachers become collaborators early on. They begin to function less as authoritarian experts, and more as facilitators in the classroom.

It also seems likely that teachers may engage in collaborative activities prior to technology integration, since collaboration is widely acknowledged as a best practice (Killion, 1999; Palmer, 1993b, 1997a, 1997b; Perry, 2004; Silva, Gimbert, & Nolan, 2000). In the study “A year in the life: Two seventh grade teachers implement One-to-One Computing” (Garthwait & Weller, 2005), two teachers believed in teacher facilitator role, and acted as a “learning guide” (p.368) immediately with the computer. For example, when students questioned the teacher, she “responded by rewording the question in such a manner as to propel the students to access prior knowledge” (p.367). Immediately, the two teachers explored ways to have the students work on projects and in groups.

Then, teachers who ascribe to a learner-centered ideology, may also use the computers to facilitate student centered learning (Bransford et al., 2003; Schofield, 1995), and not integrate the technology in a typical transmitter style.

Appropriation: Moving to the role of a facilitator

The stage of appropriation is more a milestone than an actual stage in classroom practice. While the teachers have integrated the technology, and may have engaged students in problem-based projects, their habits gradually become a style, and a belief that encompasses the way that
students learn best (Sandholtz et al., 1997).

Moving to this stage does not seem natural to most teachers. In a study by Carr-Chellman and Dyer (2000) pre-service teachers question their future roles. Seventy-nine participants read an article that described a visual image of new learning environments where teachers were no longer the expert. Half the students questioned this with a sense of fear: “The role of the teachers seem almost non-existent – students were busy at their stations ‘discovery learning’ that there almost seemed to be no need for the teacher” (p.100).

Another was concerned that a computer would replace her: “Will this idea of free learning eventually replace the importance that a teacher has in the classroom” (p.102). And, yet another lacked confidence with his teaching ability to carry out his role in this kind of environment: “I wasn’t taught in this way and I’m not sure how comfortable I’d be teaching this way” (p.102).

This sense of fear or loss is often times noted as part change processes (Fullan & Stiegelbauer, 1992). However, when referring to technology, there is a dearth of literature that mentions these emotions beyond the entry stage when teachers are initially learning about computers. There is a little literature of this anxiety or other negative feelings in the adaptation stage when teacher changes roles.

How do teachers move toward facilitation? Researchers have focused on the belief changes of in-service teachers. In an investigation of sixty teachers during a graduate education course, 91.5% had perspective transformation where students altered their use of technology with their classroom (King, 1999). Using interviews and journaling, King assessed the activities that led most to perspective change. Teachers self-reported that computer activities, dialogue and
reflection challenged them to find answers instead of looking for the one “correct” answer in one book.

Howard et al. experimented with master teachers while they were creating NASA activities during a NASA four week program (Howard et al., 2000). Using Schommer’s Five Dimensions of Knowledge survey, forty-one teachers moved from a more objectivist epistemology, affiliated with the transmitter role, to a more constructivist epistemological orientation, affiliated with the facilitator role.

Sandholtz et al. clearly illustrates a sample of teacher fear in another segment of the study, not in the stages of technology integration. They quote a teacher, “I am afraid of this whole thing. Well, the kids know what is going on, and I am not sure how to evaluate it” (p.87). However, it is unclear at what stage of integration the teacher resides. Here, the teacher seems like he is accepting the facilitative role, but needs the cognitive and connotative knowledge.

Orrill Hawley (2001) wanted to learn from and help two middle school teachers work toward becoming facilitators with computer simulations (Orrill Hawley, 2001). Her goals were to help teacher shift from being didactic providers of information to facilitators. She focused on supporting teachers to becoming expert questioners, and to help them develop the necessary guiding skills. Orrill Hawley felt that her goals required traditional teachers, to make a philosophical shift from being question answers to becoming question askers.

When helping teachers in the shift, she found that teachers were solving the problems for students, then seemed to catch themselves and step back, allowing students to solve problems themselves. However, the teachers became silent onlookers instead of active facilitators. Similar to Brookfield (1995a) she found that the, “Teachers were more likely to interact with students in instructionally irrelevant ways than to ask guiding questions while the students worked in
simulations” (Orrill Hawley, 2001 p.16). Then, teachers went to the other extreme. She found that the teachers often stepped back and allowed student to solve problems themselves, and became silent onlookers instead of active facilitators.

To help teachers with appropriation there exist a plethora of website activities for classroom use. Also, many novice instructors with computers focus on this stage of development, and teachers often help one another during teacher in-service time. However, it is uncertain precisely what fears, assumptions, beliefs, and emotions teachers hold that contribute to the adaptation stage and move teachers to the appropriation stage. It can be assumed from change literature, that teachers undergo dissonance of beliefs and of actions that they want to resolve and if resolved, could further propel them into the invention stage.

*Invention: Comfortable with a facilitator’s role*

This stage becomes qualified by teacher experimentation with different types of learning and instruction. When this stage is reached, the whole classroom “buzzes” because students are active, as opposed to passive, in projects Sandhotz (1997). Teachers hold the belief that students can learn from one another, and that the teacher’s job is to guide, as opposed to dictate student learning (Brookfield, 1999; Brooks & Brooks, 1993; Wood et al., 1976).

This is often upheld as the last developmental stage in technology integration in which the teacher becomes the facilitator. Case studies and video case studies exist within content areas to demonstrate the way learning occurs in these environments. However, there is little documented research on the concerns teachers have in this role. For example, in a self-analysis study, a history teacher used the inquiry method without technology integration. In this study, the teacher doubts the appropriateness of the content used for inquiry since students begin to question the authority of all books.
VanSledright was not in a one-to-one environment, but it can be inferred from this research, that teachers in one-to-one contexts have unique issues regarding facilitation at this stage.

An innovating instructor, Matson (1996) states “As we innovate, we go through our own metamorphosis. The process changes us as much as we change our surroundings. We reincarnate through every creative idea pursued. It changes the way we think and reveals more of who we are” (1996, p.171). This statement infers to the reflective nature of invention, and those instructors who reflect on themselves and teaching usually desire something outside of current academics for themselves and their students (Dewey, 1938; Lipman, 1991; Shulman, 1999). Invention requires a certain self-awareness that is comfortable with being challenged by the students, but the question still arises, how did the teacher’s get there?

Further complicating matters, impact studies have noted that current testing does not ascertain the complexity of skills that students gain in one-to-one environments, and assessments need to be developed that match their instruction (Bonifaz & Zucker, 2004; Kerr et al., 2003; Lemke & Martin, 2004d). The current emphasis on high stakes testing, an external force, influences teachers’ classroom practice, even if does not align with the teacher’s pedagogy. Even so, in the invention stage there seems to be an alignment between teacher’s beliefs about learning, and their actions in the classroom, including their means of assessment.

Ecological Perspective of Technology Integration

Unlike the Apple construction of linear phases for technology integration, Zhao and Frank developed an ecological model that draws upon the metaphor of an introduced species into an ecosystem. In the case study of multiple schools, computers are the introduced species, and like the survival of the fittest, “the survival of computer use is determined largely by their compatibility with the aims of teachers, who are the keystone species in the ecosystem” (p.816).
Unlike the previous findings on skill development, (Sandholtz et al., 1997) school training technology skills did not have a significant impact on technology use. But, those teachers who felt teaching with the computer was currently compatible with teaching style had a natural disposition toward them were also more likely to use them.

Like animals that propagate in favorable environments, teachers grow in technology integration if they are within a safe environment to experiment. This is consistent with discussions of positive professional and staff development (Borko, 2004; Palmer, 1993b; Perry, 2004). The propagating conditions for teacher growth includes providing a space to talk with other teachers, share ideas about learning, engage in self and group classroom inquiry, and establish a means for group and self-evaluation. Each of these aspects seems requisite for deep change – such as the change to the facilitator role.

Lastly, in the ecological perspective, teachers co-evolve with the computer, instead of moving through the stages; however the stages could be considered steps in the evolution process. The evolution process intuits a kind of slowness, morphing of both the computer and the teacher. Since technology upgrades quickly, and this in turn affects a teacher’s actions (Schofield, 1995, p.53), this co-evolution may be an accurate metaphor. In a study, I found this very true. My belief system evolved differently then my teaching activities.

Obstacles to development, some as above include environmental conditions and external factors. For example, time may become an obstacle, and may inhibit integration (Eifler et al., 2001) or technical difficulties may inhibit progress (Sandholtz & Reilly, 2004). According to Ely (1999), other external obstacles such as availability of resources, rewards and incentives, and availability of time can also influence integration. In a high stakes testing environment in which the government rewards test score increase with money, and punishes those who stagnate and
exhibit depreciating scores, the amount of time and resources available for technology integration is challenged. Instead of technology integration, the focus can become test preparation.

In the closing statement, Zhao and Frank (2003) state the end of their evolution story,

A teacher can change her way of interacting with the computer, which demands different teaching practices. This is the stage of co-evolution, in which the invading species (the computer), adapt to each other by changing themselves. In other words, the teachers may change her role to become more of a facilitator than an instructor, while the computer becomes a tool to support that. Or the teachers may find the intended uses of the computer completely incompatible and stop using it. In very unlikely scenarios, the computer use could become so pervasive that the teacher’s role in the school is transformed and her old role becomes extinct (p.830).

Although there are many growth inhibitors none stop evolution alone (Rogers, 1995). The teacher manipulates software, controls the way she interacts with the computer, and instigates role change including a change in attitude with reinterpretation of computer functions over time. When teachers are given the chance to experiment with technology and improve their computer skills, they can decrease cost, and increase their perceived benefit, thereby boosting technology integration.

Summary

Reports on teaching with technology claim an increase in learner centeredness. A teacher reports, “It has been the catalyst for a transition from blackboards and textbooks to a method of instruction where students can explore, discover, and construct their own knowledge” (ACOT - Apple Classrooms of Tomorrow: Changing the Conversation About Teaching Learning and Technology: A report on 10 years of ACOT research, 1995, p. 11). In addition, overall studies testify that technology was a vehicle for the change. Although many frustrations with training and technical aspects have been recorded, teachers eventually used the technology to engage the
students in higher order thinking, and question their own assumptions about instruction and
(Sandholtz et al., 1997).

So, on the one hand, research has been done on technology integration. The Apple ten-
year study (1995) distinguished stages of growth, and Zhao and Frank (2003) described the
evolution in general terms. On the other hand, neither study incorporated teachers’ perceptions
about their assumptions and beliefs or how teachers interpret learning when they evolved.
Neither study undertook the fears, anxieties, or self-perceived breakthroughs.

Most teacher training establishes incentives for technology integration that cause the
teacher to practice differently, and other stakeholders hope that teachers notice benefits of the
computer in action. What process do teachers think made them change and how?

Schools are shadowing the societal technology trend by providing greater computer
access in the classroom, and modifying instruction to include diverse technologies. Some
schools made a greater investment into one laptop computer per child (Curtis, 2003a), one-to-one
computing. To appropriately utilize the technology, it is believed that the teachers need to
become facilitators, and ideally enter the Inventor stage of technology integration. However,
evolving from transmitter to facilitator with is a complex process. My study hopes to examine
this process in depth by observing those who are underway toward facilitation.
CHAPTER 3
RESEARCH METHODS

In this chapter I describe the research design for this study. I begin by supplying a rationale for using the descriptive case study framework, and the boundaries of the case. Next, I explain the strategies used for data collection, followed by data analysis descriptions, writing summaries of the cases, and explanations of confidentiality. I conclude with information regarding my researcher identity, and the trustworthiness of the data.

Research Design

Rationale for Descriptive Case Study

“Case studies are in-depth and detailed explorations of single examples,” and seek to understand the larger picture phenomenon through intensive focusing on the particular (Rossman & Fallis, 2003 p.104). The case study method according to Yin (2003 p.3) is used when researchers want to develop understanding within the natural context, and asks “why” or “how” questions. It is for this reason that the case study method of inquiry was chosen.

My purpose aligned with the purpose of the method by attempting to understand how teachers’ roles transition, but looking at them specifically in the one-to-one environments, and across grade levels and schools. I was interested in getting a glimpse into teachers’ emotions and experiences, and exploring the school culture that provided the milieu for the change. Through a multiple case study method, I compared similarities and difference between the schools and teachers.

The goal of the case was to describe the teachers’ perceptions, including their verbal, written, and observed behaviors. In non-researcher language, I wanted to know what the transition looked like, and felt like within a school context and to be able to compare my
observations with established substantive (Glaser & Strauss, 1967), design (Snelbecker, 1999) and general (R. K. Yin, 1993) theories. Multiple types of data collections were collected and context was equally considered with phenomenon (Creswell, 1998; Finn, 2002; Richardson, 2000; R. Yin, 1993).

**Characteristics of Study**

**The Case**

A case is “bounded” system in that it has a beginning and an end (Stake, 1995 p.2). The boundaries of the case are determined by the inquiry purpose, which are somewhat pre-determined, but often need clarification in the field (Rossman & Fallis, 2003). For example, student outcomes are often linked to teacher performance. Although this aspect is incredibly interesting, student performances were only studied in so far as they affect the teacher’s role.

In attempt to better define the type of case, this inquiry was an instrumental case study. Instrumental case studies investigate multiple cases in order to answer extrinsic investor questions and to increase the validity of the found answers. Stake notes that “it is believed that understanding them (the cases) will lead to a better understanding, possibly theorizing about perhaps a larger collection of cases” (Stake, 2000, p.437).

Therefore, my case study is composed of seven case studies based upon criteria (Yin, 2003) for choosing the teachers and schools. See Appendix A. First, the school needed to have one computer per child in the classroom, and the students must use the computers like books, not as a “special.” Second, the teachers needed to adhere to particular criteria that were given to the administrators. The administrators then choose the teacher or teachers to be interviewed for the study. See Table 3 for Criteria for Administrator’s Recommendation Criteria.
Table 3

Criteria for Administrator’s Recommendation

<table>
<thead>
<tr>
<th>Criteria for Administrator’s Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Classroom Looks Like:</strong></td>
</tr>
<tr>
<td>• Balance of group and individual work (Sandholtz et al., 1997)</td>
</tr>
<tr>
<td>• Students talk more than teacher (Palinscar, 1986)</td>
</tr>
<tr>
<td>• Students take time to reflect on the understanding (Jonassen, 1999)</td>
</tr>
<tr>
<td>• Teacher spends lots of time with individual students or with group - not as much time in the front of the room (Hannifin et al., 1999)</td>
</tr>
<tr>
<td>• Student ask questions and the class activities move to answering the questions (Jonassen, 1999)</td>
</tr>
<tr>
<td>• Incorporate technology in at least 1/2 of lessons <em>(Technology Integration, 2005)</em></td>
</tr>
<tr>
<td><strong>Teacher:</strong></td>
</tr>
<tr>
<td>• Asks students questions building on what they know (Palinscar, 1986)</td>
</tr>
<tr>
<td>• Learns through school professional development or other classes (Perry, 2004)</td>
</tr>
<tr>
<td>• Tries out new ideas with technology (Sandholtz et al., 1997)</td>
</tr>
<tr>
<td>• Experience – Teaching at least 3 years (Silva et al., 2000)</td>
</tr>
</tbody>
</table>

The Context

A natural context or real life context is the requirement for qualitative research, and has been the chosen method of most developmental studies reviewed (Lincoln & Guba, 1985). One cannot separate the context from the phenomenon (Yin, 2003), and therefore all engagement and observation was conducted within the school. The research did not try to manipulate the environment, but understand it, so that the mere presence of the researcher had little effect on the environment (Creswell, 1998; Rossman & Fallis, 2003).

However, schools comprise complex cultures (Geertz, 1973), and thus the study demands an exploratory element remaining sensitive to the all variables and factors that affect the teacher’s role in the classroom. It was necessary to be sensitive to the literature, yet be open to the multiple and sometimes un-named forces within a teacher’s culture (Glaser & Strauss, 1967), believing that the whole of the teachers experience is more then the sum of the parts (Rossman &
Fallis, 2003). The art of studying the teacher meant looking into all facets of the teachers from their bulletin board, to their inaction with students and with colleagues. See Appendix A for Table 9 The Case.

**Data Collection Strategies**

School, a teacher’s context, is a multifaceted environment. Therefore, to grasp the essence of teachers’ thoughts within their school, data collection was systematic. In addition, it is believed that different angles produce a more complete view, and consequently various techniques were used to ascertain the particular understanding of teacher’s processes.

The data gathering techniques included audio taped interviews with administrators and teachers (LeCompte & Schensul, 1999; Rossman & Fallis, 2003), document analysis of lesson plans, and field notes of observations (LeCompte & Schensul, 1999; Rossman & Fallis, 2003). The data gathering techniques were chosen as techniques used in everyday life (Rossman & Fallis, 2003), as I wanted to explore the teachers’ perceptions and observations of classroom in “real life”.

More specifically, I chose semi-structured interviewing as a key data collection technique. People talk naturally about their experience and their perceptions, and the aim of this research was to ascertain perception. Therefore, the interviewing technique aligned with the questions. In addition, there were a total of twelve participants, so I felt it necessary to compare common information. Hence, the interviews consisted of some common questions for data comparison. However, I also wanted to uncover world-views, beliefs and assumptions to gain a more complete understanding, which is better uncovered in a dialogue informal fashion (Rossman & Fallis, 2003). Therefore, it was important to divert from the structured interview questions to ask participants for clarification such as “Tell me more about that, “ “Why did you
feel this way,” or “Can you give me an example?” In this way, each interview was tailored for the specific participant.

The data collection technique of observation provided a way for me to investigate the culture and develop questions in context. Using observations gave me a sense of the classroom culture, school culture (Geertz, 1973), and allowed me to “feel” (Rossman & Fallis, 2003, p.195) what the classroom was like in “real time” (Yin, 2003, p. 86). Also, observation allowed better understanding of participants. Geertz (1973) wrote that researchers observe to gain “…access to the conceptual world in which our subjects live so that we can in some extent - sense of the term - converse with them” (p. 24). As Geertz suggested, I was able to use observations to further question teachers. For example, when I observed Taylor’s room, I noted the student work hanging on the walls rather than pre-made posters. I asked for his rationale, which led him into a story about his frustration with the school structure.

Document analysis of school documents and lesson plans included additional insights in culture and in understanding the way a teacher thinks. Yin (2003) wrote, “You can make inferences from documents…however, you should treat inferences only as clues worthy of further investigation ” (p.86). As Yin noted, I made some inferences about my participants by using documents. For example, when I had reviewed each school’s information found on MuniNet Guide website (MuniNet Guide: Your Hub for Municipal Related Research, 2007), I could infer why City school participants felt pressured to raise standardized test scores. In another example, I viewed teachers’ lesson plans. Most teachers planned for a month, and one planned for one week. I found that those that planned for longer periods of time were those that were more project based.
My systematic data collection went as followed: I began interviewing with the administrator for one hour to one and a half hours in a semi-structured interview. This was followed by an interview with the recommended teacher that also lasted one to one and a half hours. After the first interview I viewed websites of the schools and checked their NCLB reports. After four to eight weeks, I conducted a classroom observation of one hour, at which time I recorded observations of the classroom layout with Inspiration©, and took notes on teacher and student interactions. Directly following the observation, I conducted another semi-structured interview. Each teacher gave me current lesson plans. The interview protocol, and data collection rationales can be seen below.

Participants. The participants were teachers from four schools representing a variety of subjects and grades from middle school to high school, teaching in one-to-one environments. (See Table 4) A supervisor, a principal or coordinator recommended the teacher based on the criteria found in Table 3. The criteria for teacher selection corresponds to the literature that details a facilitator’s classroom activities, in other words, what a facilitator “looks like” in the one-to-one environment. The teachers are diverse in years of experience, and subject area and work in schools that span the socioeconomic gamut for purposeful sampling (Glaser & Strauss, 1967). All school identities were kept confidential through the use of pseudonyms.
Table 4

*Case information.* Standardized Test Information and Demographics from MuniNet Guide

*(MuniNet Guide: Your Hub for Municipal Related Research, 2007.)*

<table>
<thead>
<tr>
<th>Case/Participant</th>
<th>Age</th>
<th>Grade Taught &amp; Subject</th>
<th>Total Years Experience</th>
<th>Years with one-to-one</th>
<th>Administrator(s)</th>
<th>School</th>
<th>Standardized test performance of students</th>
<th>Student Demographics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoe</td>
<td>37</td>
<td>Grade 9 Earth Science</td>
<td>9</td>
<td>3</td>
<td>Edward</td>
<td>Boarding School</td>
<td>Not Available</td>
<td>50% Caucasian 50% Minority Low income</td>
</tr>
<tr>
<td>Wyatt</td>
<td>28</td>
<td>Grade 8 Reading</td>
<td>4</td>
<td>3</td>
<td>Oliver</td>
<td>City School</td>
<td>Reading 55% Proficient Math 70% Proficient</td>
<td>570 Pupils 460 Free/reduced lunch Latino 65%; Caucasian 25% African 10%</td>
</tr>
<tr>
<td>Anne</td>
<td>46</td>
<td>Grade 12 Grade 10 English</td>
<td>13</td>
<td>4</td>
<td>Martin Principal Lisa (Technology Supervisor)</td>
<td>Rural School</td>
<td>Reading 80% Proficient Math 78% Proficient</td>
<td>1015 Pupils 160 Free/reduced lunch Caucasian 98%; African 4%; Latino 5%</td>
</tr>
<tr>
<td>Taylor</td>
<td>35</td>
<td>Grade 12 Grade 10 History</td>
<td>9</td>
<td>4</td>
<td>Martin Principal Lisa (Technology Supervisor)</td>
<td>Rural School</td>
<td>Reading 80% Proficient Math 78% Proficient</td>
<td>1015 Pupils 160 Free/reduced lunch Caucasian 98%; African 4%; Latino 5%</td>
</tr>
<tr>
<td>Jessica</td>
<td>25</td>
<td>Grade 5 &amp; 6 All major content areas</td>
<td>5</td>
<td>2</td>
<td>Helga</td>
<td>Charter School</td>
<td>Reading 60% Proficient Math 60% Proficient</td>
<td>100 Pupils 18 Free/reduced lunch Latino 6%; Caucasian 87%; African 3%; Asian 3%</td>
</tr>
<tr>
<td>Samantha</td>
<td>45</td>
<td>Grade 5 &amp; 6 All major content areas</td>
<td>13</td>
<td>4</td>
<td>Helga</td>
<td>Charter School</td>
<td>Reading 60% Proficient Math 60% Proficient</td>
<td>100 Pupils 18 Free/reduced lunch Latino 6%; Caucasian 87%; African 3%; Asian 3%</td>
</tr>
<tr>
<td>Inga</td>
<td>33</td>
<td>Grade 7 &amp; 8 All major content areas</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5

*Data Gathering Techniques*

<table>
<thead>
<tr>
<th>Techniques</th>
<th>Explanation</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document Analysis of School Document</td>
<td>Documents such as writings, newspaper reports, editorials on schools.</td>
<td>Parse out philosophy, look for critiques and acknowledgements of ideas (Geertz, 1973).</td>
</tr>
<tr>
<td>Document Analysis of Students assignments</td>
<td>Student assessments and assignments through lesson plans</td>
<td>Look for alignment, and dissonance between teacher’s beliefs and classroom activities (Smith &amp; Ragan, 1999).</td>
</tr>
<tr>
<td>Observation of teacher within classroom</td>
<td>Observed an activity for 1 hour. Made an inspiration map of classroom. Documented field notes on teacher interactions.</td>
<td>Researcher - Look for alignment and dissonance between teachers’ beliefs and classroom activities, which included classroom layout</td>
</tr>
<tr>
<td>Observation of School</td>
<td>Observation included interactions with other teachers, the demeanor of students, and parents etc.</td>
<td>Establish the culture of the school in which the teacher operates (Geertz, 1973).</td>
</tr>
<tr>
<td>Teacher Interview</td>
<td>Audio Tape interviews: Interviewed teachers before or while doing for approximately 1 hour Follow up interview</td>
<td>Gain insights into the experience including preparation, emotions, struggles, obstacles etc. of communication. Ascertain goal of classroom (Van Manen, 1997). Describe perceptions of the talk for goal alignment.</td>
</tr>
<tr>
<td>Administrator Interview</td>
<td>Audio Tape Interview Interviewed administrator of teacher. These included principals and a technology coordinator.</td>
<td>Ascertain the professional development of teachers, the culture of the school in which the teacher operates (Babbie, 2002; Yin, 2003).</td>
</tr>
</tbody>
</table>
Table 6

*Teacher Interview Instrument and Rationale*

| Questions                                                                                                                                         | Question Rationale                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) Please tell me about yourself, anything that might shed some light on your decision to become a teacher.  
  • Family, education, religion, occupation, ethnicity, gender, political orientation, local environment etc.  
  • If you would, what keeps you in the profession?                                                                                                                                                                                                                                             | • Glean ethnographic data that could establishes a baseline original teacher belief system (Kuhn, 1999).  
  • Identify some external influences on the way information is interpreted (Palmer, 1990).                                                                                                                                                                                                       |
| 2) Could you go back in time for me? Do you remember when you and the students made the move to one-to-one computer? What was the story behind this for you?  
  • What were the emotions, fears, hopes, considerations? Conflicting thoughts and emotions?  
  • What did you find attractive or unattractive? Worrisome? Exciting? Fearful?  
  • Where did you feel a pull-like you didn’t want it? Within yourself/ within the rest of the teachers?  
  • How did you view technology? Computers?  
  • How would this decision affect you the way you thought of teaching?                                                                                           | • Ascertain the milieu surrounding the initial innovation implementation and what it meant to the teacher (Fullan, 1993).  
  • Determine the primary concerns; prediction – they will be technically based (Sandholtz & Reilly, 2004)  
  • Identify emotions that seem benign to share because they are in the “past”.  
  • Establish a technology comfort baseline that will later be used to determine what the transition seemed like (Sandholtz & Reilly, 2004).  
  • Uncover the role that the teacher attributes for herself (Eisler, 2000).                                                                                                                                                                                                            |
| 3.) Now that you have had one-to-one computers in the school for ___ years, can you tell me what it is like now?  
  • What is it like in your classroom? How is that different than before? Can you give me an example?  
  • What about this do you find interesting, exiting, difficult, fearful, humiliating, intimidating?                                                                                                                                   | • Uncover the gamut of perceived teacher (self) change that took place (Fullan & Stiegelbauer, 1992).  
  • Begin to unearth the emotions that coincide with pedagogy applied in the classroom (Brookfield, 1995a).                                                                                                                                                                               |
| 4.) How did you get there? PD? Other teacher’s? What was it really like for you? If you were to compare it to something, some picture or analogy – what                                                                                                                                                                                    | • Discover the Professional Development, collegiality, leadership that was seen as important for the transition                                                                                                                                                                                                                           |
was it like for you?

- Find out how she/he expresses learning on a metaphorical level that may highlight inter-relationships that are difficult to tell in narrative (Perry, 2004).

5.) **What is your job now – as a teacher?**
- If you were to write a job description of what you are and do what would it be? How is that the same or different from what you would have said five years ago?
- What do you think about that change? How is the change positive or negative? Can you tell me your feelings about that?
- Can you tell me the story of how you worked through ---? (PD from school, talk to other teachers)

- Gain a self perception of current role
- Gain perception of evolving philosophy – the paradigm that the teacher holds (Senge, 1990).
- Change comes at a price – you loose something with every change. What is the teacher perception of this?

5.) **As teachers, we always want to try something new, or aim toward a teaching goal. What do you hope to do this year?**
- Can you explain why that is important to you?

- Uncover the perceived change to take places – knowing the end will determine where the teacher is going (Covey, 1989).

6.) **Please tell me what making this one-to-one meant for you and your students.**
- What moment was the turning point?
- What does it NOT mean? What won’t you do anymore or loose?
- What did you see as the future of this decision for you or schools?
- Is there anything else you would like to tell me that would help me better understand what this transition is like?

- Determine if having access to the technology shifted a change in pedagogy and/or a paradigm shift (Sandholtz et al., 1997).
- Gather additional information helpful information.
Table 7

Administrators Interview Instrument and Rationale

<table>
<thead>
<tr>
<th>Question</th>
<th>Question Rationale</th>
</tr>
</thead>
</table>
| 1. Please tell me anything about yourself that might shed some light on your decision to become an administrator. | • Glean ethnographic data that could establishes a baseline original teacher belief system (Geertz, 1973).  
• Identify some external influences on the way information is interpreted (Perry, 2004).  
• Uncover motivation: Unlike teaching, being a supervisor is a career of choice beyond money. The salary is usually not that much different from a teacher (Sandholtz & Reilly, 2004). |
| Family, education, religion, occupation, ethnicity, gender, political orientation, local environment etc.  
If you would, what keeps you in the profession? |                                                                                  |
| 2. How would you describe the culture of the school?                     | • Get a feeling for the cultural flavor in teacher operates.                        |
| 3. What kinds of PD did you – What was the hope that PD would do with the teachers in the 1 to 1 computing environment? | • Identify types of PD that were done, and that may have impacted the participant teacher (Perry, 2004). |
| 4. What professional development practices seem to be most effective in. | • Gain the supervisors perceptions of important types of PD. This will be used for triangulation with the teacher interviews (Perry, 2004). |
| transforming teachers to take advantage of the opportunities offered by one-to-one environments? And how?  
changing teachers’ roles? And how?  
raising student achievement? And in what ways? |                                                                                  |
| 5. What were the structures in place to deliver PD and how did they change? | • Ascertain elements of the school culture and what school view as important.  
• All reading in one-to-one environments and transforming teacher pedagogy discusses the need for creating a collaborative teacher environments and providing lots of time for PD (Barrios, 2004; Kerr et al., 2003; Lemke & Martin, 2004b, 2004d). |
| • What has been the timeline for PD and how often was it done?  
• How did you handle the technical vs the content training? |                                                                                  |
| 6. How would you describe the teacher’s ability to integrate technology and why? | • Gain perception of actuals.  
• She if perception matches the teacher participant views. |
• What would you like to see stay the same?
• What would you like to see change?
• How do teachers and administrators feel about coming to work and why?

• Obtain a sense of the current culture (Zemke & Kramlinger, 1982).

7. What are some things that you wish were available for the PD but are not and why?

• Ascertain perceived optimal for training (Zemke & Kramlinger, 1982).

**Data Analysis**

I used three levels of analysis in order to examine, categorize, and test findings (Yin, 2003). After the first interview I began with open coding (Van Manen, 1997), and later moved to theme coding, and grouping codes across case. I used the computer program HyperResearch© to assist in coding and the grouping codes in cross case synthesis (Yin, 2003, pp. 109-137). Each level of analysis will now be explained.

After administrator interviews and the first teachers’ interview, I used open coding to retain the voice of the participant with as few of my propositions as possible (Van Manen, 1997). When the open coding was complete, I reviewed research questions to determine which had been answered. Based on the detail needed from the teacher regarding a particular question, I wrote the second set of interview questions.

After the second interview, I began theme coding, since it seemed evident that particular patterns were beginning to emerge (Van Manen, 1997). Field notes and lesson plans were treated as evidence to support the areas about which the teachers spoke. There were approximately 250 open and theme codes.

The third level of analysis began after the second interview. I grouped the codes across cases to determine the themes and the interrelationships (Yin, 2003, pp. 116-120) by mapping like codes to determine what seemed similar and different among participants while remaining
cognizant to the divergent voice. (See Appendix E) I began by consolidating themes into patterns across all cases for a cross that is case synthesis. During each step of analysis, I wrote thoughts and the connections to various theories in my journal, so that I would be cognizant of my bias.

My Bias

My bias becomes the most evident in theme creation. Open coding and theme codes were based largely on the participants’ words which contrasts with theme creation. When I began synthesizing the codes for themes, I remained sensitive to literature and the literature was selected by me prior to and during the study. The literature, along with my personal experience, helped me to synthesize the codes with the literature that helped to create meaningful themes. (See Appendix E to get a sense of my thinking process.) I attempted to “step back” from the themes by allowing time between readings, up to two months, revisiting them, and re-wording themes as I saw fit. I also configured themes in different ways, wrote theme ideas in my journal, attempted some themes but felt they did not emphasize the teachers’ ideas or neglected a participant’s voice, so themes were revised. In addition, a dissertation committee co-chair, Dr. Priya Sharma, questioned the themes while I was writing. In this way, theme creation was an iterative process. However, a multitude of themes exist depending on the person’s lens, and I encourage other perspectives to emerge.

Writing the Case Summaries

The final report of a descriptive case study can take the form of themes (Van Manen, 1997; R. Yin, 1993) or creation of a story (Stake, 1995). First, I wrote about each case, or teacher and corresponding administrator in a time-order story as described by the interviewee.
Taking this time sequence perspective allowed me to understand relationships between ideas in each case, and validate the concept mapping of codes seen.

After, I wrote about each case in terms of the study’s questions and themes, as seen in Chapter 4. As a result, the story format is no longer used. Creating the themes allowed for cross-case synthesis as seen in Chapter 5. The themes were consolidated and the relationships between the themes explained.

**Researcher Identity**

I am a teacher who has struggled moving from a transmitter role to the facilitative role (Sharma et al., 2003). It is from the struggle that I designed this study where I hoped to establish a clearer picture of what teachers in schools undergo, so that in turn, I can help other teachers.

As a former middle school teacher and now university professor, I have strong feelings about teacher’s roles with one-to-one computing. Like much literature, I believe in order to fully utilized technologies benefit a teacher needs to be more of a facilitator. At the same time teachers need to be aware of the individual student’s needs. We know two things: everyone does not learn in the same way, nor does everyone learn at the same time. Yet, I believe with time, resources, and a wise teacher, education can support can both customized and collaborative learning so that students can master basic skills, higher level thinking skills, and “emotion intelligence” skills.

Complex change processes have been studied using qualitative research. Now, within the new technology of one-to-one computing, it has been reported that teachers are making the change and possibly more swiftly. Therefore, the schools engaged in one-to-one computing seem like an ideal environment to study the transmitter to facilitator role. Seeking to understand the process is consistent with the epistemic rationale of qualitative research (Baptiste, 2002; Kincheloe & McLaren, 2000; Lincoln & Guba, 1985; Rossman & Fallis, 2003).
Trustworthiness

Observation is only as good as the tool. In this study, the observation tool consisted of my interpretations, which are explicated and limited by my experience (Peshkin, 2000). As a result, I attempted to explicate the researcher identity issues to make the findings transparent by keeping a journal that is available for review (Richardson, 2000; Rossman & Fallis, 2003).

Participants, including teachers, administrators and school officials, were given my analysis. In addition, various types of data were used and aligned with analysis strategies. The information from these sundry techniques were brought together. Like a puzzle, if a piece did not fit, it was sign that I put the themes together incorrectly. This “putting together of different pieces” to make one coherent meaning is often called triangulation (Lincoln & Guba, 1985; Stake, 2000).

Member checks were conducted (Lincoln & Guba, 1985). The individual cases were sent to corresponding participants. Half, or six, of the participants responded with positive feedback, and minor corrections on things such as degrees earned or dates. I heard no response from the remaining six. I was most concerned with interpretation of three participant’s stories, but of those participants gave positive feedback such as, “That seems to be what I said”, or “Interesting, you noticed that.”

Limitations of the Study

The goal of thick description within a real context inhibits generalization to a broad population. The research findings do not make such claim; rather, I explicate some limitations.

Teachers were chosen by the administrators, therefore is should not be assumed that all teachers moving toward facilitation similarly progress. In addition, most of the teachers felt supported by administration, which would be expected if chosen by administration. In addition,
teachers agreed to participate in the study after a requirement was withdrawn – journal writing. Teachers did not have the time to write in a journal in addition to interview time. Also importantly, this study explored teachers’ perceptions after they had moved toward facilitation. This may have impacted teachers’ recollections; except for two teachers’ accounts, the teachers were overwhelmingly positive about their experience. Based upon the experience of two instructors, Matson (2006) and my own experience, and discussions in Sandholtz et. al (1997), it is believed that the process may not be so “rosy” for all. Furthermore, all participants agreed to the study. Hence, it can be inferred that all were comfortable articulating their experiences, felt a certain level of security or could have exhibited common personality traits. Lastly, prolonged engagement is a tenet of qualitative research (Rossman & Fallis, 2003). In this study I was engaged with participants for a total of 35 hours; however, I was engaged at each school for only four to ten hours.

Albeit, using a multiple case study method allow for comparison of stories (Stake, 1995; Yin, 2003), by providing an example for which others can predict teacher expectations. This goal is similar to history: learning from the past in order to interpret the present and design for the future. Therefore, instead of generalization, I create stories that intuit assertions through a systematic and rigorous analysis (Stake, 1995).

**Ethical Considerations**

The Penn State Instructional Review Board approved this study, and throughout, I upheld participant and university integrity. In Appendix B you can find the recruiting information that I sent to schools. The crucial procedures I followed are as follows: Prior to research, I obtained a state criminal background check, state child abuse check, and up-to-date immunizations. All
participants signed an informed consent form. (See Appendix C & Appendix D). Pseudonyms were used for all participants including the schools. Any data that could identify the participants such as lesson plans, school demographics or current events were removed or modified. When I interpreted the participants’ interviews in a story, each story was sent to the participant for review. In an email, I encouraged the participant to make any corrections, so that I could correctly represent the participant’s meaning. In conclusion, I have upheld all ethical standards of which I am aware at this time.
CHAPTER 4

FINDINGS

Chapter four is organized by school and by case. Each section begins with the administrator(s) of the school and a school description. The administrators’ perspectives are grouped into the following categories: view of school culture, rationale for recommending the teacher, view of technology integration, and view of professional development. After the administrator’s summary follows the teacher’s information and narrative of the interview. Each teacher’s section, or case, begins with a class description, teacher description and a footprint of the classroom. Each teacher interview is narrated into eight categories which are as follows: identity growth, beliefs about teaching and learning developed, technology integration progress, specific teaching and learning skills shaped, school’s cultural impact, fears or struggles acknowledged, joys experienced, and professional development that mattered. The categories under each participant are labeled but may flow in a different order; each administrator or teacher discussed issues in a time-order sequence, consequently the research attempts to mirror that order when possible.

Case 1 – Zoe, Boarding School

Boarding School Description

The boarding school was a private boarding school for children who lived with familial or financial hardship. The school was clean and modern. At 7 AM the students milled around the carpeted hallways waiting for the music to play, instead of a bell, to tell them that school has begun. A contemporary song played, and at the end of the song, students were expected to be in their homerooms.

Statistics

• Private boarding high school - 590 Students, 12-15 students/class,
• 50% Caucasian, 50% Minority
• National Report Card - Unavailable
One-to-One Program

- Laptops are on a cart for each student in Zoe’s room. At the boarding home, each student had unlimited access to a desktop computer. When the students reach 11th grade, each would receive a personal laptop.

Administrator in the Boarding School

When I walked into the principal’s office, I was struck by Edward’s youth. In his upper twenties, Edward had student-taught, taught and was now a principal at the Boarding school.

View of the School Culture. Edward had a passion for the students, all of who came from challenging home and environmental situations. He repeatedly said that most students had experienced difficult situations and cared deeply about the students.

Being very aware of students’ diverse needs, Edward viewed student-learning problems as a school issue, not solely as the classroom teacher’s issue. In the following example Edward talks about the school’s failure to meet a student’s needs:

Our failure is when a student has been here for a long time and they're not getting it. That's our failure, and that happens. What did we do wrong? We need a big re-evaluation of our system.

Edward compassionately contrasted the faculty’s background to the students’ background, which demanded extra faculty effort and support to understand student needs.

Rationale for recommending Zoe. Edward had recommended Zoe as a person that I may want to interview and observe. I asked why. First, Edward noted that Zoe had personal aspirations to be well informed about her content, and her enthusiasm affected her students.

Second, Edward deeply appreciated Zoe’s teaching style since he thought the student’s learning abilities were extremely diverse. He described his observations.

Her classes move along at a pace that is best suited for them. So some kids are more advanced and they're further ahead, some kids are further behind and that's okay. It is differentiated instruction to its best… still hitting the kids in the middle, but the last thing I think she does, is teach to that middle population.
Edward noted that Zoe’s ability to customize was enhanced due to the smaller class size than in traditional public schools. He felt that it was very unlikely that the students would have received this kind of instruction in their home districts.

**View of Technology Integration.** Edward explained that Zoe was the only teacher who had a cart of laptops in her room since she used them well. Zoe’s teaching style and use of technology was appropriate for science; however, he was unsure if it would be suitable for other subjects. Overall, he felt that most teachers had gone “beyond PowerPoint,” and was not concerned about more technology integration.

**View Professional Development.** Edward’s view of professional development seemed to stem from the way he perceived himself as a learner. He valued all teachers’ expertise. Teachers gave him personal feedback once a year through an anonymous survey with narration. The following quote sheds light on Edward’s point of view about anonymous feedback: “It's all beneficial. Every single piece is beneficial. It's interesting. If I can't be shaped and molded and if somebody can't come in and tell me...you did this wrong...then I've got a problem.” Edward felt all the information improved his ability to provide better leadership for the school, and likewise, on-going professional development was necessary for growth since, “what was best practiced 20 years ago, isn't best practice today and a teacher needed to keep abreast just as a heart surgeon in his field.”

Edward had a variety of thoughts on professional development. First, he felt that teachers needed to have ownership. Second, the professional development needed to be aligned with the school’s needs.
With respect to ownership, he felt that the school and he, personally, had worked well. The Boarding school offered many choices for teacher education, at a variety of times throughout the year. This allowed for flexibility.

Personally, Edward sometimes wanted to encourage a teacher toward a particular professional development area. When he saw this need, he covertly worked with a teacher, so that the teacher felt like it was her idea. Edward explained how he worked. “It's a real fun game at times to get people to think they've come up with something or to lay the groundwork with them to propose the idea … Laying some groundwork. It's not evil.” Edward felt that if teachers had the vested interest, they were more likely to implement.

The second goal of professional development entailed achieving the school’s vision. The Boarding school catered to an at-risk population. Consequently, Edward sensed that all teachers needed professional development on understanding poverty, or how to build literacy across the curriculum. In this respect, the plethora of professional development choice was a perceived weakness, since it was unlikely that teachers would choose Edward’s priorities. Consequently, professional development choice was perceived as strength, for instilling ownership, and as limitation, since Edward could not mandate a particular professional development class that aligned with his vision.

Regardless of choice, Edward felt that professional development needed to make a difference, and that meant it had to make a difference to student learning. He felt that if it did not positively affect learning, than “What was the point!” As a result really teacher professional development demanded more than the traditional one stop program. Edward explained:

No professional development program is going to work if it's offered for one day in August and that's it. I’d much rather prefer 2 hours the week before school, 2 hours at the end of the first marking period to touch base, “Hey, how's this
work?”. Now go back and implement it; Then, at 2 hours at the end of the second marking period, we have another meeting.

Edward advocated for another meeting at the end of the year. He felt that if real teacher learning were to occur, the teachers needed time to try what they had learned, and reflect on the process.

**Summary.** Edward’s recommendation of Zoe coincided with his values of successful education and professional development. As determined in Edward’s view of school culture, he was concerned about the academic success of each student, and then, he pointed out the main strength of Zoe’s teaching -- her ability to individualizing instruction for each student. Later, when Edward spoke of professional development, he acknowledged that the individual determined learning, and thus, described Zoe as a individually motivated person that continued learning in her field. For Edward, it just-so-happened that Zoe used technology to help accomplish her teaching and learning goals.

**Case 1 - Zoe**

**Class Description**
- Grade/Subject: Ninth grade, earth science,
- One-to-one Program: Laptops on a cart
- Schedule Structure: 45 minute for each class

**Zoe**
- Gender & Age: Female, Mid-thirties
- Education: Undergraduate Major - Education and Science; Masters - Instructional technology
- Teaching Experience: 12 Years
- Teaching with one-to-one: 3 years
Figure 5. The footprint of Zoe’s classroom.

I walked into Zoe’s room, which consisted of 14 tables, a laptop cart in the front of the room and a white board. The counters held tri-fold posters of student’s paleontology projects from the previous year. The project posters serve as models for the current students and grabbed the interest of an observer. The tri-fold poster was covered with labeled pictures, layered artwork of the dinosaur anatomical system, hypothesis, detailed findings and conclusions of a detailed simulated archeological dig.
Identity Growth

Zoe saw herself as a teacher from a young age, as a person who “thought outside the box,” and as a person with “undiagnosed ADHD”. As early as the seventh grade, she asked her teachers if she could teach a topic that really “lit her fire”.

Although she always wanted to teach, she said that she did not “immediately have the confidence to be able to step out” and do the things she wanted to do. Zoe talked about her confidence growing over time, and slowly, simultaneously, trying new approaches in the classroom. Zoe attributed her confidence growth to her pedagogical development and employment decisions.

In the following statement, Zoe described how she now perceived herself, and how this could have affected her administrators: “I'm an envelope pusher, I tend to take a school administrator out of their comfort zone, constantly pushing and being involved in not your normal, everyday, activities in the classroom.”

Zoe taught in a project-based manner with computers, and felt that the way she taught was the best way for students to learn. She was not concerned with how she would be perceived; instead, she was more concerned about how she would be supported.

Beliefs about Teaching and Learning Developed

In undergraduate college, education made a significant impact in Zoe’s beliefs about teaching and learning. Her former teachers taught using direct instruction, or the transmitter style. Zoe described why this was frustrating to her.

When you go to college they teach you the exact same, and it practically kills me. Because, you go to your college professors, and they say this is the worst way to teach while they stand up in front of you and teach to you that way….
Later in her college years, she learned about constructivism, although constructivist methodology was not modeled, but the theory caught her attention. In her first job, the school encouraged her to teach in a constructivist manner. Zoe was ebullient; she said, “I was like...cool, okay, I can do that!”

*Professional Development that Mattered*

Her first school district nurtured a constructivist method of teaching. Zoe described one of her turning point experiences, and how the school district played a critical role. They modeled more constructivist activity. Students were given data, they worked in groups, and their final answers varied based upon their data. Zoe explained why this teaching was realistic. “That just made so much more sense, because if you turn on different TV stations they have slightly different forecasts and why is that? Well -- because how did you interpret the data.”

Unlike the teaching methods that Zoe had experienced, students focused on the data, what it meant, which allowed for answer variation. Logically, as a science teacher, she was aware that there was usually more than one correct answer to complex problems. In addition, if her students were engaged in scientific behavior, they would have to deal with complex problems, like a scientist.

After her graduate work and more teaching experience, Zoe believed that systematic data collection was crucial for her and any teacher professional growth. She felt that she modified instruction when she when she engaged in self-examination through student products. Zoe talked about her rationale.

If you don't collect data, then what good is it?… If you can't quantify data, how are you going to recreate it in a meaningful way? How are you going recreate it? You can't; it's a pot-shot. So unless you're willing to learn from that, and take the time to write those kinds of things down in a more deliberate way, I don't think you get out of it what you can.
Zoe felt that if districts were going to get “the biggest bang for the buck”, they needed to require teachers to collect data. She strongly felt that any good professional development would not just be a one-shot workshop, but would have follow-up sessions on teacher’s implementation, which would include data collection.

*Specific Teaching and Learning Skills Shaped*

Zoe felt that learning how to assess students was vital to her development. She believed that students could develop different conclusions, which did not necessary match the predicted outcome. Rubrics helped her to assess varied conclusions.

Also, she also learned to build complex student projects over time. She was unsure how this was learned. When planning a lesson, Zoe uses “backwards” planning, that was reinforced in graduate school. She also mentioned keeping a detailed list of ideas and slowly implementing. Zoe noted that she did not “set out to build the Taj Mahal overnight,” but instead gradually collaborated with other teachers, using their expertise. For example, Zoe worked with the art teacher to create layered images of dinosaur anatomical structure.

*Joys Experienced*

Zoe experienced joy when her students learned, and when she created. With her students, Zoe was excited when she saw that students questioned the data, and said something like “Oh my gosh, look at my data, what it shows me…you know what, Miss Zoe, I know that's gotta be wrong, it can't be right.” Zoe thought this kind of student statement was the “beginning of real learning,” and she felt like “doing handsprings because they got it!”

When creating a unit, Zoe also experienced a thrill. She began as if she had access to the world’s resources. She said, “I plan as if it was Christmas morning, and I got to do some really, really cool activity.” Then, she makes the project realistic based on her actual resources. “I can't
take them to Montana, so this seems to be about the next best thing, as close as I can get it to them.”

_Fears Acknowledged_

Zoe was forthright about the obstacles that she had faced along the way, but she dreaded most partner teachers’ reactions, and students’ reactions to her project failures. Most student units required multiple tasks, involving many teacher partners. In the following example, Zoe articulates her inner questions. “If it doesn't work out then what does that mean to my administration? How will that reflect on me professionally? Will people in other departments want to work with me again?” As a result, Zoe tried to minimize the “mistakes” so that teachers were likely to partner with her in the future.

With students, Zoe aimed for honesty when trying something new. In addition to receiving their empathy, she felt that the honesty modeled the learning process. Simultaneously, Zoe was concerned about the about her failures’ impact on the students:

Well, it's certainly a little bit of uncertainty and fear that - Oh my gosh,...I've now wasted time for the students, possibly others,...exposed them to frustration which may turn them off to the learning process…

Zoe took students’ feedback seriously. Failure included student disinterest; she blamed herself, not students for indifference to learning.

_School’s Cultural Impact_

Zoe stressed the importance of school culture on her development. Her first school, she described as “very progressive,” and they encouraged her to experiment. Her second school also encouraged experimentation, but her third school did not. As a result, she left her third school after a year, and started at the Boarding school.

Support often disseminated from the administrator, Zoe described what she needed.
I need somebody (*administrator*) who will be willing to sit back and say...okay, I'm going to give you the opportunity...and if you fall on your face it's okay. It's not shameful...okay, so we'd tried to implement something in a way that didn't go so well...

For continued growth, *Zoe* felt that she would make mistakes, and she needed an environment that would respect an experimental approach for growth. She was unwilling to subject herself to anything she considered less.

*Technology Integration Progresses*

*Zoe* had integrated technology for nine years. She was continually trying new computer programs that could be beneficial to learning. Scrutinizing computer use, she observed, “The more you use technology, the more you see its weaknesses.” She felt that computers were great costs, not just monetarily, but also in time and support. In her experience there were always problems such as program incompatibility and computer breakage.

If technology helped deepen student understanding in a meaningful way, then she felt the benefit outweighed the cost. *Zoe* found that she now asks particular questions to help her decide on computer use:

How is that better than using your textbook? How is that better than the library? Help me! … If it doesn't make it more meaningful, if it doesn't allow a deeper level of understanding in a method that you couldn't achieve without it, you shouldn't be using it.

When working with technology, *Zoe* felt that the student activities, and products needed to be examined through the student-learning lenses. *Zoe* continually emphasized deepening student understanding, which served as her justification for technology use.
Case 2 – Wyatt, City School

City School Description

City school sat atop a large hill. It was an older quaint building that reminded me of the classic city schools seen on television. City school was one middle school among 25 schools in the district. The school’s district served urban and suburban regions with high, middle and low socioeconomic areas.

Statistics
- Public middle school – 630 Students, class size varies
- 75% minority, 25% Caucasian
- 80% Free or reduced lunch
- National Report Card
  - Reading 55% Proficient or above
  - Math 70% Proficient or above
  - Met Annual Yearly Progress targets 2005-2006

One-to-One Program
- There is a laptop for each student in the middle school. Students carry around their personal computer like books, but do not take the computers home.

Administrator in City School

I interviewed the principal of the Wyatt’s school. The principal at City school, Oliver, had become a fixture of the building. In a full suit and tie he explained that he was raised in the same city, and attended the same school district where he was now employed. He worked in the district for 35 years, and was principal for 23 years at the City school. Although his school was in an economically challenged neighborhood, the students maintained “annually yearly progress” (NCLB).

View of the School Culture. Oliver described the City school, and what it meant to him.

Our school now is very much a minority population school…We know - any studies that you read have a direct correlation between economic, ability or, income advantages and performance. It's not a racial thing, it's an economic thing…No, we don't use it as an excuse…so kids can't do well. We need to make sure the kids are doing well. So the expectations need to be at a certain level, and
we never can let our guard down in that respect, because if we do, then we're just going to fall into the trap.

For Oliver, never letting the guard down meant staying “focused on the goal”, and student performance on standardized tests. He felt that it was clear what the federal and state governments had told him to do.

With emphasis on testing, Oliver arranged the schedule to increase time in the tested subjects: reading, writing and math. To prepare students for the tests, the students take four practice tests throughout the year, in addition to the actual state tests. However, Oliver overtly stated that it was too much testing.

**View of Technology Integration.** Oliver felt that the one-to-one school program seemed vital to prepare students for the future, which was not tested merely on standardized tests. He explained his point when comparing his work environment to those the students would face.

It's good, there are a lot of positive things, especially when we look at the kids future, for them, in their working careers. Not what my working career has been, it won't be that way, so we need to prepare the kids for that. The disturbing part of that is we don't know what is really going to be.

Oliver felt that the computer program was helping prepare students for the unknown future that would undoubtedly include technology. It was also motivating to teachers and students.

However, Oliver believed that the current curriculum did not adequately prepare students, even with one-to-one. He explained.

We need to be aware of teaching for change, teaching for ability to acquire knowledge quickly: Habits and mind -- they are tenacious, inquisitive and metacognition... those are life skills. It doesn't really matter what you're doing, if those habits of mind that are in place, then your ability to adapt is going to be pretty good.
Oliver felt that the district had not developed *Habits of the Mind* pedagogy, or curriculum. Furthermore, it was hard to do. Oliver was unsure *how* it should be done, but felt difficulty was not an excuse.

*Rationale for Recommending Wyatt.* With this information, I had asked Oliver why he selected Wyatt for my interview. (Originally, he selected two teachers. Therefore, the principal commented about two people, using the pronoun *they*).

Well, I think they've embraced technology, and went forward with it at a very rapid pace, so the style of teaching of both of these people, is different than what they've done, in the recent past… Are they revolutionizing things to the extent that, you know, we're where we need to be? No, but they've changed the way they teach and it's, without question, because of the technology.

Oliver felt that Wyatt had made great strides toward integrating technology. However, Wyatt had not been able to create a “seamless” curriculum with technology where only “certain kinds of learning could happen” with the computer. The district’s curriculum was still fragmented.

*View of Professional Development.* In terms of professional development, Oliver also felt his limits as the principal. The district offered many in-service choices to the teachers. Oliver felt that when teachers self-determined in-service topics, they were more likely to implement them in the classroom even if the program did not contribute to student learning.

Regardless of the in-service program, Oliver felt that the teachers’ attitudes determined their learning, and their attitude was more conducive to learning if they had a choice.

I think there are a lot of things that go on if you don’t want to learn from it you won’t… If you want to learn from a bad thing, you will… Some people, even given the obvious, won’t make the connection because it’s a change for them.

Oliver felt that many teachers chose an in-service that had little relevance to the school’s priorities; therefore they did not advance the district’s vision. Oliver would like to see the
teachers engaged in “backwards planning” and “Habits of the Mind”, but sensed little teacher interest.

Summary. From my perspective, the standardized testing emphasis and the “Habits of the Mind” desire would have seemed incompatible had it not been for Oliver’s description of the district’s current curriculum. Oliver thought the district had not developed a “Habits of the Mind” curriculum, and it was hard to do. Admittedly, Oliver was unsure how it should be done, but felt difficulty was not an excuse. It seemed to me that Oliver worked within his obstacles, planned what he could, had a vision, and was aware of his place within a large district system. Curriculum was handled at a district level, not by Oliver.

Case 2 - Wyatt

Class Description
- Grade/Subject: Eighth grade reading,
- One-to-one Program: All students have laptops, but cannot take them home at the end of the day.
- Schedule Structure: 7 periods a day of 45 minutes each

Wyatt
- Gender & Age: Male, Late twenties
- Education: Undergraduate Major - Elementary education
- Teaching Experience: 7 Years
- Teaching with one-to-one: 4 years

Figure 6. The footprint of Wyatt’s classroom.
Wyatt’s room was a regular size classroom with little space for walking between desks that were grouped. The walls were covered with inspirational and reading strategies posters with very little student work. In back right corner sat the teacher’s desk. On the left rear of the room sat a laptop cart where the homeroom students power their laptops.

Identity growth

Wyatt was raised under difficult conditions, and with this experience he related to the lives of his students. He began teaching in the inner city during student teaching and continued. After teaching language arts for six years, he felt that he had become pretty accomplished in this content area. In addition, Wyatt sarcastically stated that he has taken the state mandated teacher test, so, “I’m highly qualified.”

Wyatt felt that his teacher identity had changed significantly with the implementation of one-to-one computing. The following is one example what and how Wyatt felt that his role had changed: “I was more ‘teacher centered’ at the beginning, and I’ve shifted from ‘teacher centered’ to ‘teacher-facilitator’. With the one-to-one, I think it's just given me more breathing room.” Breathing room meant using computer resources so that student could do more independent work. He noted that it was his observations of students that affected his classroom role over time. He specifically discussed his development within the context of one-to-one, and gave specific turning points of how the change began to occur.

School Culture’s Impact

The school had split language arts into reading and writing for extra emphasis on subject areas that are tested by the state. Wyatt talked about the Oliver’s influence over the school schedule to accommodate the testing demand. “Somehow he gets lots and lots of math time and
lots and lots of reading time.” Wyatt felt that the segregated content areas helped students prepare for the tests.

Wyatt felt the pressure of testing, “That's the reality of today's education – that’s what gets reported in the newspaper, that's important.” Wyatt was unsure about the priority placed on certain subjects at the expense of others, but public perception and financial federal funding, both based on test scores, superseded the need for a balanced curriculum.

When planning his lessons, Wyatt followed curriculum, “We start of the year with fiction, we went to non-fiction then to poetry, and now we're back to fiction...making sure we cover everything.” However, within this testing atmosphere, came the laptop program.

*Technology Integration Progress*

After Wyatt had been teaching for two years, Wyatt’s school had moved to one-to-one computing one grade at a time: sixth- year one, seventh- year two, and then, eighth- year three. Wyatt began as a sixth grade teacher and each year moved grades. In addition to computer integration, he also had to learn a new curriculum.

Wyatt felt he adopted technology easily, since it made student writing logistically easier, such as basic word processing. Next, he noticed the Internet’s resource were unlimited compared to his textbook. In the following anecdote Wyatt gave a turning point when he first realized the Internet research potential:

We read a fictional novel. It's about a kid growing up in the inner city in the early '70's, late '60's, and they were wondering about Harlem at the time. So a couple of kids went and found out stuff about Harlem. And, it was a boxing story so they found out about some of the boxing, so it's (*Internet*) unlimited.

In another incident, Wyatt asked a question, and a student quickly “Googled” for the answer. Wyatt talked about these examples as reasons for developing into a facilitator.
With computers, Wyatt noticed how quickly students could retrieve information for spontaneous learning. He reported that students used the word processing dictionary and on-line searches to find answers to historical and current event data. This led Wyatt to a pedagogical shift that he explained,

I kind of let go a little more control because a lot of times a lot of my kids are on task with what they're doing, because they like having them out…
I have more things out there for them to go investigate so I think it's not just me, I'm letting them do a lot of learning themselves, and teaching themselves too.

As a teacher, Wyatt became comfortable with students finding information that he did not know, and “let go of control”, because he observed in benefit in student learning.

He still uses the same objectives when writing a lesson, and he could have taught similar lessons without the computer, but he said that lesson would be “less engaging” and logistically more difficult.

Now, Wyatt used the computers daily for reading. Students began each class reading and answering questions to a current event found on CNN for Kids® or Newsroom® sites, and at the end of class, reflecting in their word processing journal. His pedagogy included less direct instruction and more student investigation.

*Fears or Struggles Acknowledged*

Although Wyatt talked positively about the change, he overtly expressed that moving to one-to-one was a difficult experience for many months, even for a man who felt that he was comfortable with computers. He said, “It was nerve wracking… oh my god, in two months I'm going to be expected to do this!” His emotions were tense when thinking back to four years ago.

Wyatt felt that his district had not pressured the teachers into computer use, but at the same time, he felt that the expensive equipment should be utilized.
Wyatt’s fears were logistical and pedagogical. Aware of the limited 45 minute-class time, Wyatt did not want computer-related issues to compete with reading. He was concerned with students learning about the computer, how to use it, treat it, and work the various programs. At the same time Wyatt worried about a pedagogical issue; he was unsure how to integrate the computer into his reading lessons.

**Joys Experienced**

Wyatt discovered teaching computer skills and integrating the computer into reading were not as difficult as he thought. In the following example Wyatt described how he learned.

We just did one period where we played with KeyNote ®... I did one day of a lesson, or even half of a lesson, because I think the in other half, I introduced a rubric. I put them in their groups, and I said, “This is what I expect.” They're (students), helping each other out. They took what I knew, and they took what they knew.

This was another turning point experience for Wyatt. He tried something new and was unsure about student reaction. Pleasantly, he discovered that that students did not have the same fear he had. Wyatt’s concern had turned in a pleasant experience.

Wyatt was also struck with student spontaneous learning, looking up something on the Internet that was related to something they were learning in class. Wyatt described his students’ ability to learn beyond the curriculum as “cool.”

**Beliefs about Teaching and Learning Developed**

Wyatt believed that to use the computer, he had to play and students had to play. He noted, “Some of these kids, they're like me; they're experimental so you just show them a couple steps.” Wyatt expressed this belief after observing students with the computer.

He also felt that different ability grouped classes needed different teaching techniques, and lower level students needed more direct instruction. This affected how he taught.
Specific Teaching and Learning Skills Shaped

In the past scenarios discussed, Wyatt had learned how to create projects and rubrics, which helped him implement the computer-based projects.

He also became comfortable with guiding the students through projects, as opposed to transmitting information to them continually. Wyatt mentioned how he does this, “I can just let the kids learn on their own as long as I'm reining them in every once in a while, and keeping an eye on what they're doing.”

As mentioned, Wyatt found that his teaching style changed with the level of the student. He explained.

With my lower level classes I do have to give less independent work. You know, less teacher as facilitator, and more as instructor, than with my on-level and above-level classes. They (lower level classes) need very regimented things to do. Although I won't sit up there, and speak to them for 45 minutes, I also won't give them, after a warm-up, 35 minutes just to go “free” on their own.

More specifically, in the lower level classes students worked independently for no more than 15 minutes, where as his upper-level class may have one activity for the class period. Wyatt’s pedagogy had developed to include more independent learning, but he still tried to meet the unique class needs.

Professional Development that Mattered

Wyatt and eight other teachers were sent to trainings on ways to incorporate the computer into lessons. After training, he taught his colleagues how to use the more advanced computer features like Keynote®, although Wyatt wished that all teachers could have gone to the training.

During the training sessions, he acquired ideas for incorporating the computer, but he felt that the training was not adequate.
College learning experiences also made a difference. In a recent graduate course, Wyatt had developed a Web Quest. Although he had not implemented it yet, he looked forward to the prospect.

When thinking about moving from transmitter to facilitator, Wyatt laughed aloud when he spoke more about the process.

A lot of teachers are control freaks…We have to have things a certain way. When I first started with the computers, it was that way. If you want to grow, and you just kind of loosen up a little more each year and it happened…I don't know why...

To Wyatt, his process was indescribable. There was no book or prescriptive teaching that could help a teacher learn to become a facilitator.

Interestingly, Wyatt said that at some point he had realized that twenty-five minds were in the room, and each thought differently. He also discussed how observing his students with the computer changed his pedagogy. Wyatt said, “Teachers just have to do it.”
Case 3 (Anne) and Case 4 (Taylor), Rural School

Rural School Description

The Rural school sat on a hill in a modern one-story building. Middle class homes, open land, and overlooked a golf course surrounded it. As soon as I walked into the building, I was struck by the artwork hanging from the walls, work expected in galleries.

Statistics

- High School – 1000 Students, 25 students/class,
- 98% Caucasian, 2% Minority
- 15% Free/reduced lunch

- National Report Card
  - Reading more than 80% Proficient or above
  - Math slightly less than 80% Proficient or above
  - Met Annual Yearly Progress targets 2005-2006

One-to-One Program

- There was a laptop for each student in the high school. Students carried around their personal computer like books, and did take the computers home in the evening.

Administrators in the Rural School

There were two administrators that were interviewed in the selection process, the assistant principal, Martin, and the technology coordinator, Lisa. Lisa selected the two teachers for the case studies, because the two teachers co-taught a European History class that they had designed. I interviewed Martin and Lisa together and separately.
**View of School Culture.** Martin was very proud of the school’s appearance and the community involvement that helped create a professional learning atmosphere. Although he reported a large disparity between the wealthy and poor, the wealthy gave large endowments to the public education. Martin also noted that there was very little community ethnic diversity, so that one-to-one was imperative for a larger world-view.

During early computer implementation, many technical and administrative problems arose. Martin thought that having a solution driven staff provided a proactive culture. Personally, he promoted solution finding as stated, “If you have a problem, come with a solution. When people come with that solution, even if that solution isn't viable…We start to look for ways to make things happen, instead of finding ways to tell them no.” Martin believed that solution finding instigated an attitude that was beneficial for the teachers and the administration.

Both Martin and Lisa felt that our economy needed students to question and problem solve. They cited an article in January 9, Newsweek written by a man who contrasted his schooling experience in the USA and Singapore. “In the US we question.” They saw questioning and problem solving as vital to our student educational goals.

They also expressed a cultural gap between the students’ generation, and themselves. Martin and Lisa referred to themselves as “digital immigrants” versus the student generation of “digital natives”. Bridging the divide was difficult.

Martin predicted greater competition among schools. Hence, if schools did not change, they may be in greater trouble. I was surprised that both seemed exciting with the prospect of school improvement and competition among schools. Martin elaborated, “I really believe it will make us better to a certain extent. We have to know who we are, and then, know where we're going.” Martin felt that his school was competitive and needed to remain that way.
**View of Technology Integration.** Due to Martin’s personal experience, he strongly advocated one-to-one computing. He was raised in a poor, uneducated, local family, and felt technology educationally and emotionally benefited him. Martin described his experience:

> Computers, through college -that's really what revolutionized my own personal learning, gave me the confidence to become a good student because handwriting was always an issue for me. I learned that I could write, and write well. With the Internet, I realized that anything I needed to know was out on the Internet, and I could find it! It really revolutionized how I learned.

The computer personally aided Martin, now he believed that technology could serve student-learning differences. He desired that students be the “center of instruction”, the “center of learning”, and “active and meaningful participants”. One-to-one could help achieve that goal.

**Rationale for Recommending Anne and Taylor.** Both Martin and Lisa, felt as though Anne and Taylor were doing something beyond what others did, but neither could articulate it. Lisa attempted to describe.

> It's so hard to measure, is that you just don't have to think about it. You don't have to think about technology… Just the type of teachers they are. They're very forward, innovative, forward thinking. I just think if you take the laptop out of the class… it can still function, but then that would totally change the dynamics in the class. I mean they (Anne and Taylor), to me, are the epitome of completely transforming what having a one-to-one scenario can do for you…

In general, Martin and Lisa felt teaching and learning had improved since the one-to-one, but most teachers had not fully utilizing technology like Anne and Taylor.

**View of Professional Development.** Both Martin and Lisa agreed that you could not make teachers change. First, teachers had to be personally interested in technology. For example, Martin gave computer-hunting games to teachers in the past, and suddenly the male teachers were interested in the computer.
Second, a crucial aspect of professional development: teachers needed to be vested in the process of change. This rural school used formal committees combined with early teacher involvement in any change process. Martin explained his philosophy:

We really believe in involving teachers in the process...from the ground up in terms of issues that we go after here. Because, if they're not on-board, they don't feel like they have ownership. They (teachers) are not going to accomplish much.

Even with teacher involvement, Lisa, the technology supervisor, noted that teacher’s pedagogical transition continued.

Lisa felt that the teacher’s belief system inhibited them from advanced technology integration. In the following statement, Lisa described what she saw as a hindering belief system:

Well, I think it still scares some teachers. I still don't think they like the fact that a student can come in and know more than they do. I think we still see that. I think we're seeing less of it, because I think the teachers are recognizing that they are still the expert in their field. They know their subject, but they're not an expert in everything. You have to recognize that the kids are going to know a little bit more from the technological aspect than what they do.

Lisa reiterated that teachers have to realize that they are not the “end all-be all”, but their content expertise could help the students, showing them how to learn. She felt that teachers could be more of a “facilitator or helper”.

Summary. Both Martin and Lisa admitted that the change had not been easy. Teachers needed time for informal and formal talk time with colleagues in order to reflect and share ideas about how to change. Mandated use of technology did not work. It took time. Anne and Taylor had voluntarily made the change with technology, and created exemplary classrooms for using the technology so that they transformed their teaching style.
Case 3 - Anne

Class Description
- Grade/Subject: 4 – Tenth & Twelfth classes of English honors; 1- Non-college prep class with special needs students included; 1- Twelfth combine European literature and history class
- One-to-one Program: All student have laptops and take them home at night
- Schedule Structure: 5 periods a day of 45 minutes of English; 1 block period of 90 minutes for European History

Anne
- Gender & Age: Female, Mid forties
- Education: Undergraduate Major – Political Science, Masters – English Teaching
- Experience: 13 Years
- Teaching with one-to-one: 4 years

Figure 7. The footprint of the Anne & Taylor’s European – History classroom.

Figure 8. The footprint of Anne’s classroom.
Anne co-taught one class with Taylor that fused European literature and history, called European History. European history was a senior level course that met for a block period, of 90 minutes. Anne also taught traditional English courses.

I observed European history, in which students were preparing for their large re-enactment for the student body and the community. There were 77 students sitting in a forum style room. Anne and Taylor gave the students directions, and groups of students dispersed throughout the school to work on various projects.

Identity Growth

Anne came to teaching as a second career, after working with at-risk students at a university. Initially, she felt that she never had all the answers, and felt that this attitude helped her be “very open to change” and to technology integration.

Anne believed that her teaching style had changed over time due to the skills and confidence she had developed. When beginning teaching, Anne said that she was very traditionally with lecture, notes, tests and quizzes. With technology, her teaching style and her confidence changed through a process that she explained.

First, you know it takes a while to wean yourself away from traditional things because you are so accustomed to it; there really has to be a change in your vision, maybe a change in your paradigm.

Anne described the change as difficult, but she noted, “When I see a better way to do it, especially that is something that is going to make it better for my students” it encouraged her.

In order to describe what she meant, Anne contrasted her attitudes with her colleagues’ attitudes about putting grades into the computer. “Some of my colleagues don't want to deal with it at all, and still they had to put their grades on the computer.” Anne felt that this resistance
would make her “very uncomfortable.” At the same time, Anne was not concerned with standing out from her colleagues and acting differently.

With the one-to-one program, Anne developed a sense of creativity and power, which in the past she did not feel. She said she could do “so much more,” and “add so much more creativity to my own lesson planning,” while she learned how to use the resources on the Internet. This helped Anne grow in confidence.

*Fears or Struggles Acknowledged*

Anne said she went into the “computer age- kicking and screaming” since she did not want to face the new. However, as detailed in the next section, this fear was quelled when she noticed the potential for productive and creative change.

While teaching, Anne worried about the pedagogy of cooperative groups. She organized her class into cooperative groups and activities because it was “very big”. Regardless, Anne was displeased with the outcomes. She explained,

I guess I viewed cooperative groups as elementary. Everybody did the same initial work, and then went from there to a collective product. Inevitably, what happens in those cooperative groups...was one kid ends up doing most of the work. That was always a thorn in my side.

Anne felt that these groups were created to socialize students, but did not lead to improved learning. Later, with technology, Anne would develop cooperative group structures that would demand individual accountability and deepen learning.

*Technology Integration Progress*

In graduate school, Anne saw the benefits of the computer when she did not have to “re-type a 50 page paper after making one mistake.” Later, when she began English teaching in the public school, she went to computer labs, and she could immediately see the benefits when word-processing.
I could have all my students in the lab facing away from me so that I could be in the middle and that I could see what was on everyone's screen at the same time and when there was a problem, I could go there, help that kid and move on...They could keep doing it and I could watch, be there watching the creation process happen.

Anne related to the students’ writing experience, and she felt that the computer enhanced the writing process. In addition, she could rotate around the room and help the students. She began to become a greater facilitator.

Later, her school purchased computer laptop carts and then, laptops for each student. Anne continued seeing the benefits of computers. Anne moved away from merely word-processing as she realized the more things available with technology. She was excited, “Wow!!! I can do this, too; and Wow, I can do that, too!!! Moving beyond the parameters.” Moving beyond the parameters meant using the computer as a “text-books,” the Internet resources, and creating a classroom structure to incorporate the technology.

Beliefs about Teaching and Learning Developed

From early in life, Anne felt that history and English were married. If she were “married to English, history was her lover.” She believed one helped understand the other. This belief helped her to create the European history project course.

Another belief evolved. Anne said that she began observing what was happening in the USA, and she contrasted the expectations of adults during her training to what was she thought was needed today. In the following statement she compared the past and present:

“I saw the importance of working together. Then, of course, as I looked at more and more industry and an industrial model, you see that more. When I was in school, it was really all about individual achievement.” As a result, Anne thought that “teamwork” in companies should be
expected in her classroom. Therefore, the cooperative groups that she disliked were modified into teams that were interdependent groups.

The computer also catalyzed her belief development because of the vast resources and the quality available. Anne believed that the computer made “education more accessible, and they (students) don’t have to rely on just me.”

Anne felt that she could make the students more independent with the computer. Anne described what this practically meant in her classroom,

We could put so much more responsibility, honestly, on the kids. That really elated me because kids don’t learn when you give them information and say, “Here’s what you need to know.” You don’t learn that way...nobody learns that way. Kids learn when you say...look here's this really cool thing...see what you can find out.

Anne believed that new the teaching method, in which the students took greater responsibility for learning, supported how she thought that students learned best.

Specific Teaching and Learning Skills Shaped

There were specific skills that helped Anne design more creative projects for her classroom. She cited rubric creation, designing sophisticated projects, and varying her teaching style according to student need.

First, when Anne learned to create rubrics, she had as a means of assessing students’ creativity. Second, Anne began to see the “potential for very sophisticated projects,” which was also a turning point in computer use. She designed projects where students would be in interdependent groups.

As an example, Anne mentioned that students having immediate access to Chaucer and Dante’s Inferno. Students groups were responsible for teaching a different chapter, creating a
lesson, and then individuals were tested on the information. Anne was not taught how to create
the projects; it just made sense.

Anne altered her teaching style with each class. For example, in honors English class she
used a lot more discussion than in the lower level classes. She called the European History class
project based, and there were more interdependent groups.

*Joys Experienced*

Anne thrived on student creativity with new projects. She noted, “They come up with so
many wildly inventive wonderful things.” It encouraged her so, Anne did not regret creating
extra rubrics to accommodate student work.

When observing the students, she also gained pleasure by their enthusiasm for learning.
Anne said,

Our kids learn so much. We always joke about tricking them into learning things
because they're having such a ball doing it. They're having so much fun, that they
don't stop to think...oh my goodness, I know all about the *Inferno*.

She felt that the student enthusiasm catalyzed deep learning.

*School Cultural Impact*

From proposal of the English history course to the current time, Anne and Taylor had
been encouraged by the district to creatively implement the course. The district had given them
money and room space. In addition, other teachers helped with the process and allowed students
to work in their rooms, such as the wood shop or art room. The school was tolerant of the
students working throughout the school, even in unsupervised areas.
Case 4 – Taylor

Classroom Description
- Grade/Subject: 5 Tenth grade American history, 1- Twelfth grade combine European literature and History class
- One-to-one Program: All student have laptops, take them home at night
- Schedule Structure: 5 periods a day of 45 minutes; 1 block period of 90 minutes

Taylor
- Gender & Age: Male, Mid thirties
- Education: Undergraduate Major – History
- Experience: 9 Years
- Teaching with one-to-one: 4 years

Figure 9. The footprint of the Anne & Taylor’s European – History classroom.

Figure 10. The footprint of Taylor’s classroom.
Taylor and Anne co-taught European history for seniors. In other classes, Taylor taught sophomores focused on American history. Taylor’s history classroom reminded me of a traditional high school room, except most wall hangings were student work that included posters and timelines.

*Identity Growth*

Taylor thought of himself as a student who was unsuccessful in school, mainly due to lack of motivation. He had teachers, “who would just bore you…and it was straight up lecture.” So, when he decided to become teacher, he “wanted to attack it at a different angle.” Taylor felt that his early teaching experiences cultivated his creativity.

In his first student teaching experience, Taylor was given neither books nor curriculum. He had to devise lessons from scratch in a “sink or swim situation,” which forced him to think differently in order to succeed. In the second teaching position, Taylor taught female adjudicated youth, mostly from the inner city, some drug addicts and some mildly retarded.

The challenging experiences helped build Taylor’s identity. He explained that this helped him. “It actually helped give me a lot, don't want to say an attitude, but I had a lot of confidence.” With confidence, Taylor was also “self-analytical.” This confidence and self-analytical nature would be important when Taylor tried new teaching methods, and would discuss how he was doing with Anne. Anne reassured him on his progress.

Taylor also saw himself as “salesman,” selling himself to the students. In the follow statement he described how his identity intertwined with teaching:

I sell myself first and if the kids buy me, they'll buy the product and the product is education. It happens to be history and it happens to be, specifically, US history and European.

As a salesman, Taylor felt that he continually modified instruction to meet class needs.
**Beliefs about Teaching and Learning developed**

Taylor’s beliefs about learning were greatly influenced by his identity. He believed that motivating his students meant creating fun and meaningful learning experiences. “I think I take the subject, whatever it is that we're learning, and I try to find a way of getting the kids vested into it and immersing themselves.” In order for students to care, Taylor made each class a little different, by “playing off the class personality.”

He thought gaining student trust was of prime importance. Taylor talked about his classroom as “wide open for the kids.” He also gained trust by ascertaining student needs and meeting them.

Through observing his students, Taylor felt that there were learning differences between the tenth grade the twelfth grade students. He described the difference, “The 10th graders are a little less, by nature, wanting to have a discussion, question. Seniors are on the verge of the “real world.”

Taylor felt that tenth graders were “like a sponge, ready to soak” information. In addition, Taylor noted that they were accustomed to lectures from past experience. Conversely, seniors were going through a “drastic change” and into debating and opinions.

From the beliefs about sophomores and seniors Taylor rationalized the instructing difference that he had toward the two groups. He said sophomores needed more lecture, and the seniors were ready for project-based learning.

**Joys Experienced**

Taylor thrived on finding approaches to teaching that could help his students become excited about learning. Hence, when laptops were distributed, Taylor relished the opportunity. Laptops potentially provided a culturally comfortable way to retrieve information, not a
contrived means such as textbooks. He said, “I even hate to use the vernacular in a Chapter 13 or 12, because I don't want the kids to think this is a book, and this is all we have.” Instead, Taylor wanted the students to think about learning as a natural part of their lives.

*Technology Integration Progress*

When Taylor first received the laptops, he said, “There was no resistance from me at all to adapt this.” He learned on his own and soaked up the training offered by the school. Immediately, he saw the benefit to all the resources for history. In his words, “it's phenomenal” to be able to go out and get the resources.

Technology helped propel what Taylor was already trying to accomplish in the classroom. He had students do role-plays and do projects. His philosophy was to learn and have fun at the same time. Laptops just helped his job become easier.

*Specific teaching and Learning Skills Shaped*

Since the beginning of teaching, Taylor used student involvement and fewer lectures, but regardless, he reported that his teaching style had evolved. While thinking he noted, “Ummm, I think my teaching style has evolved, maybe with the technology.” Then, Taylor proceeded to make a very interesting statement, “I'm probably a better teacher the less I know.” Taylor clarified his statement by describing the way he was forced to design the European History and Literature class.

When Taylor and Anne proposed the class, Taylor knew very little about the content. In order to lecture effectively, he would have to put in “years of time”, similar to what he had done with American History. In this case, that was not an option. Instead, Talyor was required to learn quickly, and this experience helped to him to empathize with students learning process.
As a result, Taylor developed a new method for teaching, that he referred to as a journey of learning. In this example Taylor described his learning process, the benefits, and what it provided for the students.

...it's okay for me to be with them in the journey of learning, and it forces me to come up with creative alternative ways of going through that journey, and that's where you get the projects, that's where I find the ways of sharing the information and dissecting it. The kids, physically and mentally, see the connections being made by Anne and me; they make them also.

Taylor’s lack of knowledge required him to rely on “historian thinking,” analyzing data to make sense of events. In this way he could model historian behavior for his students.

Reflecting more on this turning point learning experience, Taylor noted that it did not seem “smart” for him to choose to teach the course, but as a teacher it “was smart,” He learned another way to teach: “I didn't stand up there and lecture and tell them how awesome it was. They taught each other and they taught me.”

Taylor thought that kind of learning forced him into a situation difficult for most teachers who like to be the subject matter expert. In fact, sometimes it was difficult for him. He said that some student always knew more about European history than he. Taylor described how his belief system helped. He said, “If you were self-conscious or not strong in your own belief, then it would really bother you.”

In contrast, Taylor compared his attitude with other teachers around him. He did not think most teachers would relish the opportunity to teach unfamiliar content.

The more you are the master of the content, the more the kids will respect you, the more your colleagues will respect you, the easier it is for you...as the people struggle, you stand there and laugh saying "I know all of this..."

Taylor felt that an expert attitude made it easier for a teacher to lecture so as to tell students all the answers and experiences, instead of providing experiences for the students.
School’s Cultural Impact

Taylor said that his teaching style did change based on the class, but the difference was also due to classroom period structure. The European History course was more project based, but it was two periods or 90 minutes. In his sophomore classes, of 45 minutes, Taylor said he was more likely to lecture, and to adhere to the curriculum, although students still do many projects.

He and Anne developed the curriculum for European literature and history course. In contrast, his tenth grade classes were more rigid with a school prescribed curriculum.

Fears or Struggles Acknowledged

As Taylor observed student learning in his European history class, he became frustrated with the current system of schooling. The European history class was a 90-minute period, and the sophomore classes were 45 minute periods. In the following example Taylor explained the origin of his feelings:

You don't physically have the time per period, you don't have the time, days in a calendar year...academic year; you start to pull back on some of the creativity and the industrial model...you start pumping it out again.

Time and large student numbers served as obstacles for student learning. Taylor wondered if block scheduling would help all his classes since block scheduling provided longer periods with fewer students to serve.

When teaching the tenth grade students, Taylor feared student dependence on teaching the content like was done in the European history course. Taylor explained why.

“The difficult thing is, if a student doesn't do a good job or doesn't do a job at all, then you've completely skipped an important piece of information which you were responsible for.” Taylor noted that the student often had a hard time differentiating between what was essential and what
was “really auxiliary.” Taylor did not have the time to engage 120 students in rich meaningful projects.

In this way, the school structure of 45-minute periods, his belief about learning differences between sophomores and seniors, and his struggles accepting the current model of education, became a frustration and a possible contraction.

*Professional Development that Mattered to Anne and Taylor*

During the first two years of the one-to-one program, the school created time for the content area teachers to engage in monthly talks on technology integration. Teachers received classroom coverage so that the meetings could be done during school time. Meetings consisted of in-house people training, or informal teacher talk. Anne and Taylor both felt that this time was invaluable. It encouraged them to share ideas and ultimately to grow professionally.

In addition, Anne and Taylor were given additional planning time that included bi-monthly meetings. Taylor even felt that it was too much time. Unfortunately, Taylor wished that the district still supported the monthly department meeting, and without them, he felt that the teachers became stagnant.
Case 5 (Samantha), 6 (Jessica) and 7 (Inga), Charter School

Charter School Description

Samatha, Jessica, and Inga worked at the Charter Middle School for fifth through eighth grade. The school had been operating since 1998. As soon as I walked into the school building, I was struck with all the student work. Posters, charts, models were hanging from ceilings and walls, and there was a table where the eighth graders sold pizza.

Statistics

- Public – Charter middle school – 100 Students, class about 25
- 70% Caucasian, 30% minority
- 20% Free or reduced lunch
- National Report Card
  - Reading 60% Proficient or above
  - Math 60% Proficient or above
  - Met Annual Yearly Progress targets 2005-2006

One-to-One Program

- There was a computer for each student. In fifth and sixth grades, students had assigned desktop computer in their classroom. In seventh and eighth grades, students had laptops and did take the computers home.

Administrator of the Charter School

Helena, the school administrator, was a retired principal from a local traditional public school. During retirement, a half- time administrative position at the Charter was a dream educational environment where she could facilitate instead of mandate. Helena did not teach students, but she supported teachers that were already convinced that hands-on and project based learning would benefit students.
**View of School Culture.** Helena felt that the school culture reflected societal changes. In the follow statement she intertwined her reflections on the outside culture, and what it meant to education today.

If you look around our offices, they're not 1950's offices. They're not 1970's offices, or 80's. We're teaching a different breed of child that is to use hands on, that is used to technology, that is used to doing some problem solving. Let's face it: our culture today is a problem solving culture. We need to teach kids to be those problem solvers, and think out of the box. This kind of an education helps kids to do that, and I think those are the kind of things that I would like to see happening.

Helena voiced that the charter school reflected today’s needs based on the organizational structure, teacher expectations, student structure, and what was known about learning.

Organizationally, Helena described the structure as “flat” and egalitarian. Teachers self-assess and develop, administer, and analyze a parent survey. In addition, teachers teach each other new technologies and methodologies, help each other with curriculum, sit on the school board, create minutes of staff meetings, interview new teachers, and evaluate peers. In addition, the classroom teachers’ expectations included teaching all main subjects, and creating in-depth projects, which meet state standards.

Student organization structure mirrored what Helena felt was known about learning. Students were grouped according to grade, but there were two grades per classroom: fifth and sixth grade, seventh and eighth. The school was project based, meaning that students did not engage in a separate subjects called social studies or science, but instead completed projects that combined history, science, math, reading and writing to create a presentable dialogue about the learning topic. Project time was a two-hour time block. Students may create a museum, write grants, give presentations to city officials, but always present to their peers. Math was taught separately each morning.
Repeated, Helena emphasized the learning culture of the school. In the following quote she described how this helped the Charter school be a center for adult and youth learning.

Our teachers are constantly learning… So, this is a sharing culture. This is a culture of learning. This is a culture where you can say to somebody, “I don't understand how to do that; I think it might be helpful; I'd like to use that in such and such a way; could you help me.” And, people are always willing to help.

Helena felt that this sharing-learning culture was the center of the school’s success.

*Rationale for Recommending Teachers.* Helena welcomed me to interview any of the teachers. Teachers were hired based on their philosophy of teaching and learning, and those that had a “different state of mind who had been looking for a alternative ways to do things.”

I found it interesting that the Charter did not look for teachers with project-based experience. Instead, Helena was more interested in teachers that would embrace the school’s pedagogy for teachers and students regardless of past teaching experiences.

*View of Technology Integration.* The school had been a one-to-one school since inception, and technology was a vital part of curriculum creation and delivery. There was no separation of the curriculum and technology.

*View of Professional Development.* Helena described the professional development as emanating from the sharing culture. The teachers were responsible for their professional development both in formal and informal ways. It was informal in the way that teachers communicated. Then formally, a new teacher was intensely mentored by another person, and all teachers share projects once a semester with the staff.

In addition to weekly staff meetings, professional development was most often determined and implemented by the teachers. The extensive staff development issues were reserved for two weeks of in-service training that took place at the end and the beginning of the year. At the years’ end, the teachers analyzed the past year and determined what they would like
to change for the next. Periodically, an outside expert came to train. An example was training on the Smartboard®.

Unlike traditional schools, teacher evaluation was viewed as a professional development opportunity through teacher sharing. In the Charter school, Helena explained how it was done.

Every teacher gets up with either a power point presentation, maybe a portfolio. There's a set of different topics you look and they talk about: how do they assess kids; how do they work with all the kids in the school; how do they do all different things…

The teachers had determined the criteria for portfolio review and had refined them over the years. In addition, they had a rating form used to rate each other.

Helena was enthusiastic about the additional peer review that was happening this year. Teachers were going to observe each other and respond based on the pre-determined criteria, which was designed by them.

Summary. Helena saw that the school culture and organizational structure were valid for the current age, and only teachers that wanted to teach within the school culture would be hired. The school learning culture was time consuming for teachers, but more egalitarian than her previous public school experience. They propelled teachers to be agile when learning, by implementing to produce deeper student learning and discussing it with their peers. Most evidently, Helena was proud of the staff accomplishments when the teachers had so few models outside of the school.
Case 5 - Samantha

Class Description
- Grade/Subject: Fifth and sixth grade, self contained
- One-to-one Program: All students have a desk-top computer in their room
- Schedule Structure: Math - 1 hour, silent reading time – 30 minutes, Project time – 2-4 hours.

Samantha
- Gender & Age: Female, Mid-forties
- Education: Undergraduate Major – Developmental psychology; Master Degree Special education and elementary education
- Teaching Experience: 13 Years
- Teaching with one-to-one: 4 years

Figure 11. The footprint of Samantha’s classroom.

Samantha’s room was very spacious, almost the size of two regular classroom. Papier-mâché sea creatures hung from the ceiling, and computers lined the walls. Movable tables and chairs sat in the middle of the room, but were moved to the back after math. Samantha had an assistant teacher, which is why there are two teacher’s desks.
Identity Growth

Samantha considered herself an intelligent educated person who had attended prestigious undergraduate and graduate schools. However, she did not have inflated pride. Samantha was aware of her limitations, and called herself “a linear thinker” which would impact the way she learned to integrate technology and create projects.

Samantha said had gained confidence and creativity by teaching at the Charter school. She felt that she could make wise decisions about students learning.

Beliefs about Teaching and Learning Developed

From graduate school personal experience, Samantha believed that children needed to learn thinking, which went beyond memorizing facts. She felt, “It doesn't really matter what you learn. It's sort of how you think, how you problem solve.” If students could solve problems, Samantha felt that they could do anything.

Samantha was trained in special and elementary education, and she had taught in four different schools before arriving at the charter school. In most instances, she created and supported individual educational plans for students of various ages and abilities. Samantha cited Howard Gardner’s Multiple Intelligence Theory as a theory that supported her approach to instruction, and she viewed each child as an individual.

Lastly, Samantha did not believe that she knew all. Instead, she valued parent, students and peer feedback.

Technology Integration Progress

When Samantha had begun at the charter school, she had used word processing and searching, but that was the extent of her computer knowledge. Since all the student projects were
on the web, she had to learn quickly. Other Charter teachers taught her to create web pages, and how to create projects.

Samantha wanted the two-prong approach, the technical with the pedagogical. First, she mentioned the teachers that helped with the pedagogy, and why they appealed to her.

I had two staff members who were very holistic, and technology wasn't their passion…They were wonderful people, very philosophical, but not technical. I enjoyed the academic conversations with them, so that's where I could get my idea of curriculum sparks from them.

The two teachers were similar to Samantha, as she did not see herself as a technology person. The pedagogy gave a reason for learning the technical. Second, she then talked about learning the computer. Samantha credits her learning to two teachers that were “wonderful” and helped her learn.

After Samantha had learned basic web design, she relied on parent feedback for their child’s reactions, so she also listened to critiques on Website presentation and functionality.

During her first year, Samantha felt that she had a “steep learning curve” with software and project work. In fact, she had felt that she had learned some tough lessons in the area of delivery and design of instruction.

Specific Teaching and Learning Skills Shaped

Project design was a learned skill for Samantha. She was accustomed to rubric creation and individualized learning, but she was unfamiliar with making a six-week project. She learned two skills: One, how to combine project based learning with skills, and two, how to create a project with her learning style.

The first year she felt that she “threw the baby out with the bathwater”, in an effort to assimilate into a project based, technology intensive system. Samantha did not use things that she knew to be “true about teaching.” She elaborated by articulating her reasons:
I felt like I had to do every single part of my day differently… I didn't teach things the way I had before… I think I felt that everything had to be, you know… this cross connected thing, and I didn't pull out specific skills anywhere. Anymore, it was all this interdisciplinary…

Samantha felt that she overcompensated with interdisciplinary learning. She felt that students needed specific grammar instruction, and reading for specific details, yet she did not want to “ruin the literature and beauty” of the whole.

In the first year, Samantha learned to differentiate between project based education and the traditional system. She learned to ask herself what was the same and what was different. Samantha said, “Now, I do a combination,” but it required continual reflection. She described how she self questioned. “How do I create a balance where I can still teach them the tools that they're going to need in order to read and write and to research?”

Samantha learned to teach specific skills, but it was a continual process for her. Some skills seemed loosely related to the whole project, but Samantha felt the skill was important for academic development. As a result, she taught the skill.

Being a facilitator also meant constant observation of children to accurately determine their needs. Samantha learned to better diagnose and deliver individualized student instruction, while maintaining a project approach.

In her diagnosis, Samantha realized a problem. Sometimes students were expected to research and question, to actively be involved in a project, but the student was not quite ready. She describes her inward “wrestling.”

Every year with each kid I wrestle, because there truly are some kids who just need direct instruction. There are some students here who, even though project based seems like such a wonderful idea, it's too hard for them or how we do it is too hard for them.
Samantha felt that sometimes students needed more structure, and as a result, she varied her instructional method. She gave the student graphic organizers or fewer choices.

With a “linear mind,” Samantha developed a method for designing projects that worked for her. She learned to break a project into thirds. The first third was the “nuggets”, or the large “stuff you needed to know.” This third would also include a hook or video to get the students interested with a concentration on skills that would be needed to complete the project. She would observe the students who were struggling, or needed more guidance. This portion took about two weeks.

In the second third, students engaged in group-projects with lots of choice. Samantha explained her rational for the second third: “They’re the teachers to the whole group about things that may not be essential, but are interesting, and related, they get into the interdisciplinary program.” Samantha felt that student presentations were vital for learning. During this strand, she would also watch students to ascertain who needed more guidance.

In the final third, Samantha directed or redirected the student to essential information, where students were usually individually accountable. Once again, the students would display their work for other students as the experts on their topic.

Samantha told of other important teaching and learning skills acquired. She learned how to put students into effective groups to maintain accountability. She taught group dynamics, and consensus building with listening skills.

Joys Experienced

Samantha enjoyed the final strand of the projects when the students were the experts. She felt that then they “took off and blossomed”:
Hopefully, they have been sparked along the way in an area of passion. And that's when they go. They do their more individual research, and an individual product that they created. So at the end...We're going to save the world!

Samantha expected the children to identify the meaningful information, and to present it to others in a way that coincided with information, ie. game, movie, PowerPoint® etc. It gave her pleasure to watch the students.

Also at the end of project, Samantha relished the feedback students gave to each other.

Samantha felt that the students learned the “sandwich” metaphor from her: “I try to say something positive, and then constructive points. Then, wrap up with something positive again.” She also discovered that student began using rubrics as feedback guides. Samantha felt that the student seriously took feedback from their peers.

*Fears or Struggles Acknowledged*

Samantha battled with a similar issue that she had when she interviewed at the charter school. When initially viewing teachers on-line projects, she said that “I could see the logic” of projects, but they were “more a spider web, intertwining and connecting in so many ways.” This gave her anxiety.

After making multiple projects, she can now predict that she will have an overwhelming feeling during project design. Samantha explained why she feels this way, and how and why she works through the feeling.

There's too much, and there's so much out there. I know to just let it ride and keep doing all the little splinter pieces, and then, eventually it's like putting a puzzle together. All the pieces do come together and you have this amazing, elegant final project.

She admitted that project design takes focus. She must not lose the big picture and get lost in the details.
School’s Cultural Impact

Samantha enjoyed the peer collaboration at the Charter, and even the peer evaluations. She felt it was “okay to disagree.” Samantha summed up her experience in the following statement:

I love to take the essential things that kids need to know and how could you get the knowledge to kids...and present it in an exciting way, in a creative way, in a way that fits their interests… the Charter really gives me the opportunity to be a creative educator.

Since Samantha and other teachers were focused on thinking, Samantha felt that the students at the Charterleave with confidence that that can do anything, similar to herself.

Professional Development that Mattered

Samantha felt that the teacher discussions at the charter school stimulated her intellectual capacities as well as fulfilled the pedagogical needs. She contrasted her experience at the Charter school to a recent conference on special education where she was aghast at the questions that others were asking.

The questions that were coming from these experienced teachers were just scary... How little they knew...and they didn't know how to write a well-written individualized education plan with goals, and charts and things like that. They didn't even know how to write a goal! That's kind of basic to your job, isn’t it?

Outside of the Charter school, teachers school enjoyed the unique time conferences offered with colleagues and professional development since they do not get much time with their peers. Unlike many traditional experiences, Samantha felt she had many occasions to gain feedback from her colleagues, valued it, and as a result, knew more.
Case 6: Jessica

Class Description
- Grade/Subject: Fifth and sixth grade, self contained
- One-to-one Program: All student have a desk-top computer in their room
- Schedule Structure: Math -1 hour, silent reading time – 30 minutes, Project time – 2-4 hours.

Jessica
- Gender & Age: Female, Late twenties
- Education: Undergraduate Major –Elementary education
- Teaching Experience: 5 Years
- Teaching with one-to-one: 2 years

Figure 12. The footprint of Jessica’s classroom.

When I met Jessica, I was struck by her youthfulness, the baggy pants, and her high pitched but soft voice; it caught me off guard. Her room is much like Samantha’s. She too teaches a combination class of fifth and sixth grades, with desktop computers lining the room’s edges.

When I observed her room, a group of students were running a discussion on literature. Students sat with Jessica in a semi-circle. She did not sit in a place of prominence, but as a member of the group. The students ran the discussion, and each took turns asking interpretation
questions about a book. Jessica interjected at times to support or clarify a question a student was asking. She spoke less than 20% of the time.


Identity Growth

Jessica began studying to be teacher after a school counselor’s recommendation. The career option excited her, not just because of interest, but it would allow her to undo the past. In her elementary years, Jessica recalled two instances where teachers sharply discouraged her from careers. At the end of retelling the stories she said, “Yeah, it was hard. And, I couldn't pick anything all this time, and that is something like a dream in a kids mind. I avoided it (career choose), because I was afraid to be shot down.” The early childhood experiences had a profound impact on Jessica, even in high school.

Through college, training, and the Charter school, Jessica said that she had gained confidence. At the Charter school, the confidence others had in her instigated confidence in herself.

Beliefs about Teaching and Learning Developed

Jessica believed her teaching job entailed supporting students’ dreams, “Never demoralize them,” but instead, “lift them up and give students the skills to perform the duties of any career.” Jessica attributed this belief to her own elementary experience.

Another belief was formed in college through an education professor that had a profound impact on Jessica’s developing pedagogy. The professor informally discussed with his students, and from their insights derived essential knowledge. Jessica told the anecdote:

He (the professor) would say, “You know the syllabus and you know the reading for today…Have you ever experienced this type of thought before?” And it might be a thought of how to speak in a classroom. And, people would say, “I had a teacher here…” And he would say “What was right and what was wrong? What worked and what didn't work?” ...And that is when the notes came out. So we would we generate our own notes.
Jessica decided she learned best in this discussion-based informal atmosphere, where students’ experiences were valued and related to the content.

Entering her first teaching job Jessica would develop a second belief. The school, in a poor rural southern area, Jessica taught minority self-contained fourth graders who struggled both socially and academically. Jessica found the school’s transmittive based pedagogy did not allow for student cultural differences. Jessica described why she believed that school’s prescription did not work:

When you would get them into a topic and get them thinking, a lot of times, they go think through their perspective and they want to connect through their interest, and they bring it up. And, then you would want to continue it, but the time is winding down … So, you have to shut them down. They (the students) close their door. You close your door, so there is no real learning - authentic learning.

Every week Jessica had a list of proposed objectives and was required to remove free time if students did not meet the tested objectives. Students would be retested until they past the test, and Jessica reported that students quickly forgot the information once they passed the test.

However, Jessica assumed that if that if she worked hard, she would get parent and principal support, which would be the needed leverage to teach differently. Teaching differently for Jessica would mean creating lessons where students had experiences to personally and emotionally connect with the content. Getting and maintaining parental support was still important.

After teaching at the Charter, Jessica reflected on what she believed about learning: Students learn best in a project based, multi-disciplinary approach where they can engage in meaningful, and sometimes, emotional activities.
Specific Teaching and Learning Skills Shaped

When teaching at her first school, Jessica experimented with designing student experiences, one of which wound up being a turning point for her pedagogy. She had to teach about the *Declaration of Independence*. Instead of lecturing, the students wrote their own declaration document that said, “We are declaring our independence from this school because we wanted a different school,” and stated their rationale. Jessica said the students were excited about their “legally binding” signed document. During lunch, she hung the student signed document around the school.

After lunch, when the students saw their document hung, they “were freaking out, and some of them were in tears.” Unbeknown to them, Jessica had obtained the principal’s permission to hang the documents. Jessica took the moment of fear, as a learning opportunity. She said to the students, “Well you guys signed them, and do you think those people that signed the Declaration of Independence were this scared too? So that is what happened to those 52 signers.” Jessica proceeded to discuss the revolutionary feelings and the events that transpired. She noted, “The students’ jaws dropped, so I asked if they could imagine the cost of freedom.” Jessica had learned how to connect students’ emotional experiences with content.

In Jessica’s second learning anecdote, she learned how to make interdisciplinary lessons. The school sent her to a science program for gifted students, and she supplanted the curriculum into her school. Jessica shared her thoughts, “It was amazing. The science curriculum integrated literature, and math, with science while reading books, and the whole shebang, and in just the science time of 45 minutes … But they connected it all.”

Jessica implemented the science unit into her September school curriculum. She noticed that the students discussed the content at the end of the year. Jessica had added to the third piece
of pedagogy; “Student learn by making connections.” Both interdisciplinary learning and designing student experiences were specific teaching and learning skills that shaped Jessica’s desired development in education.

\textit{School’s Cultural Impact}

Whether at the first school or the Charter, Jessica wanted the support of the principal. Even in the very traditional school, the principal supported Jessica’s innovative approach. Jessica noted. “The principal let me try the new things; she could have said no.”

At the Charter school, Jessica felt that all teachers helped her grow professionally. Teachers questioned a teacher’s rationale for a project design, rather than merely suggesting project improvements. Jessica commented about the her process, “It was almost like I was in a classroom, we were on the same level.” All teachers questioned each other, a similar expectation they had of their students.

\textit{Professional Development that Mattered}

As mentioned at Charter school, teachers formally presented their projects in order to get feedback. Initially, the experience was a culture shock since Jessica never experienced feedback in a professional setting. Despite her emotions, she found the process beneficial and described why:

When you do your project, you only have one perspective and you get so excited. I got so excited, and then some of the questions came out. And, I was like, oh, wow. It was so perfect. Then, I was like, “Oh, I could do that. Why didn't I think of that?” But you are in such a tunnel, with your own focus… and you don't see it until someone points it out to you.

After listening to other teachers’ ideas, Jessica was empowered to modify, and improving her projects. Project sharing could be uncomfortable, but Jessica felt that it contributed to her professional growth.
**Joys Experienced**

Jessica showed enthusiasm when she discussed her observations of students learning. First, she enjoyed when the students connected the various things that they had learned. She described the experience “wow-so awesome.”

Second, it excited her to see the students motivated about learning. Jessica tried to created lessons that she described as “going in the backdoor,” so the students were not aware that they were learning in school. When the students kept asking questions, and looking for answers on their own, she felt that “real learning” was happening.

**Technology Integration Progress**

When Jessica first applied for the job at the Charter, she was nervous about the technology, designing large projects, and posting them to the web -- things that she had not done. However, in her interview she was appeased.

I interviewed with 4-5 teachers, and they said that I had the job. I figured this is where I was supposed to be. They had faith in me. So, my fear of technology, and putting everything in files, on the web, sort of went down when I saw the quick reaction of their confidence. When I saw their confidence, I had confidence in me.

Jessica believed that she could do the job, even with the obstacles before her. It seemed that she believed that her faith, and her feelings of destiny provided her with the reassurance for learning.

She received advice from others, was mentored, she learned the computer skills necessary so that it became seamless with the project based learning.

**Fears or Struggles Acknowledged**

Later, Jessica felt student reactions and frustrations with projects. However, she felt that students could provide her with ways to improve a project. Student feedback was on-going, and Jessica has worked out a system.
Jessica asked the students about their struggles. Then, she asked the students to self assess, and give her feedback on the rubric. Together, the teacher and students made the modifications that encouraged learning.

**Case 7- Inga**

**Class Description**
- Grade/Subject: Seventh and eighth grade, self contained
- One-to-one Program: All student have laptop computers and take them home
- Schedule Structure: Math -1 hour, silent reading time – 30 minutes, Project time – 2-4 hours.

**Inga**
- Gender & Age: Female, Mid-thirties
- Education: Undergraduate Major – in Science with an emphasis in Physiology; Level II Certificate in Biology, General Science and Middle Grades Math
- Teaching Experience: 8 Years
- Teaching with one-to-one: 4 years

![Diagram of Inga's classroom](image)

*Figure 13. The footprint of Inga’s classroom.*

Once, I found Inga playing volleyball with the students. Another time observing, Inga was rotating around the room, among seated students. The student were not in assigned seats, but sat next to partners. All students were engaged as the teacher rotated around the room, in no apparent order.
Identity growth

After an undergraduate major in biology with a concentration in physiology, Inga was unsure of a career. A motherly suggestion prompted her to return to school to earn a biology and general science-teaching certificate. Inga had taught fours years in an area public high school and middle school science, and four years in the Charter school.

Inga thrived on challenge, eschewed boredom and enjoyed a little competition. She described herself as someone who learns things easily, and as a person with confidence, but also, Inga described herself growing in confidence at the charter school. She stated, “You can’t be a bad teacher and teach here,” although there were bad teachers. Those that were “burnt out teachers doing the same things over and over again and use old information.” In contrast, Inga felt that she could teach well. In many ways, Inga had grown professionally, and her continued growth led to a disappointment in other teachers.

Belief about Teaching and Learning Developed

Inga left traditional school, and applied to the charter school since she was ready for another challenge. The technology and project based environment intrigued her, although she had little experience with either. She believed that students needed computer skills for the future. Inga explained her point of view:

I was kind of turned on by the fact that it was a lot of work on the computer. I know how much it's a part of society today, and how important it is for everybody to learn those skills because it's used so much in everybody's job. I think it's important for kids to learn as soon as possible, and become comfortable with the computer.

Inga felt that computers were important to student learning because they potentially allowed for creativity, and for professional looking products.
Originally, Inga was intrigued by a multi-disciplinary approach, but she became an advocate of project-based education after teaching in the Charter school. She now believed that students “cover more information” in traditional public school, but Inga felt her students knew the information deeply.

Inga also believed that student interest led to improved student learning. Inga felt that if students did not become engrossed in a project, though this might take a week, more discipline problems would result. Student disinterest was usually the cause of problems.

Therefore, she felt her responsibility included designing interesting projects. Inga said, “What gauges my success is watching the performance of my students.” Inga listened to student-feedback; since, she assumed student interest it was a reflection on her ability to teach.

**Fears and Struggles Acknowledged**

When Inga first came to the Charter she was ready to embrace the computer and project challenges. Inga was concerned about two things: interacting with students most of the day, and teaching with a partner.

At the Charter, Inga was expected to spend most of the day with students. From her past perspective, this was a high expectation. Inga explained compared the Charter expectation with her past experience:

*(In traditional education)* You have your classroom, and they (*students*) come in and they go out and you're just in that room...it's your show. Class starts when the bell rings and you're on. You have that 45-50 minutes to develop your lessons for that day and you have that group of kids … But here you're always "on".

Inga felt that much more was demanded of her here. Teachers eat with, played with and taught the students, and interacted with them before and after school. “It's just every day all the time.” Now, Inga found that she enjoyed the lengthy student interaction, which helped her build rapport with the students. In addition, she felt that classroom discipline was much easier.
Her second fear entailed partner work. After solo teaching for four years, she was going to be co-teaching. Inga wondered, “Would he would be lazy, or just irritating.” She also pondered if she, herself, could establish boundaries. She worried in vain as she notes, “His strengths and my strengths compliment each other's weaknesses. So, we mix really well.” Inga’s partner enjoys making the assessments, rubrics, and history, which Inga finds essential for students projects, but she does not enjoy doing.

Joy Experienced

Inga used the word “show” to describe her role in traditional education. In unique contrast, Inga used the word “show” to describe her Charter students now “on-show.” She was very proud of her students’ accomplishments and enjoyed fantastic displays of student learning.

Professional Development that Mattered

In addition to the partner feedback, Inga also received comments on her projects in formal group meetings. She found that presenting to her colleagues helped her to grow. She said,

They give you ideas of other things you can do to help enrich the project, or they might point out something that you might want to be careful about. Or, they might question you about something, and then you're, oh, yeah you're right, or yeah, I probably shouldn't.

Project sharing and the peer informal and formal conversations, allowed Inga to know that she was on the “right path” since she was “100% accountable” to her peers. It was also the reason that Inga felt that “you could not be a bad teacher” at the Charter school. You would know if you were teaching poorly.

Specific Teaching and Learning Skills Shaped

Inga had created an inter-disciplinary unit in her teaching certificate program and had incorporated a couple of projects into teaching at a traditional school. Therefore, she had
experience with project creation, but she felt that her teaching became more “refined” at the Charter. For example, she used a forensics project in traditional public school and implemented the same project in the Charter school. At the charter, students created more in-depth writing, evaluated more resources and analyzed complex information.

Even after the students at the charter school completed the project, Inga revised it again, because she felt that the students were not thoroughly explicating their reasoning. Inga found she needed to closely observe the students.

She also found planning lessons in the Charter environment different from traditional education. In the past, she had to plan for a week or two; now, she planned for two months. In addition, she could be very creative the beginning of project design. Inga described the process that she used to create a project:

I can just let my imagination go. If I can think of it, I can do it… I would set up, just get a piece of paper. I block it off and make a huge chart of week by week. I usually start with 5, …I collect activities, and I start writing in what activities I want to do, and decide when and what the outcome will be.

After the brainstorm, Inga organized the work on a website, with a website calendar listing and all of the knowledge and skills that would be required. She listed all the websites students could use, and then, listed the standards the projects met.

Inga found that she worked systematically but changed directions at times. “I might start from the back and move forward. I just build it piece by piece.” She allowed her creativity to go, and got “really excited” by all of the possibilities. She described herself as getting so “engrossed” that she did not want to “put it down until a clear stopping point.”

A clear stopping point may be a blank spot, where Inga was unsure of what to do. If that happened, Inga reported that she put the project aside, and let her subconscious sit on it. Later, she “filled in the gaps.”
Technology Integration Progress

In the beginning of the Charter work, Inga reported that her partner’s technology savvy was crucial. When she had a problem, he would show her how correct it. She said, “I was never intimidated,” because he complimented her expedited learning. Inga was proud of her technology skill.

After initial computer skills were learned, Inga was always searching for ways students could make sense of information in a motivating fashion. In this way technology was a great tool for her. For example, students made wire-frame models, and later, in Flash®, created animations of anatomical movements to show injuries.

School’s Cultural Impact

When Inga first began at the Charter school, she noticed that students presented their projects in their classrooms or to some audience. As Inga said, it was “cool” and wanted her students to do the same, however, she also wanted her students to go beyond the other classes. Inga reported how she did this.

I’ve taken it to a higher level, and we do presentations in the "big" room. We did the optical illusion museum, and they set up all throughout the big room and turned my room into a walk through model of the eye...

Inga thrived on the competition, but it was not the only thing that inspired her. Inga talked about the learning philosophy that supported presentations; it forced the students to know the information well.

They're (students) not only just "learning" it, but then they apply it, which is... they learned it; they applied it. Then they go to step 3, here, and present it. So they have to know it well to teach it.

Other teachers and their student presentations may have inspired Inga, but she came to understand the learning philosophy that supported student presentations.
CHAPTER 5
DISCUSSION
Moving from Transmitter to Facilitator
Individual Change

When thinking about teacher change from transmitter to facilitator, one thinks of a process, movement, or something that happens over time, not a single event. The change process is gradual, and the person changing interprets the feedback (Duke, 2004). The focus is not on a final product. Therefore, in the discussion of findings, I summarize how or why teachers moved toward the facilitator’s role in one-to-one environments based on the common issues and themes, which they had conveyed through their interviews, observations and lesson plans.

There are six themes: external forces influenced teachers’ perception of classroom needs; beginning small trials reinforced beliefs about teaching and learning; student observations and structural constraints modified instruction; moving toward project based approaches; overcoming hurdles for project implementation; and teachers developed their identity but were enhanced with professional support. Within each theme there are multiple categories that explicate the themes.

Before approaching the teacher themes, I’ll discuss the administrators’ selection of the teachers and compare their views. The administrators provided many insights into the change process of the teachers. First, they provided the cultural context in which the teachers’ changes were made (Fullan & Banathy 1973). Second, they gave insights into administrators’ perspectives of technology integration with teachers. Third, administrators’ input together with the teachers’ input supplied enough data to align the teachers within views.
Administrators’ views

Administrators chose teachers for the interviews based on my criteria: that is, they identified teachers that were making good progress from transmitter to facilitator with technology integration in one–to–one environments. Their choices were based on informal observations of the teachers, their curriculum development, and teacher-student interaction as well as discussions with the teachers.

Administrators recommended teachers that would be considered in the “inventor stage” of technology integration, according to the Sandhotz et al. (1997). The teacher invention stage is characterized by facilitating classroom collaboration, students’ complex projects, team teaching, and implementing various forms of student assessment. Importantly, these teachers “experimented with new instructional patterns and ways of relating to students and teachers” (p.44).

It was not a goal of this study to classify the stage of teacher development; however, a basic consideration of teacher stage development enhances understanding of the change process. Hence, it should be noted that participating teachers varied in their degree of invention.

The City School Administrator felt that his school had not achieved the ideal curriculum for student preparation. In parallel, his recommended teacher, Wyatt, had not achieved the ideal technology integration. The recommended teacher was the assigned reading teacher, who taught a subject targeted by standardized testing. Regardless of the testing pressure, Oliver said that Wyatt “embraced technology”, and had changed his teaching style as a result, and felt that Wyatt was “running with it.”

The Boarding school administrator, Edward, recommended Zoe, for multiple reasons, not only because she used technology. From his observation, Zoe was a teacher whose “passion
trickled down to the students.” She had a “personal desire to move forward in an area” and her enthusiasm rubbed off on her students.

Most importantly, Edward saw Zoe’s ability to individualize instruction. When describing her instructional style he said, “It’s the epitome of differentiated instruction and it’s so hard to do in any classroom, with or without support.” Edward discussed Zoe’s ability to differentiate at length, so, it was obvious that Edward respected Zoe for this ability. Consequently, he described ways the school had financially supported her extra programs including a personal laptop cart and computer software.

The Rural school administrators recommended teachers that engaged in unique instruction, although not by individual customization such as in the Boarding school. Instead, Martin and Lisa admired Anne and Taylor’s ability to utilize the computer resources, and felt that Anne and Taylor represented the “epitome” of transforming education in ways that other teachers had not done. Lisa explained,

A lot of our teachers use laptops, almost all of them do, I would say, but maybe just doing the old things in the new way; let's word process, print this out instead of doing it on paper, let me just throw you a worksheet, but Anne and Taylor use it in a way that they're doing new things in new ways.

Lisa and Martin could not articulate what Anne and Taylor had done differently except by comparing them to traditional teaching styles. In situations where the one-to-one program needed defending, Lisa and Martin used the classrooms of Anne and Taylor as examples of ones that were significantly altered by technology.

Unlike the other schools, the Charter school administrator recommended any teacher for my observation. Helena attributed the open selection to the teacher expectations within the culture: “Our staff works on its own to learn new things and it is a very interesting culture here.” The school was project-based and computer based. Therefore, when the school was hiring, they
looked for teachers who did not want to teach traditionally, but rather, desired to teach in an alternative style and also, fit into the school culture. Helena explained what they looked for in a teacher candidate. “We let them know that this is a school where teachers help make the decisions. That's tough. Sometimes it's easier to let somebody else make the decisions.” As a result, Helena realized that the school was suitable for only particular teachers, but those that remained, she deeply admired.

Table 8

*Inventor Stage Continuum*

<table>
<thead>
<tr>
<th>City School Wyatt</th>
<th>Boarding School Zoe</th>
<th>Rural School Anne and Taylor</th>
<th>Charter School Samantha, Jessica, &amp; Inga</th>
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<tbody>
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<td>45 minute classes</td>
<td>45 minute class</td>
<td>45 minute class &amp; one 90 minute class</td>
<td>Self contained classes</td>
</tr>
<tr>
<td>Never team taught</td>
<td>Team taught based on project needs</td>
<td>Team taught one class</td>
<td>Team taught</td>
</tr>
<tr>
<td>Higher level classes have many projects</td>
<td>Most work is project based</td>
<td>European History class: project based</td>
<td>All subjects but math, were interdisciplinary</td>
</tr>
<tr>
<td>Some individually based instruction</td>
<td>Most individually based instruction</td>
<td>Used projects in other classes</td>
<td>All subjects but math were project based</td>
</tr>
<tr>
<td>In higher level classes, students taught one another</td>
<td>Students taught one another</td>
<td>Individually based instruction in European History</td>
<td>Individually based instruction</td>
</tr>
<tr>
<td>In higher level classes, students as experts</td>
<td>Students as experts</td>
<td>Students taught one another</td>
<td>Student taught one another</td>
</tr>
<tr>
<td>Experimented with new instruction</td>
<td>Experimented with new instruction</td>
<td>Students as experts in European History</td>
<td>Students became experts</td>
</tr>
<tr>
<td>Used the computer as a tool</td>
<td>Used the computer as a tool</td>
<td>Experimented with new instruction</td>
<td>Experimented with new instruction</td>
</tr>
<tr>
<td>Students used tables in groups</td>
<td>Students used tables in groups</td>
<td>Used the computer as a tool</td>
<td>Used the computer as a tool</td>
</tr>
<tr>
<td>Students’ desks were arranged in groups</td>
<td></td>
<td>Student used desks in rows for solo content, and “forum” style room for European History.</td>
<td>Students had tables, and computer desks.</td>
</tr>
</tbody>
</table>
Regardless of their degree of innovation, the participating teachers could be classified as innovators because of their risk-taking disposition (Rogers 1995, pp. 252-280). They had implemented an innovation before the majority. In the City school, Boarding school, and Rural school the participant teachers were selected from forty or more teachers. In the Charter school, all of the teachers could qualify. Teacher selection was made during their hiring interview into the Charter school. Only willing innovators were hired.

Explanation of themes

I compiled the categories of Chapter Four administrators into two themes, based on the common ideas administrators held and what the ideas meant to them. All administrators spoke of technology integration in combination with societal changes, and how their particular school addressed their mission. When discussing professional development, all of the administrators emphasized the individual teacher’s role, as well as the school’s culture, which might or might not encourage professional development.

Toward the end of the theme, I discuss how the administrators’ views align with literature.

Table 9

Administrator Categories to Themes

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<tr>
<th>Chapter 4: Categories</th>
<th>Chapter 5: Themes</th>
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<tr>
<td>View of technology integration</td>
<td>Society change affected the school mission</td>
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<tr>
<td>View of school culture</td>
<td></td>
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<tr>
<td>View of professional development</td>
<td>Professional learning was determined by the individual</td>
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<tr>
<td>View of school culture</td>
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Society Change Affected the School’s Mission

Without being asked, all of the administrators discussed their current view of pedagogy, within which were embedded views of technology integration.
The administrator from Boarding school, Edward, compared how best practices in education evolved similarly to best practices in medicine; they both evolved as a result of increased knowledge. As an example, Edward laughingly explained his point by describing views of veteran teachers who resisted learning new methods:

Most of it is veteran faculty, not everybody falls into this category, but a lot of people think, “I've been teaching for 20 years, it's okay. I'm doing everything right.” Well, if I have to go to the hospital today to have my gallbladder removed or my appendix, I'm hoping they won't do the same thing, surgery wise, that they did 20 years ago. Things change.

Computer integration was an extension of best practice for education; computers were not separate from curriculum. Edward noted, “We don't feel as though we need to offer a computer course to every student because of the amount of technology the teachers use in the classroom.” If a particular assignment required “PowerPoint or Dreamweaver” the teachers would teach the software to accomplish the task.

Computers’ seamless integration into the curriculum was a desire shared by all administrators, but each approached it from a different angle. The City school administrator emphasized technology from the perspective of student development, in contrast to the Rural school administrators who were concerned with student competitiveness in a global economy. The Charter school administrator accentuated the technology milieu of contemporary students. The City school administrator, Oliver, did not feel the school district nor any teacher had achieved seamless technology integration. First, Oliver felt the weight of standardized testing. As a self-perceived focused person he noted, “It's pretty clear what we need to do based on who we are as a school and what everybody else is telling us, like the state, the federal government.” Therefore, the curriculum needed to emphasize math and reading, the tested subject areas, and could not focus on the kind of curriculum Oliver felt would most prepare students.
Ideally, Oliver felt that the students should learn “Habits of the Mind” because their future was not going to be similar to his, and technology could help prepare them. Oliver explained the relationship:

I'm convinced that the kids’ future isn't our existence, and if we don't tune in to that, and the ability to communicate in many different ways, we didn't do the kids justice. Our career is paramount to the kids’ success. It is good. We need to make sure we're putting the computer, and it's use into instruction because it's the only way. It's best for them.

If the computer was not the only way, than Oliver felt the school should use a less expensive teaching tool. Oliver felt the one-to-one computer program should be used to administer a curriculum that would prepare the students for the future that included tenacity, inquisitiveness, metacognition and life skills – “Habits of the Mind.” The computer should help teachers go beyond worksheets, reading books on-line, and the current standardized test preparation.

At the Rural School, the administrators spoke of globalization, the need to be competitive, and their desire to see the school reflect the current societal trends. The administrators, Lisa and Martin, felt that the computers could propel them into societal change. Martin described why he saw the computer as vital to the rural school’s development:

It’s providing on line courses, alternative learning environments, or alternative ways to learn and gain information. As a public school, if we do enter a competitive model, which politically is what we're looking at, we have to be ahead of the curve and be ready to do that.

This competitiveness did not scare Martin or Lisa. In fact, Martin noted that it “drove” him. He felt that it was causing the rural school to be “changing for the better.” Changing for the better meant meeting more student needs such as offering more courses on-line, and teacher instructional practice evolving.

Like the City school, Lisa and Martin felt the Rural school had not yet reached the ideal instructional environment. Though teachers had made considerable strides toward incorporating
technology, most had not changed their instructional style. Lisa said, “A lot of our teachers use laptops, almost all of them do, but maybe just doing the old things in the new way.” Lisa and Martin would like to see all teachers improve their instructional style, although they could not articulate how.

Unlike the other schools, the Charter school existed based on the societal changes, and the school overtly correlated its pedagogy with contemporary needs. Helena, the administrator explained why she thought this was important:

We're teaching a different breed of child that is used to hands on, that is used to technology that is used to doing some problem solving. Let's face it, our culture today is a problem solving culture…This kind of an education helps kids to do that.

As a result of the problem solving and technology savvy generation, the charter school offered a project-based curriculum that used computers and its resources like books. It could be considered seamless technology integration. Unlike the other schools, Helena felt that their school was meeting today’s needs and future needs. Teachers enacted current pedagogy, and that Helena attributed to the school’s small size and teacher selectivity, all of which resulted in expedited teacher and curriculum change.

Their thoughts coincide with literature on sustained change (Duke, 2004; Rogers, 1995; Senge, 1990). As proposed in change literature, any innovation that overcomes resistance must align to society’s values (Klein, 1996; K. L. Peck & Carr, 1997). In addition, societal change is ubiquitously cited as justification for moving to one-to-one.

However, it was surprising that only one principal focused on the external pressure of standardized tests (Cuban, 2002, p.157), which is known to derail technology innovation (Sandholtz et al., 1997, p 170). Three out of four schools reported scores to the state, and had
met Annual Yearly Progress, yet only the City School felt that mandated tests and test preparation interfered with curriculum development.

As a public school which catered to a low-income population, the City school felt substantial effects of standardized testing similar to literature on districts with low-income populations (Kozol, 2005). These schools seemed the most threatened with state take-over, financial loss, and often succumb by spending the majority of class time on tested subjects, teaching in a traditional-transmitter fashion (Newmann, Bryk, & Nagaoka, 2001). Despite this testing pressure, the City School principal simultaneously held two values. He felt the need for a curriculum that advanced student learning beyond standardized test, but also felt students needed to raise their test scores.

**Professional Learning was Determined by the Individual**

All administrators believed that the individual teachers determined their change and learning. This belief was also corroborated by change literature (Duke, 2004; Reigeluth, 1999b; Rogers, 1995). “People excel and learn, not because they are told to, but because they want to” (Senge, 1990, p. 9); albeit, all administrators reacted differently to this knowledge.

In the largest district, the City School, the administrator had a sense of powerlessness toward teacher change. Oliver believed that because the individual determined his own learning, he could do little. On the positive side, the district gave the teachers many choices, which was needed for ownership. However, Oliver took more time to discuss the negative side of teacher choice and professional development. Oliver felt that the individuals stifled their own growth when they chose professional development that did not promote growth, since it would require them to go outside their “comfort level”. He explained, “If you're thinking about your own comfort level -- now you're losing focus, and growth won't happen. I don't care what you put in
front of the people.” The thought discouraged Oliver when talking about teachers. He believed that many professional developmental choices met immediate desires, and made teachers comfortable. Oliver felt that the more beneficial choices would contribute directly to successful student learning, but would require teachers to think outside of their “comfort level”. Oliver advocated books on “backwards planning” and “Habits of the Mind”, which were not heavily promoted. In addition, Oliver felt that he had little influence on curriculum, since the district determined that.

Similar to the City School, the Boarding School administrator felt that the teachers had “too many choices” with their professional development opportunities. Teachers could take in-service programs, college courses, or choose from a variety of school offerings. There were 25-30 pages of choices. Edward saw a positive result:

If teachers propose the ideas to other teachers, then there is a vested interest. They're going to put more time and the willingness and effort into it than if I say, you need to do this. So that's what makes it fun. It's a challenge, but a fun challenge.

Teacher-choice contributed to ownership. On the negative side, this freedom of choice often led to Edward’s vision for professional development being unmet. However, he felt that “convincing teachers” gave him a positive challenge, since he would try to covertly persuade teachers to choose professional development, which he thought was necessary for student success.

Edward felt that lack of student success was the school’s problem. He bluntly said, “That's our failure and that happens, it happens everywhere.” As a result, Edward explained that the school should re-evaluate its system, and promote professional development would positively affect student learning. He felt that useful profession development meant “on-going classes” with
follow-up sessions where teachers shared their learning experiences. Edward felt this did not happen when the teachers had a plethora of professional development choices.

The Rural school administrators also felt that professional development was determined by the individual, and tried to use that toward its advantage. Martin, the assistant principal, felt before he could instigate any change, he needed to develop relationships with the teachers:

I think that building relationships first, caring about them as people first, and then knowing that they have somebody who will listen to them and listen to their suggestions, but not always agree with them or do what they want them to do, but having someone who will listen is the first step.

Administrators discussed individual change’s disadvantages, but also vocalized using it toward their advantage. Both the Rural and Boarding school administrators focused on building relationships with individuals, and encouraged ownership of problems and solutions. They tried to have teachers determine the professional development they needed, and strategically help teachers mold their ideas.

In the Charter school, the administrator viewed the teacher’s individual ability to change as the Charter’s strength since it instigated their professional development. Helena noted, “Our staff development works so very well.” Helena felt that the school created a learning-culture by individual teacher self-assessment, peer-assessment, and teacher created parental surveys. From the various data, teachers then developed the professional development plan at the end of the year, and executed the plan the following academic year.

Helena felt that the Charter’s professional development systems were also possible because the teachers were not unionized. She said, “In non-union system like this, we can talk and say, ‘Here's some things we need to do; this is the way it needs to be’, and we all talk about it and agree.” She believed that the consensus building at the school was made easier because they did not have to put energy into satisfying union quotas and time restrictions. Instead, at the
Charter school, teachers made the decisions, resulting in what Helena described as “flat” and “egalitarian” organizational structure.

Only in the Charter did the teachers and the administrator mentioned the same specific professional development opportunities that changed instruction (Sandholtz et al, 1997, pp. 169-183). In the Charter, teachers bought into and evolved the vision. In the other schools, principals had to sell a vision, which caused frustration.

All administrators were aware of macro and micro change. The social cultural forces were influencing the schools to change, but the individual was the micro unit, teacher, was the change needed to integrate technology. This truth caused frustrations in the larger schools. In the Charter school, with just a few teachers who were carefully chosen, individual change was an asset. All chosen teachers could be considered innovators with technology integration (Sandholtz et al., 1997), when compared to their colleagues.

**External Forces Influenced Teachers’ Perception of Classroom Needs**

The participating teachers were influenced by external forces, which shaped their beliefs toward their classroom’s needs. External forces included societal changes and personal background experiences. Both forces contributed to the feeling of dissatisfaction with the status quo.

*Societal or Classroom Changes*

Similar to the principals, some interviewed teachers mentioned an awareness of societal needs. As a result, they felt that their classrooms should reflect current trends. Their perspectives varied slightly. Anne’s awareness instigated a need for new classroom organizational structure. While Inga wanted her students to have proficient contemporary skills, and Samantha felt her students needed to be immersed in problem solving.
Anne said that she looked at industry, and how the “industrial model” had changed, so that she felt “it's important to be able to work as part of a team.” This observation influenced Anne to experiment with cooperative groups until she found an organizational structure that demanded high expectations for all in the group.

Inga noted how computer use was profuse in everyday life. “It’s used so much in everybody’s job, and I think it’s important for kids to learn as soon as possible.” This conclusion attracted Inga to a one-to-one school, and motivated her to learn how to use the computer to teach.

From her undergraduate training, Samantha felt that it was more important to teach the students “how to think and feel they can do anything.” Although Samantha did not have computer experience, she was attracted to a one-to-one school because the computer became a means to create an interdisciplinary, project-based approach that immersed students in problem solving.

The idea of societal change seemed to come gradually through observation and experience. Rogers would call this awareness a passive change, since the teachers observed this phenomenon over time, maybe through classes, mass media, or interacting with others in society (Rogers, 1995, p.164)

Wyatt’s knowledge of facilitation seemed to be driven by desire, more than dissatisfaction. When he first received the computer he thought, “I have this $1200 piece of equipment in front of me and it's mine to use all day.” He had the computer, and wanted to use it well. After training and experimentation, he did.

According to Rogers, innovations can create new needs. “An individual may develop a need when he or she learns an innovation exists” (Roger, 1995, p.164). Wyatt’s experience
seemed similar to the 1995 ACOT ten-year study. When classrooms had one-to-one computers, teachers began changing their instructional style to accommodate the technology.

**Personal Experience**

For other teachers (Taylor, Zoe, Jessica) the decision making process was instigated by dissatisfaction based on personal experience. Over time, these teachers became intolerant in their personal perceptions of the quality of education, and how they believed learning occurred.

Taylor bluntly said:

My stereotype of a teacher and the job just did not seem to interest me at all. I felt you'd be cookie-cuttered into a certain way, and I had some history teachers unfortunately, even though I was interested in the subject matter, who would just bore you.

Negative past experience encouraged Taylor to think creatively so that his class would not be boring, and the computer gave him a tool that was “less like a textbook”, and more interesting for the students.

Zoe felt that her past experience was full of examples of poor teaching. She said with exasperation, “Everybody taught me the exact same way and when you go to college they teach you the exact same.” She felt that learning did not occur in the typical lecture format, but instead, was drawn to the philosophy of constructivism in college. By exploring technology, Zoe felt she could meet more student learning needs and create a more constructivist environment.

Like Zoe, Jessica wanted to provide interesting learning experiences for her students, since she, too, had many poor experiences as a student. However, Jessica talked enthusiastically about one positive experience in college that had a profound impact; it was informal and discussion based. Jessica felt that “When you give kids something meaningful and different, they learn so much.” So, even though Jessica had little experience with computers before a one-to-
one school, she was willing to learn because she could create meaningful learning opportunities for her students.

These teachers did not want to perpetuate their poor past experiences for their students. They actively sought alternative teaching methods that would make learning interesting. When alternatives were presented to them, whether it was constructivist pedagogy, computers, or interdisciplinary learning, they enthusiastically pursued new knowledge about the method.

\textit{Initial Step Toward the Innovation}

A well-known change theorist, Rogers, speaks about decision-making processes to embrace an innovation based upon knowledge of external forces. In fact, he calls the initial step toward decision-making “knowledge” (Rogers, 1995, p.161-203). In the knowledge step, the individual acquires an aspect that introduces the innovation or the innovation’s concept. There are different types of knowledge such as “awareness,” and “how-to knowledge.” In this theme, teachers developed an “awareness-knowledge.”

For six of the seven teachers, awareness of facilitation developed without one-to-one computing. Societal changes and unsatisfactory past experiences instigated a dissatisfaction with current methods and a desire to develop a new method of teaching. This finding, of belief superseding action, coincides with literature, but is a debated topic (Cuban, 2002; Rogers, 1995).

On the one hand, studies have shown that belief does make technology integration easier. In a one-to-one study, Garhweit & Weller (2005) found that two teachers integrated technology easily, but belief in more constructivists’ learning methods aided their integration. Other studies on computer implementation, although not in one-to-one environments, found that teachers were more likely to integrate technology if their beliefs (D. K. Anderson & Reed, 1998; Garthwait & Weller, 2005; Zhao et al., 2002) aligned with constructivist methodology.
On the other hand, the Sandholtz et al. (1997) study showed that teachers evolved in their beliefs with extended one-to-one technology use. When they first began the Entry stage, teachers incorporated the technology into their traditional teaching methods. But when teachers reached the Appropriation stage, their beliefs began to change.

**Beginning Small Trials Reinforced Beliefs about Teaching and Learning**

All teachers were persuaded to grow beyond the initial “knowledge” step or knowing they had to do something different. They engaged in small trials or experiments that led them to believe their instructional style needed to evolve, making them more facilitative. For some teachers, the small trial was with computers, and with others, it was without computers. However, in all experiments, teachers wanted to enhance student learning by making it more interesting, relevant or meeting learning style needs.

Without computers, Zoe, Taylor, and Jessica shared the most pronounced small trial anecdotes. Zoe was persuaded to be more facilitative when she saw students engaging and being assessed on complex activities in an in-service session. She described what in-service teachers did and how the students responded:

They gave the kids all this meteorological data and then had them work in groups to determine what kind of a weather report to put out that day. Depending on how you interpreted the data, you may have come up with a different answer, and it was okay that not everybody came up with the same answer.

After Zoe saw how the activity was done, excitedly, she began experimenting in her own classroom by making more activities student oriented. Students would examine real data, question it, and often conclude with complex and varied answers that could be correct.

Thus, Zoe, the science teacher, became very accepting of student questioning, as long as the students were motivated to learn.
I have to trust them (the students) with that opportunity to get frustrated; have to trust them with the opportunity to figure it out for themselves; have to trust them with the opportunity to ask questions.

Zoe trusted her students through the learning process and created an atmosphere where student questioning was expected instead of restricted to the less-capable students. Therefore, she was concerned with developing a class climate that encouraged student inquiry (Lipman, 1991), which also aligns with constructivist methodology in the classroom (Halpern, 2001; Lundquist, 1999; McMahon, 1999).

Taylor’s trial was in the beginning of his teaching career, when he was hired to teach at an all female adjudicated youth center where holding students’ interest in history would be a challenge. Taylor said, it was “very, very, very scary.” Initially, Taylor’s fear was similar to that document by Carr-Chellman and Dyer (2000). A pre-service teacher noted that her possible role change was unfamiliar to her, because she was never “taught that way” (p.102). Taylor noted that after teaching there, he said, “I liked kids and like the subject matter, so it's all that motivation.” He learned ways to hold the students’ interest as they “creatively” learned (B. C. Anderson, 2003; Brooks & Brooks, 1993), and as result, his instruction was not “boring” like his past teachers.

Jessica had designed an activity based on writing the Declaration of Independence and was persuaded as she observed her students’ “all excited”, and “scared,” because they had experienced the “revolutionary feeling”. Jessica noted why the experiment persuaded her:

They got the whole thing into a different activity--by asking them questions. And them generate what they know, and what they want, and putting it into a historic perspective. So, that was awesome.

Jessica was able to ask questions, and create an activity, rather than lecturing, which would have been in the prescribed curriculum. From the experience, Jessica felt that affective learning was
inseparable from cognitive learning (Dick & Cary, 1996). After the trial, she tried to create lessons that would help the students emotionally connect with content and provide meaningful experiences.

Zoe, Taylor, and Jessica were inspired by student interest in content. The author Perry wrote, “Ask any good teacher why he went into the field, and somewhere in the answer you’ll hear the reference of liking young people or wanting to share the love of a subject area with other” (p.15). Hence, it seemed natural that the teachers would be persuaded into becoming teacher facilitators if student enthusiasm and learning in their subject area increased.

With computers, Wyatt and Anne shared the most pronounced anecdotes. In the beginning of computer labs, Anne noticed how her students could write uninterruptedly and how her role could change with word processing. She could observe the “creation process” while students worked on their writing, and felt that it help her and her students:

I was helping as much as I could without having to stop the kid. I know when I’m writing and I’m on a roll, don’t stop me … So that was one positive thing. I think it was also positive for the kids to see it freed them.

Anne noticed how she became facilitative in the writing process since she did not have to say things like “move your hand” so she could see students work. Also, the writing process became less arduous, because students would not have to complete a full rewrite if they wanted to revise. Therefore, Anne was inspired to find other computer tools that would generate student creativity.

With one-to-one, Wyatt was afraid that he would need to teach his students “step by step”, and would lose instruction time. Instead, he observed his students learning the technology faster than expected, as they “helped each other out”. In another un-planned observation, Wyatt noticed students using Google for an answer to one of his questions. Wyatt described the incident, “One of the kids just flipped up his laptop, went on to Google and typed it in (the
question) and he raised his hand.” The student yelled out, “I know the answer!” Wyatt was bewildered by the student’s responses and declared, “What is it? You know you cheated,” but the student retorted, “I didn’t cheat!” Then, Wyatt realized that searching the Internet for an answer was what he did, and reflected, “I think that’s what we do now.” Wyatt reported that with one-to-one, students find more answers, instead of the teacher telling them, and that his students do more spontaneous learning than before one-to-one.

All teachers observed students expeditious software learning, as well as incidental and spontaneous learning. The experiences that teachers had with computers were similar to those in the Sandholtz et al. (1997, pp.38-42) study. In the middle stage, adaptation, teachers often noticed that student production increased, meaning that student writing improved or students thought in more complex patterns. Teachers saw the direct benefits of using the technology (Barrios, 2004; Bartels, 1997; Lemke & Martin, 2004b; Rockman, 1994).

**Student Observations and Structural Constraints Modified Instruction**

Six teachers, who displayed the greatest degree of the inventor stage, also felt similarly about feedback, a type of observation: student feedback was necessary for instruction and project modification. The way in which the participants gained student feedback spanned the gamut of informal observation to systemic examination of student products.

Attitudinally, Samantha took student feedback seriously because she believed that “they’re (students) my customers, right?” Therefore, “It's all good feedback,” whether students responded positively or negatively. Formally, at the end of the year Samantha gave a list of the projects that students have done, and the student chose “which ones liked the most.”

Taylor observed his students’ interest in a subject. He “hated to use the vernacular in a Chapter 13 or 12, because he didn’t “want the kids to think history is a book.” When he moved
to a one-to-one situation, there was “no resistance” from him, because the Internet was a “phenomenal resource for his subject.” Basically becoming more facilitative was a natural step for Taylor as he watched student interest increase.

In literature teachers are described as scientists with “natural wonderings” (Perry, 2004) who need to test their experiments. Therefore, the teachers desire for student feedback seems inseparable from the process if teachers are experimenting with learning. However, the participant teachers wanted students' interest to increase, not merely grades and academic skills.

In another example, Inga talked about informal student feedback. She looked for student “disinterest” in a topic, and she felt that a gauge of disinterest was student misbehavior. Inga explained,

We don't have to deal with behavioral problems because when the students are bored then they misbehave… I try to make sure that everyone has a job, something to do and make sure it's at their level and have something in the back of my mind that they could do if it's too easy for them or too hard for them.

She wanted her students challenged but engrossed in their learning, and student enthusiasm for learning was how she rated her success. However, if disinterest in a project lingered past her comfort time, Inga may “ask the kids” who may give her a suggestions.

Anne also discussed how she addressed student difficulties, or as she said, “Wow, this is going nowhere fast!!!” Anne would ask the students “What do you guys think we should be doing?” or “to make this more interesting for you, what do we need to do?” She noted that a teacher has to get past the negative student response to get to the productive responses that may include statements like, “I can't picture this in my head, or I can't relate to.” Afterward, Anne might ask herself, “Then, I think, okay I need to do something...what can I do?”

These teachers’ actions concur with literature that discusses incorporating student input into instructional design as necessary step toward a climate for facilitation: Student input allows
students to take control. Therefore, when students are part of the decision-making process, they have more ownership of the learning (Costa & Lowery, 1989; Halpern, 2001; Lundquist, 1999; McMahon, 1999). In addition to lesson feedback, teachers used student ownership in assessments (McTighe & O’Connor, 2005; Wiggins & McTighe, 2005).

Jessica talked about another formal approach to attaining student feedback. When she saw the students struggle, she would address them, “Okay, this is not working too well, you guys aren't really pulling through this project well, you look like you're stuck; what are the struggles?” The students would then do a self-assessment, look at the rubric, and together, Jessica and the students would modify the project and rubric. Much literature notes that when assessment becomes a collaborative process between the instructor and the students, it becomes a gateway for student learning (Krumboltz & Yeh, 1996; Lundquist 1999; McTighe & O’Connor, 2005)

Zoe took a systemic approach to lesson revision. When she tried something new, she “let the students know”, so that the students would know that “feedback was important.” Zoe was hopeful that this openness would allow the students to feel that it was not “happening to them but happening with them.”

Unlike the other participants, Zoe also talked about reviewing students’ portfolios and completing an item analysis on test, so that she could compare students’ work each year. She wanted to see “if students had a greater level of understanding” from year-to-year, in hope that, “students from year to year would be able to come to more in depth conclusions because of the better teaching.”

Systematic analysis is espoused in instructional design literature (Dick & Carey, 1996; Smith & Ragan, 1999), and in fact, Zoe was completing a masters degree in instructional
technology, a field related to instructional design. Zoe felt that you could most accurately revise a project if you systematically analyzed data, which would be the student artifacts.

When teachers received feedback from the students, which included students’ interests, frustrations and questions, teachers also analyzed student academic expectations. Melding the academic expectations and observations, teachers talked about ways they tried to individualize instruction based on individual class needs. Consequently, some teachers talked about the need to be a transmitter depending on the teaching goal and structural constraints.

In the traditional public schools, Rural School and City School, students were grouped according to grade and ability, and the teachers talked about varying their teaching style depending on the need of the class, and the school’s expectations.

Wyatt from City School noted that he was more facilitative with his upper-level classes, but felt his lower level classes needed “very regimented things to do.” Although he would “not lecture to them for forty five minutes”, he would not let them “go free on their own” as he had with the upper level class that was searching the Internet for poetry.

Anne taught an honors English course, regular English, basic English and European History which was a project based course. Based on her curriculum and students, she varied her style. Anne stated the difference between the classes:

European history class is so project oriented a lot of times we're having them do a simulation …I do a lot more lecture style in my honors class... My honors class is very heavy reading for them and we do a quiz every single... In my regular English class, I'm just kind of riding hard (laughter) trying to keep them in their seats. I could never hold a discussion in that class. I don't lecture in that class because they can't pay attention.

In each class, Anne weighed the goals. For example, in the honors class, students were preparing for college and exams so Anne felt she was training for students’ future English requirements.
It has always been the primary goal of teachers to prepare students for their next step (Gardner, 1999) and to vary instruction accordingly. However, education has also been sharply criticized for providing different instruction and different curriculum instruction to the basic or “lower” level students than the higher level students (Kozol, 2005; Skilton-Sylvester, 2003). So it is not surprising that Taylor and Samantha struggled with this changing their instruction style based on the schools structure and the students needs.

Taylor struggled more with the school’s constraints. He co-taught a class with Anne at the Rural school, but also taught college preparatory and basic history. His European History class composed of seniors, was project based, and his tenth grade - U.S.A. history - was more direct instruction. His described his teaching style rationale for the tenth grade history course:

I am a little more rigid with it's content that I have to get through...connecting last year's course to...and for some of them, this is the last U. S. history class they'll have in their lives. So I'm a little more stringent with making sure I get through more of the content.

This rationale was similar to Anne’s. Although Taylor gave a rationale for more lecture in tenth grade history, he also described the frustration with the structure. He talked for ten minutes about how the structure disturbed him, and he wished that the tenth grade students could be more “creative”. Frustrated, Taylor said, “You don't have the time to do that, you don't physically have the time per period, you don't have the time.” Unlike the European History course, he had a prescribed curriculum for the tenth grade each, one period of forty-five minute. Taylor said that he would do something, and than stop. “You start to pull back on some of the creativity and the industrial model...you start pumping it out again.” “Pumping it out”, meant pushing through the curriculum using a lecture style.

Taylor was mentally wrestling with what he believed and what he could actually do with the time and curriculum given. He felt the student interest would increase and he could better
prepare students if they were involved in more creative projects, yet the large number or
students, and the teaching time were structural constraints he could not overcome.
Simultaneously, it seemed that he rationalized his teaching style based on student needs, which
somewhat contradicted his want of creativity. This example shows that Taylor was wrestling
with his beliefs about learning and what was appropriate for students, which is appropriate when
people change (Brookfield, 1995a), and their beliefs seem unattainable within their setting.

Grappling with teaching styles was not only relegated for the traditionally structured
school. Samantha, at the Charter school, also grappled, though she taught at a school that
promoted a project based learning approach, and taught less than twenty-five students. During
the first year, Samantha “wrestled” with meeting students’ needs. When she began at the Charter
school she assumed that all learning needed to be interdisciplinary and project based, so created
all complex projects. After implementation, she thought some students did not excel. Samantha
reasoned that students were coming from traditional school, lacked particular skills, and some
students needed less choice and more direct teaching. Samantha described the situation,

It’s a huge to transition them (students) from that type of passive learning into the
active learning here, where they are developing their research questions, where
they are out there evaluating sources, and then they're creating a product.

Now, Samantha felt that each year students presented different needs, so her instruction was
something that was determined by the individual child. Although Samantha struggled with this
every year, she concluded that she taught with a combined approach of direct or transmissive
instruction with some students.

In the beginning Samantha felt the need to teach everything in a project. Another study
found similar overcompensation. When teachers were first implementing interdisciplinary units,
teachers felt that particular academic essentials were overlooked for the sake of an
interdisciplinary approach (Nolan & Meister, 2000). Teachers concluded that some content needed to be taught in isolation, through a transmittive teaching style.

Watching the students affected teacher beliefs, and what it meant to be a facilitator in the classroom. Observations of students influenced teacher’s beliefs and instruction style in order to individualize instruction, which was a characteristic of the Inventor Stage (Sandholtz et al., 1997). Individualizing also became problematic for some teachers as they reasoned with their evolving belief system. The teachers were excited by the student creativity, seeing them teach one another, and synthesize difficult topics. Conversely, teachers believed that student questioning, leading into extensive frustration meant that their instruction was not meeting students’ needs. This kind of teacher observation led to learning that was sometimes difficult for some teachers.

Moving toward Project Based Approaches

It has been established that the teachers were innovators, or considered in the innovative stage of technology integration, and being innovative, meant thinking uniquely when it came to planning student lessons. As Zoe said, “It's important to think outside the box, and when you've been constrained to a book -- to a set of labs that you've done for umpteen years-- that's, I think, when you get in trouble.” Or, as Taylor noted that he never wanted to be “married to it (textbook) for 10 years, which actually turns into 13 or 14,” since this meant potential problems with unquestioned lessons and risks of boring student with meaningless activity. Influenced by beliefs about learning, teachers developed a project-based approach that utilized the computers, but each came at it with a slightly different process.

Most teachers began teaching with a traditional approach, and slowly moved toward a project approach. As Anne said, “First, you know it takes a while to wean yourself away from
traditional things because you are so accustomed to it; there really has to be a change in your vision, maybe a change in your paradigm.” When teachers went taught in a project approach they felt that they were becoming greater facilitators.

Zoe began fostering ideas toward a more project-based approach as new teacher. She would come up with ideas and recorded them,

I had these ideas and I’d write them down and I’d keep them, or in my lesson plan book … I’d leave myself notes in my teacher planner…things that I might like to try or things that didn’t work so I would need to remind myself to look for a different way to do it the next time and that way I can look back on that.

In this way Zoe acted similarly to those who value to innovation process (Matson, 1996), where innovators are encouraged to write their ideas and reflect on them.

Zoe began with small projects and moved to larger ones, or as she put it “I did not set out to build the Taj Mahal on my very first try. I got to the point where I felt confident enough that I think I can take some baby steps out and do this.” Confidence in teaching grew over time as Zoe became more familiar with content and expectations.

Similarly, Inga had a science background and began with small projects and developed toward larger projects. Inga implemented a small interdisciplinary project for an assignment in traditional school, and entering the charter school, Inga used the same project but expanded it. The progression from smaller to large more complex projects is also reported as an element of technology integration in a one-to-one environment in Sandholtz et al.(1997)

Jessica and Wyatt had similar experiences where they trained in project creation. Before teaching at the charter school, Jessica was sent to a gifted science training where she as taught to integrate the subjects for unit learning. Jessica recalled the experience, “It was amazing. In the science curriculum they integrated science, and literature, and math, with science. While reading books, and the whole shebang, and in just the science time of 45 minutes.” Then, she returned to
school and implemented the unit. Like Jessica, Wyatt was sent to training by his school district where he was taught how to build a small project that used the computers.

Unlike the others, Anne and Taylor conceived of a full project based course because they saw a need. Anne explained,

So we saw a real need… when I was teaching an honors English class and teaching works like A Tale of Two Cities, I had to cover the French Revolution first... So we saw a need for the history part, but I also saw a need for the literature part.

Since Anne and Taylor felt that the project based course was the best way to fully understand the literature and history elements, they jumped directly into designing and implementing a large project based course. During implementation, they found that they could not cover as much content as planned and had to “scale back.”

Similar to Anne and Taylor, Samantha also implemented project learning all at once, but this made her a bit anxious. Samantha was hired by the charter school, but did not have experience with creating projects. When she viewed Charter school projects on the web, she became worried about creating them. Samantha explains why,

I am a linear thinker, so when I looked at what you would have to do in order to develop these web sites, it was more a spider web, intertwining and connecting in so many ways that I can see that at some level, but once I had to develop it myself it was overwhelming.

Like other participants, Samantha believed that students learned best when students were engaged in meaningful projects, however, the process of project creation was intimidating. Unlike other participants, Ann, Taylor, and Samantha wanted to implement project based learning, but they did not have experience with creating those environments. In other words, they needed much “How-to-knowledge” (Rogers, 1995, p.165).
According to Rogers How-to-knowledge consists of information necessary to use the innovation properly. Lack of this knowledge can cause feelings of uncertainty, and the more complex the innovation, the more knowledge necessary. Each teacher needed to discover how-to-knowledge for project creation and project implementation, and each had slightly different how-to-know that was necessary.

**Overcoming Hurdles for Project Implementation**

Teachers had to devise ways to create projects and implement projects, but each teacher placed emphasis on specific hurdles they had to overcome for project implementation. Hurdles included a large gamut: Finding a structure for writing a project, making connections between content, devising assessment for student products, building emotional security, getting technical help, and creating an appropriate student organization and structure.

When I asked Zoe about planning a large unit, she discussed that the possible negative impact on students was a hurdle for her to overcome. Zoe explains,

> Well, it's certainly a little bit of uncertainty and fear that; Oh my gosh,...I've now wasted time, for the students, possibly,...exposed them to frustration which may turn them off to the learning process any further in the unit and … the impact that my poor planning may have on the students.

Zoe mentioned that “science is a messy” and that this compounds the possible problems and failures.

To minimize failures, Zoe employed a common approached she called “backward planning—where you start with the end in mind,” now an accepted technique for project development (Wiggins & McTighe, 2005). She had refined planning backward in a graduate course she took.

Now, that Zoe had gained confidence, planning a project was exciting to her. Below she described the beginning stage of project creation:
My technique is I start with Christmas morning, as a way I look at it. If I could have everything I wanted for my students in this experience, what would that look like? Then I back off from that to what's doable.

Finding what was “doable” was not limited to available resources. Zoe also learned to be concerned with technology problems and with student learning curve with new technologies.

Both took time, and Zoe wanted to “cut down on the level of frustration for the kids, because it helps them to continue to attack the assignment rather than lose steam over it.” With technology problems, Zoe systematically recorded problems and logged the amount of classroom time lost with each issue. She presented this to her administrators, so that she could justify, and then receive the needed technical help.

Inga also had a science background but taught in the charter school. Her hurdles to project creation included the finding project ideas, creating steps to a project, and designing a class project that included all content areas. However, hurdles to Inga were not unpleasant. Like Zoe, she also found pleasure in the beginning stages of project creation. She noted, “First, I have to have the vision… It (an idea) just pops into my head and I write it down and save it on my computer as a project idea.” This somewhat serendipitous notion of project ideas “popping” in the head, is also a hallmark of the innovation process (Matson, 1996, p. 78-80).

Also, similar to Zoe, Inga wrote down her ideas on her “computer as a project idea”, but also mentioned that the idea might come from anywhere. For example, Inga mentioned that her sister got very sick, and she noticed the information literature in the doctor’s office. This gave her the idea for developing a student understanding of injuries, and making informational brochures.

When creating a project, Inga also emphasized the sudden block, similar to writer’s block that she experienced when she is creating. The block did not worry her, and she explained why,
I let my subconscious work on it (project) and when it comes time to lay out the project, I usually pick—like probably where I want it to end up. Pick how I want to start it out, and then I fill in the gaps in between on what it would take from where we start to where we end and what they will need to know and learn to get to the end.

Like Zoe, she thought of the end, and filled in the details. However, when she created a project, Inga had a partner who could help her fill in the gaps. Inga was expected to create interdisciplinary units, and did not feel comfortable with history. Inga said bluntly, “I could never get the history of things… Normally I don’t like history.” Although initially trepidatious about working with a partner, Inga found that her teaching partner enjoyed history so that he would add the history components. Together, they were able to create complete interdisciplinary units.

After the initial project idea, teachers often hit a blank; they did not know what would come next. Some teachers let the idea rest, and returned to it when the idea next idea came along. Yet many teachers talked about the frustration of this spot, and Samantha in particular.

Samantha thought of herself as “linear”. When designing a large project, she felt it was easy to get lost in all the details and lose sight of the big picture. Through trial and error, she developed a step-by-step process for student project development.

When Samantha first began designing projects, she used the state standards and a grade level book. From this research, she would determine her “nuggets,” or the common knowledge that all students must know. Then she split a project in thirds. The first third she gave students the big picture, and she used a more traditional teaching approach “given them an overview of probably everything they need to know” with “cool footage” or something to catch their attention.
During second third, she would “give them choices” and individuals or small groups will get choice of questions to research. In these two sections, Samantha ensured “nuggets” were covered. In the last third students designed projects and found answers in their “area of passion.”

After creating many projects, she now expected frustration, “Every time I develop a new project, I get that wave of it’s overwhelming…There’s too much, and there’s so much out there.” However, she finds consolation in the end: “The end product would be worth the frustration.”

Similar to Samantha, Jessica did not know how to begin a project. A peer teacher advised to begin project creation with the standards, which supplied initial guidance. The second hurdle for Jessica was making her projects as “good at they could be” in a collaborative culture where teachers shared projects for modification. Faculty at the charter school routinely shared their projects in faculty meetings to receive feedback from the other teachers. During her first experience, Jessica said that she was very excited, but was then unnerved by their questions. She noted that they asked questions like “How do you see this fitting into this?”

After Jessica got over the “shock” and realized that all teachers went through the process, she found group-project-sharing valuable. Jessica explained the learning process that she experienced:

When you do you project, you only have one perspective and you get so excited, and like I did. I got so excited, and they some of the questions came out and I was like, oh, wow. It was so perfect. I was like, Oh, I could do that. Why didn't I think of that. But you are in such a tunnel, with your own focus… and you don't see it until someone points it out to you. And then you are like, I could do that. After listening to others’ suggestions, Jessica felt that she could make a better project than her original project.

Jessica interwove the cognitive and affective learning (Brookfield, 1995a; Dick & Carey, 1996) that had to exist together for her to improve her projects. In order for
her to accept the project ideas from her colleagues, she had to be emotionally ready to learn from them.

As in the previous examples, teachers looked at the standards, read in books, and kept articles of things that they had read (Matson, 1996 p. 42). They felt inspired by the computer, and things that they could do with the Internet. Anne noted, “The biggest thing I do to prepare for class anymore … I do web searches.” They also kept themselves interested in subjects other than they were teaching to see how they could make connections in projects. Teachers felt that some things were easily connected, “like science and math”, and others needed to be learned.

Taylor felt as though he had to learn to make the connections, but his learning seemed quite usual. He taught the European History course with Anne who felt like “history and English were married”, but Taylor did not think he knew the connections as well as Anne. Instead, when he first began teaching the course, he said that he was only a “step or two ahead of the kids,” rather than a master of the connections between history and English during the Renaissance. Taylor considered his lack of knowledge a good teaching tool. In reasoning he said, “I find the ways of sharing the information and dissecting it” and showing the students how he was making connections. Taylor felt as though he was modeling making the process the students needed to do.

Admittedly, Taylor noted the experience made him feel vulnerable and most teachers would not want to experience this feeling. Taylor described his reasoning,

I think that most of my colleagues want to be a content expert and I'm talking probably throughout the nation, in the world and in the profession of teaching. The more you are the master of the content, the more the kids will respect you, the more your colleagues will respect you. The easier it is for you: as the people struggle, you stand there and laugh saying “I know all of this.”
Taylor believed teachers were more comfortable, and less threatened when lecturing, and as a result, acted less as a facilitator. When Taylor taught the project based course, he forwent the lecturing since there was no time to learn all the content. However, he saw this as an advantage.

Anne’s hurdle emphasized the student group work as a necessary component for project based learning. When she first began projects students worked in groups, but it was an “elementary type thing”, and it seemed like it was for “socialization.” She then had student rate each other’s participation, and even added it to the assessment. Anne still felt groups did not hold individuals accountable, and one student did most of the work.

In time, Anne felt technology “inspired” her, “I continued, especially with the computers, and I began to see the potential for very sophisticated projects.” Seeing the potential for more complex projects, she developed interdependent groups. Ann described the change in her student group structure,

What I have moved to is the kind of cooperative group where everybody is interdependent so that not everybody is doing the same thing or the same research, but everybody needs to contribute his or her research in order to make the project work.

As a result of inter-dependency, Anne felt like students tried to compete with one another, took more ownership in their work, and respected their fellow students.

Wyatt , at the City school, was the only interviewed teacher that said his planning had not substantially changed. When he first received the computer he was nervous, and through student observation became less so. But when planning, he noted “I would still try to hit the same objectives, ...it's just that extra tool (the computer)”. Although, at the time of this research, he had been taking a graduate course where he had created a Webquest, and was hoping to utilize it in his classroom.
Unlike the other teachers, Wyatt was also the only teacher that mentioned pressure to raise standard test scores. He was expected to divert little from the district curriculum and administer four practice tests throughout the year in addition to the state mandated test. The school’s emphasis on standardization may have influenced Wyatt’s planning and subsequent lack of diversion from the normal planning. This conjecture would coincide with literature which shows that assessment determines classroom learning experiences and strong emphasis on standardized tests can inhibit technology integration (Cardman, 2001a; Cuban, 2002; McTighe & O'Connor, 2005)

However, all teachers used rubrics though discussed little in this theme. Teachers used rubrics for student assessment, and thought that they were crucial for projects. In the previous theme, it was discussed that teachers used the rubrics for revision and student feedback. Here, Anne mentioned her development of rubrics and what that had done for her,

When I first started teaching, it was tests, quizzes, ….Then, it was a rubric - what does that word mean? It was all brand new. Now, I almost have to create new rubrics to accommodate what my kids come up with because they come up with so many wildly inventive wonderful things. In that way it's been wonderful.

Ann felt that rubrics allowed her students to be creative, so that her assessment could reflect student creativity.

In the largest one-to-one study (Sandholtz et al., 1997), assessment was one of the largest barriers for technology integration in classroom:

When students demonstrated new learning outcomes, such as creative problem solving strategies or heightened abilities to collaborate and perform new tasks, their teachers struggled with how to translate those demonstrations into qualitative measures of that could be entered into grade books (p.180).

Therefore, it seems logical that the innovative teachers had overcome this barrier, and were comfortable with creating assessments.
Teachers Developed their Identity but were Enhanced with Professional Support

Rogers (1995), as change theorist, and Cuban (2002), as technology critic, questioned whether innovators implement an innovation due to a natural disposition toward it, or because of other factors. In this study, all teachers seemed to have innovator qualities, but they all claimed that they developed their innovative teaching with others’ help. There are three dimensions to their growth. First, they had disposition of learning “like a student” and valued creativity, Second, they had support within their teaching environment and administrative support. Third, the charter teachers experienced comprehensive modeling.

It is common in computer integration studies that students often teach the teachers the technology (Lemke & Martin, 2004b, 2004d; Rockman, 2003; Silvernail et al., 2003). It was no different this study. Wyatt valued his training to use the technology and the support that the students provided, but he did not collaborate as much with peers as the other teachers. Wyatt did highlight the disposition needed by teachers in the role reversal between teacher and student in one-to-one environments. He said,

You have to be, if not tech savvy, kind of tech courageous...not afraid to just go out there and experience, and not be afraid to give some control to the students...It's okay if you don't have all the answers, because they're not afraid.

Wyatt had experienced fear himself, and in his fellow colleagues, but after the experience felt that this fear was unnecessary because the students helped one another and him. As a result he gave the following advice:

So do not be afraid to let the kids just go off on-their-own and explore a little bit. But, don't be afraid if you don't know everything, because there's enough out there, and there's enough kids out there that'll be glad to show you what to do.

Wyatt felt that “letting go of control” would be difficult from some teachers, but the plethora of resources on the Internet helped. In fact, all teachers admitted limited knowledge, and like
students, they were looking for answers. Teachers attributed their natural disposition of “not knowing” to acceptance of Internet use for content, and hence, the development of a facilitative teaching style. They had a tolerance for ambiguity.

Anne felt inspired by all the resources on the Internet and was shown many of the resources in faculty meetings and in informal collaborations with other teachers. Anne talked about why it made such a difference. First she noted what it was like before she had the computers, “You're looking for these great materials and you're trying to order stock and trying to put stuff on your walls.” Anne recalled it as an arduous process, and was relieved with the Internet. She said, “But now, the world of opportunity is so immense because it is the whole world now. It is the whole Internet now!”

Second, it contributed to her confidence. Ann was not only excited about the Internet resources, but also, what it meant to her personally. Anne reflected, “And I can still confine it. I still have the ability to bring it back down to this...to what's going on in my classroom.” Anne took pride in her ability, and as a result she felt new creativity. She explained her feelings,

I feel unfettered. I can go so many more places. I can add so much more creativity to my own lesson planning. I can add so much more creativity to what, and they add creativity to what they're assessments can be.

Anne was clearly excited about her ability to be creative, and the students could be as well. She did not mind that the creativity meant extra work, developing new rubrics to accommodate student projects and working with other teachers to design new projects.

Taylor also talked about the importance of creativity in his growth, and about Anne support of his creative learning. Taylor explained why Anne’s support was meaningful, “I can be creative and when I’m working with Anne, I’ll look at trying to be creative and she’ll tell me
what she thinks. This is why we work so well together.” The peer support meant that Taylor received feedback from a peer that he considered knowledgeable.

Taylor felt that he was still “learning to make connections” and Anne often reassured him of his progress. Nevertheless he still admitted occasional feelings of insecurity, “So, I think I’m over that, yet I still have some feelings of inadequacy or, why did I do this, that was completely stupid.” Being creative also meant making mistakes, and learning from those mistakes. Taylor valued peer support through the process.

Zoe did not work with a partner, but she highly valued administrative support during her learning. She stated why this was so important,

You really need to have an administration that's supportive of “going outside the bounds,” so to speak… It's multi-departmental (project work). I can't pull these kinds of things off by myself so it really takes a culture in the school to want to step-out-there with you. You can fail big.

Accommodating and encouraging administration was a necessity for Zoe, and she even left a school where the administration seemed dubious of her teaching methods.

In a study, Zhao, Pugh, Sheldon, and Byers (2002) acknowledged teachers’ concern with school support. They found that administrative and school support determined the success of technology integration, even when teachers determined to implement a project. However, there was no detail in the one–to–one study on the teachers’ need for an environment where teachers were comfortable with making mistakes.

In prior themes, I mentioned that Zoe required technical computer support, and she systematically gathered data to show it. Zoe was the only participant who talked about technical support. In addition, she talked about its need in the past tense because it was not a current concern. Ironically, technical support is probably the most discussed aspect of school and computer use (Sandholtz & Reilly, 2004) and is considered one of the largest barriers to
technology integration (Bonifaz & Zucker, 2004; Cuban, 2002; Zhao et al., 2002). Therefore, it was not surprising that teacher innovators did not have technical issues as a concern, but instead, could focus on their professional growth. And, Zoe considered growth paramount in teaching. She said, “When you lose that spark and you stop growing, then I don't think your kids can grow.”

*Extraordinary Peer Collaboration*

The teachers in the Charter School were immersed in a “teachers as learners” school culture to a greater degree than the other teachers. Peers evaluated one another during portfolio presentations and in classroom observations. Teachers learned from parent feedback as they analyzed a survey. In another formalized setting, the teachers presented their project work. Samantha said, “You can show it and people are really responsive to the feedback from their peers. I did notice this summer when people were doing their presentations.” Fellow teachers questioned each other’s project rationale and provided additional perspectives.

When Jessica described her experience in this culture, she said, “It was almost like I was in a classroom.” Jessica felt as though she was the student, but she also noted that she needed to be a “role model” to her students. Within the same dialogue she noted, “everyone makes mistakes, and in order to learn you need to learn that mistake. So, you need to learn to make the change the next time.” Being a role model to her students meant exhibiting what it was like to learn from your mistakes. In other themes, it can be seen that other participants felt the same.

The learning disposition coincides with professional development to inspire deep change emphasized by Perry (2004), “Educators need time to be true students again”(p. 35). When teachers instruct, they return to process with which they are comfortable. If they are comfortable learning, they teach how to learn. If they are learning in a particular way, they are likely to teach
in that way (pp. 36-54). Similarly, these teachers became comfortable with how students should think about the subject content, not merely knowing the content, but instead, the teachers themselves were engaged in exploration.

Modeling technology integration significantly impacted teachers’ growth at the charter school. Teachers mentioned that they learned the computer technology from peer teachers, but felt learning to make complex projects was just as important. For example, Inga watched two other teachers whose students created project presentations that were interesting to the school and community. Inga said that she noticed and responded, “I can do that. I was like, that’s cool, and I want my kids to present and to show what they learned as a result of what we've done in the project.” Consequently, Inga had her student present projects in an interesting setting where other teachers and community members would be impressed.

The Sandholtz et al. (1997) study also found modeling to be a very effective professional development tool. They called it, “situated teacher development because the program is situated in a context of practice” (p. 139). Teachers observed other expert teachers, and were encouraged to interpret their learning, similar to the constructivist learning that the professional developers wanted for the classroom students. Charter schoolteachers were immersed in modeling.

All teachers displayed a learning disposition, but six of the seven teachers also contrasted themselves to teachers who did not learn, and made a point to distinguish themselves from that mindset. According to literature, this is not uncommon. Perry (2004) writes, “Many veteran teachers have forgotten what it is like to be a student and active learner” (p. 35). The participant teachers resented those teachers who did not grow and were not active learners.

Instead, all participant teachers valued the challenge of creativity. In fact, among the seven teachers, the words creative or synonyms were used twenty-nine times when referring to
their own learning or student learning. They were tolerant of ambiguity during the learning process. In addition, the teachers valued spending time with peers who instigated them into thinking, and supported them in learning, even when they made mistakes.
CHAPTER 6  
Practical Applications

In this section, I will offer some practical applications based on a small study and on a review of literature. In addition, throughout, I answer my primary and secondary research questions. However, this study was in no way expected to generalize, but rather to use observations to intuit lessons. Lessons are often not learned from generalized statistics, but rather from practical knowledge based on experience. This study was based on teachers’ and administrators’ experiences and past practices, in essence a sort of biographical and historical study. We use history in order to learn what has come before us to make future decisions. It is in this vein that I present the practical applications. In the world of education, each context offers unique challenges and opportunities; therefore, it is my hope that readers will use this study to grow in their particular context.

*Teachers and students need timely technical support.* None of the teachers mentioned current problems in getting technical support, although one participant, Zoe, spoke about computer problems in the past. However, sometimes, what is *not* mentioned informs as much as what is mentioned. Every article and book on preparing for technology integration addresses the provision of necessary technical support (Barrios, 2004; Bartels, 1997; Bonifaz & Zucker, 2004; Cuban, 2002; *A Laptop for Every Student?*, 2003; Rockman, 2003). Most advocate just-in-time technical support (Penuel, 2006; Rockman, 2003; Silvernail et al., 2003) in order to minimize teacher frustration and maximize student time-on-task. In addition to supportive literature, in this study, Zoe found that student confidence decreased with increased technical problems. Students were concerned that the computer problems were due to their incompetence rather than something apart from them. Schools should avoid situations that lower morale due to technology.
Sandholtz and Reilly (2004) remind us that teachers are masters of pedagogy, not machines, hence they should not spend their valuable time trying to fix them. Zoe spoke specifically of the cost, of time in computers: if technology integration costs too much time, computers are not worth the effort (Barrios, 2004). In this study, teachers had the necessary time to develop their pedagogy. This included finding Internet resources, learning to operate their computers, creating projects and collaborating with peers.

*Teachers need to be able to implement technology easily with what they currently have in the curriculum.* It is advantageous to begin with technologies that have a short learning curve, that can easily off-load work from the teachers to the computer, or that make the teacher and the student more productive (D. K. Anderson & Reed, 1998; Ross et al., 1999; Sullivan & Keating, 1998; Yildirim, 2000).

In this study, teachers went through the stages of technology integration studied by Sandholtz (1997). As predicted from the Sandhotz et al. study, they moved into the adaptation stage of technology integration when they felt technology helped to enhance student productivity, increase student content understanding, and boost student motivation. This was similar in other one-to-one reports (Bartels, 1997; Kerr et al., 2003; Lemke & Martin, 2004b, 2004d; Rockman, 1994, 2003; Silvernail et al., 2003). Specifically, in this study, teachers mentioned word-processing and using Internet resources as positive tools to enhance current lessons. Teachers at the Rural school enjoyed a “share file” on the school network which allowed them to easily share files among the teachers. Teachers need to find ways to fit technology into the current curriculum, and then they need to become comfortable using them.

If teachers are to move past the adaptation stage of technology integration, and be facilitators at the invention stage, more will have to be done (Sandholtz et al. 1997). Based upon
this study and supporting literature, teachers need a culture within which they can courageously and systematically experiment. This leads to the next suggestion.

*Teachers need to be in a school environment that allows them to make mistakes, since mistakes are part of experimentation (Matson, 1996).* In this study, teachers were not afraid to make mistakes, which may have been an aspect of their natural disposition, but most of them discussed their schools as safe places to deal with the feelings that come with mistakes. The teachers’ feelings that they could safely experiment, and thereby become innovators, was consistent with literature.

Currently, literature emphasizes schools as “learning communities” or “learning organizations” according to Senge’s book *Schools that Learn* (2000). He discusses the need to provide an atmosphere of learning based on collaboration, focus, and experimentation. In support of learning communities, Hargreaves (2006) found that three innovative schools that embraced this philosophy also sustained their innovations. It is essential for “learning organizations” to be communities where teachers meet *often* in teams (DuFour, 2004) to work on *meaningful projects* that originate with the teachers’ *observations* (Intrator & Kunzman, 2006; Penuel, 2006; Perry, 2004).

As a result, most professional development should not be orators giving rousing speeches, but rather teachers engaged in collaborative learning activities, like students (Intrator & Kunzman, 2006; Penuel, 2006; Perry, 2004) where they raise questions, create projects and assess outcomes (E. Hargreaves, 2005; Johnson, 2004; Wiske, 2004). The next practical applications encourage teacher experimentation specifically, and help teachers reflected on their practice, which is an integral part of technology integration (Zhao et al., 2002).
Teachers need to experiment and reflect on their experiments with student observational feedback. Participating teachers spoke of student observational feedback, both informal and formal. The informal included teachers’ gut reactions based on what they observed. Formal feedback included student assessments such as artifacts.

Informally, teachers watched for student interest toward learning, and felt failure if the students were not motivated. If the students struggled excessively, teachers tried to modify instruction by asking for students’ input on the project, lesson, or rubric. The teachers also engaged the students in dialogues about improving projects or rubrics.

Formally, one teacher discussed collecting data during and after her classroom activities. This was not the current use of data in education evaluation. In the current USA milieu, there is a push for “data driven decision making,” yet most of the data that are used for decisions is based on standardized tests (Eisenhart & Towne, 2003; E. Hargreaves, 2005; Hinde, 2003). However, the data that the teacher collected was not only based on testing, but on other student activities such as multimedia productions, computerized models and writing. The data was formative evaluation data, collected so that the teacher could modify her instruction (Atkin, Black, & Coffey, 2001; E. Hargreaves, 2005; Smith & Ragan, 1999).

Gathering student feedback focuses teacher development on student learning rather than teacher performance (DuFour, 2004; Senge, 2000). In teams, teachers can create or decide on formative assessment tools, which assess student understanding. Therefore, artifacts should not be limited to standardized tests (Donovan & Bransford, 2005a; E. Hargreaves, 2005; Wiske, 2004), but should also include other artifacts such as student projects and writing. With student artifacts, teachers can analyze a student’s understanding and discuss teaching methodologies for
improved student understanding (McTighe & O’Connor, 2005; Tomlinson & McTighe, 2006b; Wiggins & McTighe, 2005).

Teachers need to know how to create or design projects. Project or curriculum development can be a means for teachers to develop their pedagogy since it requires them to question their role, knowledge, and its meaning. Reports indicate that teachers prefer to work on curriculum for professional development (Penuel, 2006).

Interestingly, the process of project design was fun for some teachers, but arduous for others. All regarded the end project as worth the process. This may have meant using either a step-by-step process or backward planning, or starting with the standards (Wiggins & McTighe, 2005). Therefore, teachers needed to know how to create them, and find a way to create that aligned with their style.

For initial learning of project design, teachers can take graduate classes on curriculum design or instructional design (McTighe & O’Connor, 2005; Smith & Ragan, 1999; Wiggins & McTighe, 2005). If there are teachers already in a school who are masters of project making, they can help novices and be a mentor. In this way, the master teachers provide leadership (Silva et al., 2000). All of the Charter teachers mentioned that having project mentors was helpful to their growth.

Once teachers have started designing a project, they need time to collaborate (Intrator & Kunzman, 2006; Penuel, 2006; Rockman, 2003; Wiggins & McTighe, 2006). The Charter teachers talked about a process that was helpful for them. Teachers presented their projects to their peers who then questioned and offered ideas for modification. It was important that all of the teachers presented projects. They needed to undergo the same process, so that no one teacher felt threatened or isolated in the process.
In order to minimize mistakes, teachers may want to begin with small projects (Sandholtz et al., 1997), go through the process of sharing projects with peers, and collect and analyze the student feedback and observations. In this study, this process produced project modification, but it also encouraged confidence to take on larger projects.

_Teachers need to know how to assess student progress and while sharing the responsibility for progress with students._ All teachers felt it was necessary to hold students accountable in projects through assessment. In addition, assessment and lesson alignment are essential for developing teacher innovators. Teacher growth toward innovation can be delayed if teachers do not know how to assess student learning (Sandholtz et al., 1997). One way this was done was through rubrics. This study and others attest that one-to-one can help foster student creativity (Kerr et al., 2003; Lemke & Martin, 2004b, 2004c, 2004d), but if teachers cannot assess student work, the creative work is unlikely to be sustained (Hargreaves, 2006).

Another way that students can be held accountable is through the formation of interdependent groups for cooperative learning. In this situation, the class is dependent on a person or group for delivering the content. Student presentations provide meaningful accountability for students (Wiske, 2004). Currently, one-to-one literature reports that collaborative work increases with technology infusion, but a hallmark of the inventor stage includes individual accountability (Sandholtz et al., 1997). A combination of cooperative groups and individual accountability creates interdependent groups. Teachers can learn strategies for grouping from literature which focuses on ways to make interdependent groups (Johnson, 2004; Mandel, 2003).

_Teachers need to address beliefs about learning within the current culture._ Sandholtz et al. (1997) wrote, “The successful use of technology – or the adoption of any educational innovation – requires teachers to confront their beliefs about learning and the efficiency of
different instructional activities” (p. 171). All of the participating teachers could articulate how they believed students learned.

Study participants could also identify the origin of their beliefs, which was consistent with observations of contemporary culture and their personal background. Both of these influenced current teachers’ beliefs about student learning. For example, it was mentioned that corporations now expect employees to work in teams. Therefore, their students needed experience working in sophisticated team projects. In another example, teachers felt that they had experienced boredom in k-12 school. Therefore, they felt that students should not be bored with learning, because the students that are, may become discipline problems. These beliefs contributed to development of appropriate classroom lessons.

Research has shown that the infusion of technology is a critical event that does change teacher’s beliefs (Levin & Rivka, 2006-2007; Sandholtz et al., 1997); and professional development that facilitates teachers to think about changing beliefs about learning, aids in teacher growth. It is helpful if teachers engage in conversations during professional development opportunities such as in school discussion groups or with an outside program (Intrator & Kunzman, 2006; Perry, 2004).

Teachers need to know when to use appropriate instructional styles. This study was about teachers becoming facilitators; however, the teachers used different instructional techniques depending on the class, student, content or school structural constraint. Since teachers were interested in meeting individual student needs, they observed students’ needs within their constraints. Two teachers reported frustration with the process when they had to determine whether to use direct instruction, a transmissive style or become more facilitative.
When teachers have clear goals they can more easily determine the necessary instructional style (Davis & Krajcik, 2005; Levin & Rivka, 2006-2007; Nolan & Meister, 2000). However, not only do the teachers need to be aware of their goal, (Davis & Krajcik, 2005; Smith & Ragan, 1999) they also need to be aware of the way the student learns (Donovan & Bransford, 2005b; Tomlinson & McTighe, 2006a). Therefore, a teacher must wisely choose the way to instruct the student so that their style falls on a continuum between transmittive and facilitative (Levin & Rivka, 2006-2007). In other words, teachers need to be a “sage on the side” (K. L. Peck, 2003). Currently, the best way for teachers to develop their instructional style would be through project creation or discussions with others whether in school organized conversations or in graduate courses.

*Teachers can expect a gamut of emotions.* The mantra, “teachers as learners” or “teachers as students” (Perry, 2004, p. 35), carries with it a host of emotions. In this study, when teachers underwent the learning process, their experiences evoked emotions of joy, frustration, anger, and fear at different times, as they became facilitators. Their experience is not unusual; it is consistent with literature (A. Hargreaves, 2005; Intrator & Kunzman, 2006; Palmer, 1990, 1997a). The teachers were neither afraid to address their emotions, nor did fear stop them from fostering their creativity or their student’s creativity to increase interest in learning.

To help teachers work through their emotions, they need a collaborative and a supportive environment. In the study, teachers desired success, but dealt with feelings of fear and anxiety as they faced the unknown in circumstances such as creating or implementing a new project. On the flip-side, they took joy in student work and creativity. Sharing with other teachers helped them feel less alone. Therefore, as teachers design and implement projects, a collaborative
environment can help support their emotions during the process (Collay, 1998; Palmer, 1993a, 1997b).

*In a collaborative culture everyone matters:* Teachers felt the school politics of their innovations (Cuban, 2002). Teachers mentioned their gratefulness toward their administrators when provided with the “license” to experiment. The only exception was the Charter school, where the administrator said that the charter existed within a “flat” organizational structure. There, teachers made many decisions that an administrator would make within a traditional school.

Within the traditionally organized schools, teachers enjoyed administrative support. One teacher felt that it was important that administrators valued her teaching style, especially because it was not transmissive or traditional. In literature, a supportive administration is necessary for technology integration (Ely, 1999; Zhao et al., 2002). Sandholtz et al. (1997) details the necessary support needs at the various stages of technology integration development.

In all of the schools, teachers valued their time to talk to other teachers, formally and informally throughout all developmental stages (Sandholtz et al., 1997). Like many studies on support, all teachers talked about the important aspect of meeting with peers to discuss their ideas (Barrios, 2004; Lemke & Martin, 2004b; Palmer, 1993a, 1997b; Penuel, 2006; Zhao & Frank, 2003). Three teachers emphasized that they needed time with peer teachers in order to share ideas and to collaborate on projects. In one case, peer time was removed in the third year of implementation, and the teacher vehemently wanted peer collaboration time to return.

Peers allayed fears and challenged ideas toward improvement. Regardless if it was traditional or Charter school, teachers depended on their peers for ideas and emotional support.
Thus opportunities to provide peer support should be explored and established as a norm and provide practical recommendations.
Further Research Needed

As mentioned in the limitations of the study, this study cannot be generalized to a larger audience, but the reader can infer what issues may be pertinent for further research. Based on that assumption, I make my recommendations.

Studies are needed which focus on exceptional teachers, especially for technology integration, so that ideal teachers can be better defined. The administrators selected the teachers, but four of them found it difficult to articulate what the selected teacher did differently than others. It seems like where innovative teaching is prized, administrators will want more teachers like those selected.

It would be helpful for “learning organization” schools to identify non-threatening ways in which teachers can interact and question one another, while encouraging teacher growth. In this study, it was important that teachers felt that they could make mistakes; this is an attribute of a learning organization (Senge, 1990). In addition teachers, prefer project creation and curriculum work for professional development (Penuel, 2006). The Charter school combined all of the above concepts, so it was not surprising that the teachers looked forward to in-service days. Professional development revolved around their project creation, and the teachers shared projects with one another. The Charter teachers also talked about ways they questioned one another so that they did not feel threatened, while at the same time, they were challenged to justify their project plans (Wiggins & McTighe, 2006). It would be helpful if research identified effective peer questioning tactics and documented the impact they have on professional growth using longitudinal studies.

Modeling provides an effective way for teachers to grow (Sandholtz et al., 1997), and more modeling strategies are needed. For example, Powell and Napo
observation techniques as administrators focused on differentiated instruction. They observed many teachers for five to ten minute increments and looked for ways teachers differentiated. After, administrators sent a group email to teachers detailing ways that they saw teachers differentiating instruction, without names, and with literature references. In a group, teachers discussed the observations, focusing on strategies to differentiate instruction. The teachers could use a similar strategy in their classroom. In this study, teachers talked about modeling events that helped them grow. It would be useful for schools to have a bank of useful modeling techniques for teachers and administrators. Research that documented such effective modeling techniques and their impact on the participants would provide useful practical guidelines as well as areas for investigating the development of effective modeling.

It would be valuable for teachers to know when to use a particular instruction style. According to literature, teachers need to vary their instruction style based on student differences (Palinscar, 1986; Tomlinson & McTighe, 2006a) and content matter (Levin & Rivka, 2006-2007; Nolan & Meister, 2000; Shulman, 1999). Teacher facilitators met individual student needs, which sometimes meant direct instruction; they used direct instruction with particular content. Varying teaching style dependent on content is referred to as “Pedagogical Content Knowledge” (Shulman, 1999). However, the decision of when to instruct in a particular way can be frustrating to teachers. Currently, this seems to be tacit knowledge among the teachers and needs to be developed (Davis & Krajcik, 2005).

Research needs to explore the relationship between the ways teachers create projects and the ways teachers learn or work. Literature has shown that people learn and create in different ways (Davis & Krajcik, 2005). It has also been shown, that teachers who are comfortable with projects are most likely to implement them (Levin & Rivka, 2006-2007). Therefore, it would be valuable if teachers knew how they could create projects within their own style.
Student feedback, beyond test scores, is not often discussed in literature, yet schools could benefit from identifying ways to elicit students’ constructive feedback. In this study, teachers monitored student interest and boredom as feedback for class project modification. They used rubrics, student self-assessments and formal class discussions to ascertain students feedback. Research needs to explore the ways of eliciting student feedback, which would be the most meaningful for modifying instruction.

Since most teachers remain in the “adaptation” stage of technology integration (Sandholtz et al., 1997), and the administrators were anxious for more teachers in the “inventor stage”, it would be advantageous to have larger studies that focus on the factors that encourage teachers toward the inventor stage. There have been studies on conditions for technology integration (Ely, 1999; Zhao et al., 2002) and recommendations of professional development (Intrator & Kunzman, 2006; Palmer, 1997b; Perry, 2004; Wiggins & McTighe, 2006) and ways to build a collaborative culture which helps understand the process. But, schools that desire more teacher inventors would find it helpful to have a professional development programs focused on teachers’ growth into the “inventor” stage.

The Sandholtz et al. (1997) study found that the ACOT teachers created a new culture in their classrooms and the teacher’s role changed when they integrated technology. They noted that the process “was SLOW, difficult” (p.171). Does the process need to be slow? The National Writing Project (Perry, 2002) has been noted as high quality, replicable, professional development that helps teachers change the way that they teach writing and better understand the way the that writing is learned. In addition, I looked at the Charter teachers’ experiences, and that of Zoe who experienced modeling. In the Charter school, where there was a plethora of
teacher-modeling projects, teacher sharing, and support, teachers grew quickly in technology integration and became facilitators. Could a replicable teacher development program be created?

Most obviously, how can we develop and aggregate the learning of more teacher innovators but also meet the demands of the testing culture? Edutopia, www.edutopia.com, is the main website that advocates technology integration and encourages teachers to be innovative in their approach. Technology integration in one-to-one environments is fairly new, but is becoming widely accepted. It seems we need more to find ways to meet the accountability demands of standardized testing, and to simultaneously prepare the students for the innovation economy, which is beyond current standardized testing measures. Currently, there is no specific research on teacher innovators in one-to-one that addresses both.
Personal Findings

Currently, I instruct pre-service and in-service teachers in technology, so the exceptional teachers for this study caused me to reflect on my instruction.

I was struck by the teacher participants’ play with creativity. They do not fear failure, but continue the process of learning. At same time, they want a supportive environment that motivates them to move ahead and continue growing.

Equally interesting, was the teachers’ characterization of failure: student disinterest in learning. Unlike my experience teaching middle school, most teachers blame boredom on student disposition. Instead, most participating teachers considered student engagement a welcomed challenge.

These exceptional teachers had the courage to change with experiments and failure, and served as a model to me. The participants provided me with more courage to model systematic learning experiments with my teachers, and to employ more project based learning in the college atmosphere.

In turn, the study also reinforces the way I instruct, but challenges me to focus more on changing perceptions. Teachers come into my classroom with many beliefs that can either help or hinder technology integration. I expect to spend more class time reflecting on beliefs, and examining those beliefs based on experience. I also want to challenge in-service and pre-service teachers to run more experiments, eliciting student feedback and to reflect on what was learned, remaining open to failure and success.

As a university instructor, I am a change agent. Rogers (1995) notes that most change agents concentrate on “knowledge,” the first stage awareness, but many teachers need “how-to-
knowledge” (p.166). Through the processes supplied above, I hope to give my students more how-to knowledge

**Conclusion**

This research was about a select group of teachers, chosen for their technology integration in one-to-one environments, but who were moving toward a facilitative teaching style. It turned out that all administrators chose teachers who were innovators that were employing projects for classroom activities. The teachers and principals shared their insights into how they developed along with the emotions that aided interpretation of events. Below in Figure 14, see my interpretation.

Sandholtz et al. (1997) wrote, “Introduction of technology to classrooms does not radically change teaching; instead, technology can serve as a symbol of change, granting teachers a license for experimentation” (p.171). Experimentation was a word that repeatedly came to mind when I analyzed data for the following reasons: teachers were not afraid to make mistakes; they made observations about themselves and their students; and they modified their instruction as a result of observations. Basically, it was the scientific process.

Teachers learned helpful techniques for facilitation through professional development, graduate classes, trial and error, collaborating with peers and modeling of other teachers. When teachers had other teacher-models to follow, it seemed that they grew as facilitators faster than the others; this is consistent with literature (Sandholtz et al., 1997). Becoming a teacher facilitator meant making observations of students needs, trusting student feedback, modifying instruction based on students’ insights, using direct instruction as needed, and dealing with the emotions that coincided with student observations.
As the teachers observed students, they all felt that that a facilitative style was appropriate neither at all times nor for all students. Instead a largely facilitative style was adapted dependent on the student learning needs, curriculum demands and school structure. This is consistent with instructional design literature (Reigeluth, 1999a; Smith & Ragan, 1999), and recent study of teacher beliefs and technology (Levin & Rivka, 2006-2007). However, theoretical literature, including segments of my literature review, discusses instructional style as a dichotomy between traditional, didactic, transmittive styles versus an extended knowledge, constructivist, facilitative styles. In practice the innovative teachers of this study operated more a continuum of styles based on learning needs, learning goals and constraints.

Teachers’ emphases on changing instructional styles based on student learning needs showed that they were more committed to the students than to the innovation, which was facilitation with computers. Administrators also wanted to see that the technology would improve student learning which would make computers worth the financial and emotion investment. The teachers that were interviewed for this study felt that the benefit of one-to-one outweighed the cost.

I sought to answer multiple questions that would aid me as a college professor. I also wanted the study to become practically valuable to administrators and teachers who are interested in professional development. After thorough review, I feel that I have achieved the goal of this research.
Figure 14. Interactions that determined teachers’ pedagogical change in one-to-one environments

Classroom
- Students are stakeholders and must give feedback to the teacher

School Culture
- Supportive
- Encourages Risk taking
- Supplies Modelling
- Curriculum

Time
- Using technology needs to be worth the time

Societal culture
- Uses computers
- Problem Solving
- Collaborative

Feedback Loop - Emotions of Joy, Fear, Frustration

Teacher pedagogical practice - Habits & Activities

Feedback Loop - Rationale
- Evaluating
- external factors

External Forces

Internal Forces

Beliefs about Learning
- Learning should be fun
- Student should question
- Learning needs to be meaningful
- Technology deepen creativity
- Need to meet learners individual needs

Personality
- Teachers learn- like a student
- Acceptance of mistakes
- Wants challenge
- Values creativity
- Tolerant of Ambiguity

Skills
- Uses computers to meet student needs
- Creates and uses rubrics
- Creates Projects
- Experiments with lessons

Assumptions
- All teachers are learners
- Teachers must continue to grow

What makes a teacher move toward the Innovator Stage of Technology Integration
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APPENDIX A

Table 9

*The case*

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| **Unit of Analysis** (Babbie, 2002) | • Individual Teachers  
• 7 teachers |
| **Selection Criteria** (Glaser & Strauss, 1967) | • One-to-one school or classroom  
• Recommended by administrator based on displaying facilitator characteristics  
• Representation from at least 4 different schools  
• Representation from at least 2 different age groups |
| **School Participants** | • Small City school - Middle School  
• Rural School – High School  
• Charter School, suburb area– Middle school  
• Boarding School for at risk students – High school |
APPENDIX B

Moving From Transmitter to Facilitator with Technology Integration
Sockman Research Overview

Goal of Research
Understand how teachers are transitioning their role, from transmitter to facilitator in one-to-one environments. (Teachers will participate from various one-to-one school districts, content areas and grades.)

Rationale
Schools repeatedly note that teachers move toward facilitation while teaching in one-to-one environments, and that facilitation seems necessary for appropriate technology integration. However, very little is known about the teachers’ transition. Examples exist of good technology integration, but how did the teacher get there? In my personal experience, changing teaching styles becomes problematic. I encounter struggles with what I believe, resulting in pedagogical discrepancies that I want to resolve. I am sure that teachers in one-to-one environments also have their own internal issues from which we can learn.

Benefit to the School and Others
While learning about the teachers’ thoughts… 1.) schools will better understand the transition, and hence, can provide more informed professional development. 2.) schools will learn about their own school 3.) participating teachers will engage in reflection - a necessary component for growth.

Research Needs from the School District
1.) Person (s) that will determine teachers for study: Teachers that are making good progress from transmitter to facilitator.
2.) 1 – 2 teachers in the school district that are willing to do the following:
   • Engage in a 1½ hour interview
   • Welcome the researcher into the classroom for 1/2 days
   • Engage in a follow up a 1½ hour interview
3.) 1-supervisor or principal interview for 1 hour

Issue for Discussion – Anonymity
Two equal goals: Maintain integrity of school, and allow others to learn from the experience.  Thought: Use pseudonyms for all research materials, and prior to publication study participants read and critique information.

Researcher Background
Taught in public school for 10 years & loved it; Taught at PSU; Teaches at ESU; Working with McREL on nanoscience unit for high school; Granted 2005 Paul W. Welliver Outstanding Graduate Student Award.

Contact Researcher: Beth Rajan Sockman  brs139@psu.edu  570-839-1329
APPENDIX C

INFORMED CONSENT FORM FOR SOCIAL SCIENCE RESEARCH
The Pennsylvania State University

Title of Project: Transiting Teaching Roles with Technology Integration - (IRB #21826)
(Principal, Supervisor or Technology Coordinator)

Principal Investigator: Beth Rajan Sockman
Department of Learning and Performance Systems
314 Keller Building, University Park, PA 16802
TELEPHONE: 570-839-1329
EMAIL: brs139@psu.edu

Advisor: Dr. Kyle Peck
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Advisor: Dr. Priya Sharma
Keller Bldg., University Park, PA 16802
TELEPHONE: 814-865-4374
EMAIL: psharma@psu.edu

1. Purpose of the Study: The purpose of this research is to a.) Understand how teachers transition teaching styles in on-to-one teaching environments; and b.) Explore what that experience means to the school.

2. Procedures to be followed:
   a. A statement of permission from you, or the principal allowing the research to be performed. The letter will be mailed to Penn State’s Office for Research Protections.
   b. Participation in this research will include an interview that will last 60-90 minutes. The interview may be audio taped.
   c. The teacher participant(s) in the school will be interviewed for 60-90 minutes, will keep a journal, will welcome Beth into his/her classroom for a one-hour observation, and conduct a follow-up interviews.
   d. After all the interviews are conducted, a report will be written.
   e. You will receive a copy of the report, and you will be asked for feedback. At that time your comments, insights, corrections and modifications will be welcome.
   f. The unedited tapes will be stored in a locked filing cabinet at the home of principal investigator, Beth Rajan Sockman, and will be destroyed in the year 2010. Only Beth Rajan Sockman will have access to un-edited tape recordings.
3. **Discomforts and Risks:** There are no risks in participating in this research beyond those experienced in everyday life. Some of the questions are personal and might cause discomfort.

4. **Benefits:**
   a. You might learn gain insight into teaching by participating in this study.
   b. Receive a thorough description of the teacher’s role change process so that we can better understand expectations, emotions, and transitions.
   c. Hopefully identify meaningful professional development for transitioning teachers.

5. **Statement of Confidentiality:** Your identity and the school’s identity will be confidential. Pseudonyms will be used to retain confidentially in research, and if research is published. Direct quotes will be used. However, if you reference people, institutions, or information that is not recommended for public knowledge, pseudonyms will be used. The following may review and copy records related to this research: The Office of Human Research Protections in the U.S. Department of Health and Human Services, and Penn State University’s Social Science Institutional Review Board, and Penn State University’s Office for Research Protections.

6. **Right to Ask Questions:** You can ask questions about the research. The person in charge will answer your questions. Contact Beth Rajan Sockman at (570) 839-1329, brs139@psu.edu with any questions. If you have questions about your rights as a research participant contact Penn State’s Office for Research Protections at (814) 865-1775.

7. **Compensation:** There is no compensation for participating in this study.

8. **Voluntary Participation:** You do not have to participate in this research. You can end your participation at any time by telling the person in charge. You do not have to answer any questions you do not want to answer.

You must be 18 years of age or older to consent to participate in this research study. If you consent to participate in this research study and to the terms above, please sign your name and indicate the date below.

**You will be given a copy of this consent form to keep for your records.**

Please place a check mark next to the following statements that apply to **audio-taping**:

- _____ I give my permission to be **audio** taped during the interview.
_____ I do not give my permission to be audio taped during the interview.

Unedited audio will be destroyed 2010

_________________________  ______________________
Participant Signature                  Date

The informed consent procedure has been followed.

_________________________  ______________________
Investigator Signature                 Date
APPENDIX D

INFORMED CONSENT FORM FOR
SOCIAL SCIENCE RESEARCH
The Pennsylvania State University

Title of Project: Transiting Teaching Roles with Technology Integration - (IRB #21826)
(Teacher)

Principal Investigator: Beth Rajan Sockman
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Advisor: Dr. Priya Sharma
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EMAIL: psharma@psu.edu

1. Purpose of the Study: The purpose of this research is to a.) Understand how teachers transition teaching styles in on-to-one teaching environments; and b.) Explore what that experience means to them.

2. Procedures to be followed:
   g. Participation in this research will include:
      a. A first interview that will last 60-90 minutes. The interview may be audio taped.
      b. Welcome the researcher into his/her classroom for 1 hour.
      c. A follow up interview of 60 minutes interview.
      d. The total amount of your time will not exceed 3 hours.
   h. After all the interviews are conducted, a report will be written.
   i. You will receive a copy of the report, and you will be asked for feedback. At that time your comments, insights, corrections and modifications will be welcome.
   j. The unedited tapes will be stored in a locked filing cabinet at the home of principal investigator, Beth Rajan Sockman, and will be destroyed in the year 2010. Only Beth Rajan Sockman will have access to un-edited tape recordings.
3. **Discomforts and Risks:** There are no risks in participating in this research beyond those experienced in everyday life. Some of the questions are personal and might cause discomfort.

4. **Benefits:**
   c. You might learn more about yourself by participating in this study and gain insight into your teaching.
   b. Hopefully identify meaningful professional development for other teachers.

5. **Statement of Confidentiality:** Your identity and the school’s identity will be confidential. Pseudonyms will be used to retain confidentially in research, and if research is published. Direct quotes will be used. However, if you reference people, institutions, or information that is not recommended for public knowledge, pseudonyms will be used. The following may review and copy records related to this research: The Office of Human Research Protections in the U.S. Department of Health and Human Services, and Penn State University’s Social Science Institutional Review Board, and Penn State University’s Office for Research Protections.

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7. **Compensation:** There is no compensation for participating in this study.

8. **Voluntary Participation:** You do not have to participate in this research. You can end your participation at any time by telling the person in charge. You do not have to answer any questions you do not want to answer.

You must be 18 years of age or older to consent to participate in this research study. If you consent to participate in this research study and to the terms above, please sign your name and indicate the date below.

You will be given a copy of this consent form to keep for your records.

Please place a check mark next to the following statements that apply to audio-taping:

_____ I give my permission to be **audio** taped during the interview.

_____ I do not give my permission to be **audio** taped during the interview.
Unedited audio will be destroyed 2010

Participant Signature  Date

The informed consent procedure has been followed.

Investigator Signature  Date
APPENDIX E: Codes to Theme

Level 1 – Open Coding
Level 2 – Theme Coding

Zoe

Open Code

| Kids rough |
| Teacher - I am a Envelope pusher |
| Teacher - Confidence in Teaching |

Theme Code

Inga

Open Code

| Kids Learning |
| Teacher - Confidence in Teaching |
| Teacher - Creative |

Became a theme code

B: It's the one I passed on the way here...gotta go.
Z: It literally is across the street. My passion has always been with "at risk" kids, anyway, so this seems like a good fit. So I put an application in here; it was the only place I put an application into and interviewed and got the position. Again, I made it quite clear that I'm an envelope pusher, I tend to take a school administrator out of their comfort zone, constantly pushing and being involved in not your normal (everyday) activities in the classroom, and they said that was okay and to date that's been okay.

Open Code

"Mental gymnastics".
B: Right, I think it was like I was a caterpillar into a butterfly. It blossomed and bloomed into a beautiful butterfly. (Note, change of voice to playful and gentle laughter)
B: (Amusement)...Interesting.
B: I feel a much more creative course here, a much more beautiful thing here as far as what the students can do, what I can do as a teacher, and just everything. The relationships I can have with the kids, the relationships I can have with other teachers.
B: Is there anything...it sounds like it means a whole lot to you...is there anything else you can say that it means to you that you haven't said in that analogy? What this whole experience has meant for you?
B: I've been very confident in my teaching...
B: Really...
B: I've gained a lot of confidence...
B: And you've gained more confidence now?
B: Yes, I think I am a great teacher and I am very confident that I can even say that.
B: Wow...did you feel that way 4 years ago? I mean before coming here? Would you have said that?
B: Yes, I think so. I was good at it, and I knew that the first time...I can do this...I can get people to learn. I can be motivating and I'm clear and the kids just learn, they do well when I do something...
Wyatt

Teacher - I can TEACH
Teacher-Confidence in Teaching

B: All of a sudden you have to do this...

W: Yeah. You know, you've been teaching for a couple years, we don't think you're qualified enough, you better take a test to make sure; so my running joke in the building is that I'm considered 'highly qualified' now by the state and federal government so I can teach...which I kind of understand where they're coming from; if you're teaching the subject you should be able to pass the test that proves you can teach the subject, but it was a little slap in the face that they said...they take this test...after you've been teaching for 3 to 4 years.

B: I was offended, by the way...(laughter)...as a teacher, because I was teaching (at the time) and I think that was a little bit down the road...I was highly offended.

W: I took it, you know, cause the district (at the time) paid for it, too, and I took the test...it was like, great, but you know what, I've been teaching the subject for 4 years so I'm not going to go into something and teach it if I don't know it. The joke is those who can't teach, but I could do the stuff (but that's beside the point); so I took the test and now I'm "highly qualified" so if you ever ask anyone...(laughter)

B: (laughter)

W: "I'm "highly qualified".

Samantha

Teachers share projects/disagreements
Teacher-Confidence in Teaching

the first time I had seen somebody kind of go...it's a good idea. That's important to reach out and evaluate and to think...okay...where do I stand on this? I know for me, I feel like people have changed over time but I know that I always come in with that interdisciplinary approach broader than other people have. I have a passion for literature and writing and I think that some of the techy stuff...I understand, some people have really skewed them by saying that...Yeah...true interdisciplinary...I'm not realising that there are even more ways that you could hit whatever those nuggets are. Like right now we're reading (Call to Courage) (7). There are a lot of wonderful concepts. We're dealing with coral reefs and we're dealing with sea crabs. We're talking about how the ocean is...You know many aspects...and it can be subtle but I know I'm reaching some people through the novel in a way that they're not open to so far the scientific...okay...I have to research coral reef creatures...whatever... But they're passionate about that. So I look for what kind of literature we can read and how it can really bring out the concepts I'm trying to deal with.

B: How, in the beginning, like I love this idea of perception and your idea......

S: I feel that people really didn't value the literature part of my project...I'm really...B: Yeah, and so for me I try to gently continue (over the years) to say and to support these ideas that I have during project time in (in the morning, in the afternoon, in the writer's workshop or in the literature circles) because there are the kinds of writing activities we're doing and these are the kinds of books we're reading. So that goes back to the multiple group intelligence or...
Example of Moving from Codes to Themes

The theme code, “Teacher - Confidence in Teaching” was evidenced in chapter 4 categories for each of the cases under teacher identity growth. In addition, teachers discussed confidence in different ways: Wyatt took the standardized teacher test; Anne could “tame” the Internet; Taylor taught adjudicated youth and with Anne “made connections”; Zoe experienced small success in project development; Samantha saw the students’ needs and met those needs; and Inga and Jessica discussed their confidence growth as a result of experience teaching in the Charter School.

My thought: Confidence was important.

Sensitivity to literature

From Chapter 2: As expected, researchers found that with training and use, teachers did grow in confidence and acceptance, as the fears of the unknown were quelled (D. K. Anderson & Reed, 1998; Ross et al., 1999; Sullivan & Keating, 1998; Yildirim, 2000). As teachers gained confidence in a one-to-one school, teachers also implemented more technology (Sandholtz et al., 1997).

My thought: Since teachers talked about their confidence growing, but in different ways and at different times throughout the process, I felt it could not be a theme, but was an underlying component to all themes. It was a disposition needed for experimentation.

Sensitivity to literature - Confidence Implied to accept student feedback

From Chapter 2: An innovating instructor, Matson (1996) states “As we innovate, we go through our own metamorphosis. The process changes us as much as we change our surroundings. We reincarnate through every creative idea pursued. It changes the way we think and reveals more of who we are” (1996, p.171). This statement infers to the reflective nature of invention, and those instructors who reflect on themselves and teaching usually desire something outside of current academics for themselves and their students (Dewey, 1938; Lipman, 1991; Shulman, 1999). Invention requires a certain self-awareness that is comfortable with being challenged by the students.
Sensitivity to literature - Confidence Implied to engage in peer learning and inquiry

From Chapter 2: This is consistent with discussions of positive professional and staff development (Borko, 2004; Palmer, 1993b; Perry, 2004). The propagating conditions for teacher growth includes providing a space to talk with other teachers, share ideas about learning, engage in self and group classroom inquiry, and establish a means for group and self-evaluation. Each of these aspects seems requisite for deep change – such as the change to the facilitator role.

From Chapter 5: In literature teachers are described as scientists with “natural wonderings” (Perry, 2004) who need to test their experiments.

My thought: Confidence was a disposition that the teachers did not talk about in isolation.

Sensitivity to literature about the disposition and individual change

From Chapter 5: Rogers (1995), as change theorist, and Cuban (2002), as technology critic, questioned whether innovators implement an innovation due to a natural disposition toward it, or because of other factors.

This led to the theme: Teachers developed their Identity but were Enhanced with Professional Support
Level 3 – Code mapping

1.) Codes are mapped below

Sample Journal Thought
2.) January 20, 2006
Interviewing teachers at Rural School. Possible theme – Creativity, Experiences where the teacher didn’t spend the whole time in teaching, think about how students learn, maybe had some bad experience in education years, had some models that made them think of education. Seems like identity issues are arising. They thrive from the creativity. Use of rubrics.

Professional development (PD) for the teachers was not limited to formal in-service days or a graduate courses. Instead, it was integrated into daily operations. It also revolved around what the teachers believed about learning.

Conclusion that influenced making of themes for Chapter 5
3.) Themes on PD – They must be in multiple themes and not just one. PD could be evidenced in most themes.
APPENDIX F

Narrative time-order story

Case 1 - Zoe’s Story

I walked into Zoe’s room that consisted of 14 tables, a laptop cart in the front of the room and a white board. The counters were lined with waist high cabinets where tri-fold posters of student’s paleontology projects from the previous year. The project posters serve as models for the current students, and grabbed the interest of an observer. The tri-fold poster was covered with labeled pictures, layered artwork of the dinosaur anatomical system, hypothesis, detailed findings and conclusions of a detailed simulated archeological dig. The teacher’s desk sat in the back corner with papers and laptop computer on top.

Story

I asked Zoe to talk about her background that could have played a significant role in her teaching. Zoe said that she always like teaching from a young age. As early as the seventh grade, she asked her teachers if she could teach a topic that really “lit her fire”, and many teachers allowed her.

In undergraduate college, education made a significant impact in her future teaching style. Her former teachers taught using direct instruction, or transmitter style, but later in her college years, she learned about constructivism.

Everybody taught me the exact same way, and when you go to college they teach you the exact same, and it practically kills me. Because, you go to your college professors, and they say this is the worst way to teach while they stand up in front of you and teach to you that way…. The constructivism method of teaching is something I was introduced to very late in my college education, and then when I went to a school district that said, yes it's okay for you to teach like that, I was like...cool, okay, I can do that!

Although constructivist methodology was not modeling for Zoe in college, the theory caught her attention.

However, her first school district nurtured a constructivist method of teaching. Zoe described one of her turning point experiences, and how the school district played a role. First, she saw an implemented activity, which used constructivist methodology.

The kids were given meteorological data, and they worked in groups to determine what kind of a weather report to put out that day. Depending on how you interpreted the data, you may have come up with a different answer, and it was okay that not everybody came up with the same answer. I was like...cool...I can do that. That just made so much more sense, because if you turn on different TV stations they have slightly different forecasts and why is that? Well because how did you interpret the data.

Unlike the teaching methods that Zoe had experienced as a student in school, this made sense to her.
Logically, as a science teacher, she was aware that there was usually more than one correct answer to complex problems. In addition, if she was going to have her students engaged in scientific behavior, they would have to deal with complex problems, like a scientist.

The same district then taught her how to assess students’ complex answers by using rubrics. Now that Zoe saw how to assess the students, she had tools to implement the constructivist style of teaching.

You know, you can use data all you want, but you also have to be careful about your interpretation of that data. You may interpret it incorrectly but... If they didn't get it, they wouldn't have recognized that the data didn't make sense, so to have the kids be able to evaluate the data like that, that's what I'm going for. When that was modeled for me in first school, then I was sold.

Zoe found it exciting when a student would review data, and would determine that the data did not match the predicted outcome. She felt student questioning was the beginning of real learning.

She described her first school as “very progressive”, and they encouraged her to experiment, though they did not have money for technology.

Armed with strategies to engage students scientific thinking and reasoning, Zoe applied and received numerous technology grants at her second school. It did not bother her that other teachers were not teaching in the same way, since she always saw herself as a little different. Zoe described herself as an adult with undiagnosed ADHA, and a person that does not mind “standing apart”.

With years of encouragement to develop her constructivist teaching methods, she was teaching in the third school. Albeit, at the third school she found little administrative support for the way she wanted to teach. Surprisingly, she talked about her own role, and the impact she had on the administrators.

I'm an envelope pusher, I tend to take a school administrator out of their comfort zone, constantly pushing and being involved in not your normal, everyday, activities in the classroom... Whereas I'm going "cool" and the administrator might be going “What?! you're letting them what?.” I'm allowing the students to start to integrate this learning for themselves through discussion, sometimes through fixing a lab 3 times to the point where it's valid; and yes, that's why they needed to come in after school and spend another 1/2 hour here so they could get it. But, man... when they're done with that, I could have sat down, and they could have taught somebody. So, they have that kind of a level of understanding but it's sort of a messy process. So with an administrator coming in and the only used to coming in and seeing everybody sitting in rows, looking at the board and writing what the teacher says, that wasn't what you were going to see in my classroom

Zoe wound up leaving the unsupportive school after a year, and went to teach at Boarding School. Instead of being frightened of a teacher who does not follow the step-by-step curriculum, Edward and others encourage her efforts, and valued the way she encouraged academic success for every student.
The day that I observed Zoe, students were working on a volcano project. More specifically, they were viewing NASA satellite images from the Internet, locating the places on a map, and using three types of data, to justify a hypothesis: Identifying the type of volcano in the image. Zoe rotated around the room, not just answering questions, but asking students questions. When the student had a problem, Zoe did not give him the answer, but questioned him about what he already knew.

After observation, I asked Zoe, if her teaching style had changed. She talked about the beginning and what it meant to her now.

When I first started out, although I was an "outside the box thinker", I did not immediately have the confidence in myself to be able to step out and do those things. I kind of felt like I hadn't paid my dues yet and so for the first few years, although I had these ideas and I'd write them down and I'd keep them, or in my lesson plan book...things that I might like to try or things that didn't work so I would need to remind myself to look for a different way to do it the next time. That way I can look back on that.

Zoe talked about her confidence growing over time, trying new things slowly, and keeping a list of ideas. She learned listing ideas from her years being a waitress.

Zoe seemed to me, fully human, in that she described herself as making plenty of mistakes along the way.

Well, so when I got to the point where I felt confident enough that I think I can take some baby steps out and do this...the difference now, the transition now, is that I'm not afraid to step out and get multiple people involved in a multiple week thing that, if fails could fail pretty big time...

Now, Zoe has developed a project based approach to most units, and the tasks were very complex, and involved multiple partners. She said, she did not “Set out to build the Taj Mahal overnight. Equally important, Zoe carried a realistic attitude toward her own learning, and she wanted that supported by her administrators.

I need somebody (administrator) who will be willing to sit back and say...okay, I'm going to give you the opportunity to...and if you fall on your face it's okay. It's not shameful...okay, so we'd tried to implement something in a way that didn't go so well...okay, well that means tomorrow we're going to do it differently and it wasn't a mistake, I didn't waste my time. I figured out a way not to do it so why would I want to avoid that.

While Zoe was willing to fail, she also realized the impact it could have on her students learning, and as her projects became bigger, failures could also influence the teachers that help her.

Art, technology, and shop teachers had all worked with her on projects. Large projects meant large risk.
If it doesn't work out then what does that mean to my administration? How will that reflect on me professionally? Will people in other departments want to work with me again, so it's a risk? It's multi-departmental. I can't pull these kinds of things off by myself so it really takes a culture in the school to want to "step out there" with you.

As a result, Zoe tried to minimize the mistakes when so that teachers were likely to partner with her again. Zoe aimed for honesty with the students, told them when she was attempting something new, and asked them for feedback. She felt that this modeled the learning process for her students.

I asked Zoe how she goes about creating a new project. She begins with “Christmas morning”, planning as if she had access to the world’s resources.

If it was Christmas morning and I got to do some really, really cool activity, I can't take them to Montana, so this seems to be about the next best thing, as close as I can get it to them.

Zoe was initially excited when she had a new idea, the “Christmas morning” idea. After, the idea got molded until it became realistic for her context, and often became melded with a uncertainty. Zoe continued talking of her range of emotion when designing:

Well, it's certainly a little bit of uncertainty and fear that; Oh my gosh, if this takes...I've now wasted, for the students, possibly others,...exposed them to frustration which may turn them off to the learning process, any further in the unit. That is a potential frustration more than anything else. It is the impact that my poor planning may have on the students, and so I try to be very careful about that...

Failure to Zoe was student disinterest. She blamed herself, not her students.

Zoe tried to minimize mistakes by using “Backwards Planning” (cite), that was reinforced in her master’s program. In addition, she tried to think through all activities, and make a model, a finished product that the students would need to produce.

After doing an activity or project with the students, Zoe kept detailed notes on the process and students products. In fact, she felt that systematic data collection was crucial for teacher growth, and any professional development. Implementation notes where taught to her in her first school, the one with few finances. She felt that any good professional development would follow-up on teacher’s implementation.

In addition, Zoe was currently working toward National Certification, and finishing her master’s program. Augmenting, her previous systematic observation, had done item analysis for multiple-choice test item, and took copious notes on student projects.
If you don't collect data, then what good is it?... If you can't quantify data how are you going to recreate it in a meaningful way? How are you going to recreate it? You can't, it's a pot-shot. So unless you're willing to learn from that, and take the time to write those kinds of things down in a more deliberate way, I don't think you get out of it what you can. So I mean if we're looking for the biggest bang for our buck...but that doesn't mean that I have to be a scientist to recognize the fact that I need to have some evidence from my teaching.

Zoe was a reflective practitioner, and placed emphasis on what she felt was the most important aspect of any professional development, self-examination through student products.

When working with technology, she felt that the student activities, and products needed to be examined through the student-learning lenses.

I can say that to everybody till I'm blue in the face; you need to use technology appropriately in the classrooms, in a meaningful way. Lots of teachers just say...well, yeah, I use the internet in my classroom...Great, and how is that better than using your textbook? How is that better than the library? Help me! Because if it isn't, don't. Technology is great and it's shiny and it tends to motivate kids, but if you're only looking to motivate kids and you forget that you're trying to teach them, that's probably not the time to use technology. If it doesn't make it more meaningful, if it doesn't allow a deeper level of understanding in a method that you couldn't achieve without it, you shouldn't be using it. And that's my philosophy. So if you're not willing to support your staff, you're not willing to support your teachers that way, to help them do that, then it probably isn't gonna stick.

In her teaching, Zoe continually emphasized developing and deepening student understanding, which was her justification for using technology. To do otherwise, technology was a waste of money.

Zoe mentioned the more you use technology, the more you see its weaknesses. It cost lots of money, not just for the initial purchase, but also in the time and support. Upkeep needed to be worth the end product. If technology helped deepen student understanding in a meaningful way, and then, the benefit outweighs the cost. For Zoe, technology was worth the costs.

Summary
The concept and practice of constructivism made sense to Zoe when it was discussed and modeled for her. As a result, she slowly modified her teaching practice. While becoming more facilitative, she began to incorporate additional real-world, complex problems for her students, in which computers naturally fit.

She enjoyed making projects, feeling like “Christmas morning”, and was simultaneously concerned she may waste her time and the time of others. Although she considered herself different from other teachers, Zoe needed the support from colleagues and administration for creating large projects, depending on their expertise, and accepting her possible mistakes.
Zoe felt that any professional development aimed at changing practice, should include an implementation phase. After implementation, a systematic data collection, beyond “gut” observation of students, contributed to growth. Zoe allowed herself to learn from the scientific examination of student data.
VITA

Beth Rajan Sockman


New York University, Oxford, England (Summer 1993). Language and culture


Teaching:

East Stroudsburg University (2006-Present) Assistant Professor in Media Communication and Technology. Teach graduate and undergraduate courses on computers for educators, and an undergraduate course in basic electronic media. Use new electronic media and assessment tools for higher-level thinking. Facilitated collaboration between students and in-service teachers.


Stroudsburg School District (1991-2002) Academic Instructor - 4th and 6th Grade; Taught with tenure; Developed writing program between 6th grade and college students; Promoted the use of technology through student achievements; Developed internet sites to correspond with curriculum; Evaluated NASA-sponsored internet sites; Coordinated multiple science enrichment programs for 360 students; Wrote and received grants for Arts in Education Programs.

Pleasant Valley Presbyterian Church Brodheadsvisle, PA (1995-1996) Youth Director. Developed and delivered curriculum for religious programs. Trained other youth leaders.

Research - Penn State University TELS fellow (Technology Enhanced Learning in Science). Conducted mixed methods research on university–K12 collaboration (2004-2006); Self analysis qualitative research on becoming a facilitator (2003); Co-Performed a ideal design for seminary (2003); Co-evaluated PT3 Grant: Awarded to Penn State/AECT (2003); Co-evaluated CLC charter school in qualitative research (1997).

Children International Summer Villages Director of international peace camps (1998 & 1999). Designed and implemented leadership training, employing internet and face-to-face instruction. Facilitated cultural understanding for children of 14 countries, 70 participants. (Media, PA & Tel Aviv, Israel)

Honors: Paul W. Welliver Outstanding Graduate Student Award, PAECT (2005); RET representative for two NSF conferences: Assessing, Determining and Measuring the Impacts of the Research Experience (2003) & Bringing Research into the Science (2002); Research Experience for Teachers (RET) fellow at the Center of Polymer Interfaces and Macromolecular Assemblies, Stanford University (2001); Cum Laude, University of Pennsylvania (1991).

Professional Societies: Association for Educational Communications and Technology; Pennsylvania Association for Educational Communications and Technology International Society for Technology in Education; Association for Supervision, Curriculum and Development.

Publications:


