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Looking at/looking through: Teachers planning for curriculum-based learning with technology

Karen Work Richardson
William & Mary - School of Education

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LOOKING AT/LOOKING THROUGH:
TEACHERS PLANNING FOR CURRICULUM-BASED LEARNING WITH TECHNOLOGY

A Dissertation

Presented to

The Faculty of the School of Education

The College of William and Mary in Virginia

In partial fulfillment
Of the Requirements for the Degree
Doctor of Philosophy

by
Karen Work Richardson
June 3, 2009
LOOKING AT/LOOKING THROUGH: TEACHERS PLANNING FOR CURRICULUM-BASED LEARNING WITH TECHNOLOGY

by

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DEDICATION

To teachers everywhere who spend their days solving wicked problems, and especially to those who so freely gave of their time and talent to help me understand how they do it.
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Completing this dissertation study required a kind of single-minded discipline different from any other project in which I have been involved. For the past 18 months, no matter what I was doing—washing the dishes, walking the dogs, talking with friends—I was working on it in some small part of my brain, thinking about everything from the logistics of scheduling an interview to how to frame my results. And, while much of this work was done alone, I benefited from an amazingly strong support network of professional colleagues, friends and family who celebrated milestones with me both large and small and at least feigned interest when I chattered about my work.

The first thank-you goes to my teacher participants to whom I have dedicated this study. Despite not really having any extra time, they managed, in-between planning, teaching, managing, supervising, tutoring, sponsoring and coaching, to make some for me. The strength of this study comes from their voices.

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Twenty-five years ago, I sat beside Amy Griffin Blackburn as we graduated from William and Mary. I’m thrilled to say that we continue as friends today, and her careful work as editor and proofreader made this paper better. Any remaining errors are mine alone.

Also, a special word of gratitude goes to my parents for making education such an important part of my life, and for their unconditional love and support.

And a most heartfelt thank you to my husband, Bob, who never asked how long it would take, or what was in it for him. He was both a strong foundation and a supportive scaffold throughout the journey.
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ABSTRACT

This interpretivist study drew upon the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006; Thompson & Mishra, 2007-2008; Koehler & Mishra, 2009) to study teachers’ lesson planning processes. It focused upon 12 fifth, sixth and seventh grade content area teachers from three southeastern U.S. school districts as they planned for and used digital technologies during lessons in their classrooms. Participating teachers were interviewed about the processes they used to plan instruction, focusing upon how they determined which technologies might be used. In addition, sample technology-infused lessons were observed to see how the plans were put into action. Each of the different types of knowledge represented in the TPACK framework was evidenced in the teachers’ planning. Though pedagogical (P), content (C), technological (T) knowledge, and PC, TP, TC, and TPACK were represented, interactions between technology and pedagogy (TP) took precedence. As the teachers planned and implemented lessons, they followed Shulman’s (1987a) Model of Pedagogical Reasoning and Action, loosely applied. They incorporated technology use into existing practices and routines, and all of those uses can be classified according to Harris and Hofer’s (2009a) learning activity types. At the time that the study was conducted, participating teachers were beginning to develop specific instructional
routines related to the use of digital technologies in instruction. These routines were related to learning activity types. The study’s results can assist those who work with teachers and technology, since they reveal teachers’ thinking and decision-making during instructional planning that incorporates educational uses of technology.

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LOOKING AT/LOOKING THROUGH:
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Chapter One

Introduction: Teaching and Learning in the Digital World

The rapid rise in use of digital and networked technologies has led to the perception that the world is changing in fundamental ways. Author Thomas Friedman (2005) says that we live in “the flat world,” where simultaneity of communication allows new ways of working and playing:

But this moment in the mid- to late-1990s was when people first started to feel that something was changing in a big way. There was suddenly available a platform for collaboration that all kinds of people from around the globe could now plug and play, compete and connect on—in order to share work, exchange knowledge, start companies, and invent and sell goods and services (p. 92).

This flat world floats on a sea of digital technologies. We can watch DVDs in the car, surf the World Wide Web on our cell phones, and videoconference with colleagues across the globe from our laptops at the coffee shop. Digital technologies seem to have changed everything from the way companies do business to the way families communicate.

Navigating this digital world demands new ways of being literate (Lanham, 1993; The New London Group, 1996; Tyner, 1998; Parker, 2005). Just what that means, however, is difficult to decipher (Cole & Nicolopoulou, 2003). Daley (2003) calls for expanding the definition of literacy so that the ability to read and write includes interacting with multimedia. Others prefer to enumerate multiple literacies, or
"multiliteracies," that are needed to take into account the diverse modes of communication available in the digital world (The New London Group, 1996). They prefer to apply distinct names to these literacies such as media literacy, information literacy, visual literacy, or technology literacy (Tyner, 1998; Hobbs, 2006) and argue amongst themselves about which may be more important. Typically, librarians prefer the term information literacy (Tyner, 1998), but the term is not used uniformly. Chauvin (2003), after considering several different literacies, suggests that the best term to use is "visual literacy," as he believes it encompasses all the others. Hobbs & Frost (2003) recommend using the term "media literacy" to refer to this new multimodal set of skills and awarenesses because it is more widely used in educational settings.

These disagreements over how to define new literacies reflect the comparative youth of the multiliteracy field, which is characterized more by contentiousness than consensus. The various factions argue both amongst themselves and across literacies. One media literacy scholar even went so far as to comment, "Whenever media literacy educators get together, they always circle the wagons—and shoot in!" (Hobbs, 1998, p. 16).

Unfortunately, when the shooting begins, it is often teachers who are caught in the crossfire, since the burden of teaching these new literacies falls primarily to the public school educator, for whom consensus is much more helpful than contention. When media literacy advocates do lay down their weapons for a time, the only point on which they seem to agree is that teachers are not doing an adequate job in the classroom. They often prescribe "a more active, student-centered, participatory style that emphasizes inquiry and learning by doing" (Hobbs, 2006, p. 18). On this point, scholars in the "new"
literacies field join those in the wider educational technology community, in which reformers have long suggested that technology will only be integrated effectively in classrooms when a constructivist, inquiry-based pedagogy is implemented.

This "pedagogical dogmatism" has, in fact, discouraged many teachers from using technology (Harris, 2005). According to Harris, "The educational technology rhetoric of the past two decades demonstrates a basic confusion between technology integration — the pervasive and productive use of educational technologies for purposes of learning and teaching—and technology as a vehicle of educational reform" (Section 3, para 10). She recommends that the educational technology community choose an agenda that focuses on effective technology use in all classrooms, regardless of pedagogical approach. At its core, this agenda asks us to begin by taking an honest, agenda-free look at how technology is being used in the classroom at present.

It is ironic that in this time of rapid transition, in which clear definitions and agendas are hard to find—a time in which we seem to be living in the "gray areas"—most scholars are content to depict a black-and-white picture of the contemporary classroom, in which the children of the future are forced to learn in the ways of the past. School culture is depicted as primarily text-based (Hobbs & Frost, 2003). Text, according to these authors, has been elevated as the primary form of media in the classroom, with teachers both fearing the displacement of print by children's use of other media and feeling overwhelmed by the expanding ideas about literacy in the digital world. Prensky (2001) distinguishes between digital "natives" and "immigrants." Students, who have grown up surrounded by technology, are considered natives, comfortable in the world of multimedia. Teachers, meanwhile, are the immigrants whose allegiance remains with the
print-based world in which they were raised. These teachers create a classroom that, with its use of legacy, or traditional, content, is unfriendly to students raised in the world of digital technologies (Prensky, 2001). Thus, the culture clash plays out in the contemporary classroom:

For many students, what happens in the traditional American classroom is boring. Small wonder, when you compare such relatively inanimate stuff as pencil-and-paper-bound reading, writing, and math drills to the media mix of mind-bending imagery and hair-raising sound that consumes most of their waking hours outside of school (Ellis, 2005, para. 1).

This overgeneralized depiction of contemporary classrooms as multimedia wastelands where highly creative, digital students are locked in pencil-and-paper prisons seems both unfair and, more importantly, unhelpful as we try to come to an understanding of the roles of digital technologies in the lives of teachers and students. If we simply assume that all students are digitally oriented and all teachers are print-oriented, we miss the opportunity to capture rich personal perceptions of and interactions with media and technology, including how they support meaning-making.

Students also suffer because of these overgeneralizations. It is the danger of using such overgeneralizations to present an incomplete picture of student media use that worries Jenkins (2006). Citing a series of Kaiser Family Foundation reports (2005a; 2005b) that "bemoan" the amount of time young people spend with "screen media," Jenkins calls for a more balanced view of media use, saying:

These accounts do not appropriately value the skills and knowledge young people are gaining through their involvement with new media, and as a consequence,
they may mislead us about the roles teachers and parents should play in helping children learn and grow. (p. 11).

In this way, both teachers and students are misrepresented by overgeneralizations. A more balanced view of what goes on in the contemporary classroom would benefit both. Lemke (2006) suggests that understanding individual meaning-making practices in relationship to media should form the initial research phase of multimedia use. While he is referring to video and computer gaming in particular, his recommendation seems to apply to other multimedia research as well. An understanding of the varieties of relationships to media among students and teachers can help "un-generalize" the depictions of both groups:

In building this understanding, each relationship to media may look like an exception to the "rule," but that is part of the point. It is far too easy to make generalizations that sustain common fictions about the way things work, smoothing out differences and idiosyncrasies. Real examples show diversity and interconnections that summaries often conceal (Nardi & O'Day, 1999, p. 83).

It is these “real examples” that I wish to uncover with my research, beginning with teachers as individuals, focusing, as Lemke (2006) suggests, on their personal experiences as they interact with technology and consider ways to incorporate it in their classrooms.

Study Overview: Teachers Integrating Digital Technologies

This study focused upon 12 fifth, sixth, and seventh grade content area teachers in three rural southeastern U.S. school districts as they planned for and used digital technologies as part of lessons in their classrooms. Participating teachers used technology
in their classrooms and had a variety of levels of professional experiences and placements. They have been involved in the school districts' educational technology professional development programs. The teachers were interviewed about the processes they used to plan daily instruction, focusing on how they determined which technologies they used. In addition, their technology-infused lessons were observed to see how the plans were put into action.

*Study Focus, Part I: Building a Framework for Integration*

The questions that frame and focus this research are about the nature and process of technology integration with respect to teachers' thinking. As teachers move through this process of planning a lesson, what do they think about? What types of decisions do they make? On what do they focus their attention: the technology itself, other aspects of their practice, some combination of the two, and/or other issues or concerns? In essence, I explored how teachers move among and combine different types of knowledge to make decisions about the technologies, pedagogies, and content that will be part of planned learning experiences for students. Though I followed the participants throughout this process, in particular, I investigated their planning, attempting to see into the professional learning and decision-making that lead to curriculum-based uses of digital technologies.

According to Mishra and Koehler (2006), "teaching is a highly complex activity that draws on many kinds of knowledge," including "knowledge of student thinking and learning, and knowledge of subject matter" (p. 1020). Their Technological Pedagogical Content Knowledge — TPCK, and later: TPACK (Koehler & Mishra, 2009) — framework is based upon earlier work by Shulman related to the types of knowledge teachers employ as they both plan for and implement classroom instruction. Shulman (1986) identified the
intersection of two types of knowledge: general pedagogical and content knowledge. Pedagogical knowledge (PK) encompasses classroom organization and management, including everything from how teachers ask questions, allocate time, structure assignments, and plan lessons. Content knowledge (CK), on the other hand, is concerned with understanding a particular subject such as biology or algebra (Shulman, 1986). Shulman argued that previous generations of educators tended to focus on either pedagogy or content, making one particular type of knowledge subordinate to the other and always keeping the two separate. For example, after examining tests taken by teachers in the late 1800s, Shulman concluded that they focused almost exclusively on content matter with only a smattering of questions about instructional techniques or management practices. Teachers were, first and foremost, expected to know their subject matter. How they communicated it to students was believed to be less important at the time.

Shulman (1986) furthered the notion of teacher knowledge by introducing the concept of "pedagogical content knowledge" (PCK). Rather than viewing knowledge of pedagogy and content separately, PCK occurs in the overlap between the two. It is in this intersection where the real complexity of teaching can be seen (Shulman, 1986). There, where pedagogy meets content, a teacher makes specific, practice-related connections between the two. Shulman writes, "Teachers never teach something in general—they always teach particular things to particular groups of kids in particular settings" (p. 14). Pedagogical content knowledge is characterized by an understanding of both the subject matter and the students learning it. Teachers who possess this knowledge understand the intricacies of presenting their content to their students, including how best to represent
different concepts, and which concepts may be easier or more difficult for their students to understand. These teachers are also able to recognize which conceptions, preconceptions, and misconceptions their students possess in relationship to the subject matter and how these influence students’ learning.

Pointing to the similarity between the phenomenon that Shulman identified when he first wrote about the intersection between pedagogy and content and TPACK, Mishra and Koehler (2006) suggest that it is now technology knowledge (TK)—the technical knowledge associated with software and hardware—that is often considered separately from pedagogy, content, and pedagogical content knowledge. Rather than taking a technocentric approach, as is often adopted by members of the educational technology community (Harris, 2005), Mishra and Koehler’s framework combines technological, pedagogical, and content knowledge. The fundamental focus of the framework is "the complex interplay of these three bodies of knowledge" (Mishra & Koehler, p. 1025). They write:

[TPACK] is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones (Mishra & Koehler, 2006, p. 1029).

To Shulman’s (1986) pedagogical content knowledge, Mishra and Koehler add two more
knowledge pairs—technological pedagogical knowledge (TPK) and technological content knowledge (TCK)—as well as a three-way intersection formed by the overlap of all three types of knowledge: technological pedagogical content knowledge (TPACK), as shown in Figure 1. Teachers must have knowledge of each domain individually. More importantly, however, if they are to use technology effectively in their classrooms, teachers must also have the knowledge that is represented by the four intersections among the three primary elements.

![Figure 1: Technological Pedagogical Content Knowledge (Koehler & Mishra, 2009; adapted from Koehler & Mishra, 2008)](image)

This framework eschews the notion that there is only one acceptable pedagogy to use with digital technologies, asking us instead to consider the ways technologies can support numerous pedagogies and content areas. Similarly, the framework suggests that generic technological approaches may not be as useful as considering ways that technology can be integrated in specific content areas. This flexibility, which recognizes the diversity of
teachers and their classrooms, makes TPACK a useful way for teachers across the educational spectrum to consider the uses of technology. Harris, Mishra, and Koehler (2009) write:

Using the TPACK framework to frame the development of teachers’ knowledge does not necessitate a rigid or algorithmic adherence to a single approach to technology integration. For example, one teacher interested in integrating technology in history may consider use of primary sources available on the Internet, while another may choose to have students develop hypertexts that reveal multiple cause-effect relationships among related historical events. One mathematics teacher may choose to provide data sets that students represent with graphs and charts created with spreadsheet software, while another may choose to help her students to discover data patterns represented by the changing slope of a sine wave as it is constructed and altered dynamically with a graphing calculator. Thus, the development and demonstration of teachers’ TPACK knowledge requires flexibility and fluency—not just with curriculum-based content, but also with pedagogy, technology, and context—remembering that each influences the other in pervasive ways (p. 402).

It is the nature of digital educational technologies that has led to the need for such a framework. Nondigital technologies—textbooks, blackboards, and flip charts, for example—have been so embedded in the classroom that they are comparatively transparent in pedagogical use (Mishra & Koehler, 2006). Teachers and students look through them to the content they deliver or the pedagogy they support without thinking too much about the technologies themselves. Constantly evolving digital technologies are
not so easily rendered transparent (Mishra & Koehler). Because teachers have not had the same kind of ubiquitous access to these technologies, they have not been able to adopt them to the point of transparency. Instead, these digital technologies require attention; teachers must look at them along with content and pedagogy in order to determine how to use the technologies effectively in their classrooms.

Interlude: Appropriating an Analogy

In 1983, Richard Clark initiated a debate that continues in some form to the present day. Clark's conclusion that media are "mere vehicles that deliver instruction but do not influence achievement any more than the truck that delivers our groceries causes changes in our nutrition" (1983, p. 445) spawned multiple rebuttals and reactions. I have no desire to enter the debate, but his analogy has become a tool for thinking for me: a way to visualize the meaning of TPACK. Previous views of technology and its relationship to teaching and learning separated technological knowledge from other types of teacher knowledge. Technology itself was a "mere" vehicle that could presumably be used by any teacher in any classroom without providing any positive or negative benefit on its own. TPACK, on the other hand, emphasizes the contextual nature of this technological knowledge, intertwined as it is with pedagogical and content knowledge.

Relating Clark's analogy to TPACK is not unprecedented. Schrum, et al. (2007), in their argument that educational technology research must do more than study generic effects of exposure to technology, use the delivery truck analogy to link technology, pedagogy, and content: "To use Clarke's (sic) rather prosaic analogy, in order for the grocery truck to be effective in improving a person's nutrition, the person has to be on the truck's delivery route and the truck also has to be delivering something besides doughnuts
and French fries." We are invited to use the grocery truck as a way of visualizing technology and its relationship to the classroom. I will do so, as I make connections between TPACK and the rhetoric of teaching, drawing from Clark, but also moving further away.

*Study Focus, Part II: TPACK and Teaching as Rhetorical Act*

As mentioned above, digital technologies are not so easily rendered transparent as nondigital ones (Mishra & Koehler, 2006). With transparent technologies, it is as though the milk truck came before dawn and unloaded its contents. Teachers and students do not actually see the truck itself; their only interest is in the milk it has delivered. Digital technologies, however, which do not arrive with such obvious connections to a particular teacher's pedagogy and content, do not have this transparent quality. They are opaque and, in their opacity, they "disrupt the status quo, requiring teachers to reconfigure not just their understanding of technology but of all three components [of the framework]" (Mishra & Koehler, 2006, p. 1030). Teachers, however, are not often given the chance to reconfigure digital tools and resources. The technocentric approach of much educational technology professional development does not help teachers make connections across technology, content, and pedagogy (Harris, 2005). Instead, it invites teachers to gaze directly at the technology, learning of its affordances and utility.

This approach to thinking about technology and education suffers from what Papert (1987) called "technocentrism," a term with Piagetian roots:

I coined the word technocentrism from Piaget's use of the word egocentrism. This does not imply that children are selfish, but simply means that when a child
thinks, all questions are referred to the self, to the ego. Technocentrism is the fallacy of referring all questions to the technology (para 8).

Asking teachers to focus in this way reflects the assumption that by exposing them to TK alone, they will be able to effectively integrate the use of technology in their classrooms for content-based teaching and learning (Mishra and Koehler, 2005). In terms of the TPACK framework, the technocentric view is equivalent to looking at only the technology component, ignoring the edges where it overlaps with pedagogy and content. Technology integration—what Harris (2005) defines as "the pervasive and productive use of educational technologies for purposes of learning and teaching" (Sec 3, para 10)—takes place when teachers stop trying to bolt technology onto existing practices and are able to understand relationships among the three components of instructional knowledge: content, pedagogy, and technology. Mishra and Koehler (2005) describe the vision of expert teaching that this ability engenders by saying:

Good teaching is not simply adding technology to the existing teaching and content domain. Rather, the introduction of technology causes the representation of new concepts and requires developing a sensitivity to the dynamic, transactional relationship between all three components suggested by the TPACK framework (p. 134).

TPACK also reflects a situated view of technology, which takes classroom context into consideration (Mishra & Koehler, 2005). As they learn about technologies, teachers must do more than just learn technical skills; they must also learn "what technology can do for them as teachers" (p. 132); a task that is made difficult by digital technologies’ opacity. By asking teachers to focus their attention on their practice in this way, rather than on the
affordances of the technologies themselves, the TPACK framework begins to define a new rhetoric of teaching.

Often defined as "the art of persuasion" and generally considered a negative word because it is associated with lofty but empty sentiments, rhetoric, according to Lanham (1993), is really about "the economics of human attention-structures" (p. 227). When we persuade someone, our goal is to get her attention, and have her look at things from our point of view. Human attention, however, is a scarce commodity in our information-rich world (Lanham). When teachers attend technocentric training sessions, they are asked to attend primarily, if not exclusively, to the technology; the delivery truck has materialized at the classroom door. It commands their attention, inviting them to look under the hood. They fiddle with the luminous buttons on the dashboard; they "ooh" and "aah" at the fancy navigation system. Some may even learn to drive the truck successfully, but it rarely seems to take them where they want to go in terms of creating learning experiences for their students. In the end, when they return to their classrooms, most fall back on the transparent technologies—the ones that do not command attention and with which they are comfortable—and the delivery truck disappears once again from view.

Because it focuses attention upon audience, purpose, and message, teaching is a rhetorical act (Speer, 1997). It is particularly during the planning process that teachers engage in this rhetorical act, as that is when they attend to their practice, making decisions about what to teach and how to teach it. TPACK is one way of defining the focus and knowledge necessary for the rhetorical act of planning, particularly due to its concern for specificity of context; what Speer (1997) calls "the small world of each class" (p. 156). It attempts to move teachers beyond a strict concern for technical knowledge to
a more general sense of how technology impacts other aspects of classroom life, especially teaching and learning.

The TPACK framework identifies the types of knowledge that teachers must employ as they first look at their practice and then look through it to their classrooms. Alternating between looking at and looking through is, according to Lanham (1993), a fundamental rhetorical concept: "Rhetoric as a method of literary education aimed to train its students to toggle back and forth between AT and THROUGH vision, alternately to realize how illusion is created and then to fool oneself with it again" (p. 81). In a contemporary application of this oscillation, Lanham describes the reader of electronic text, which by its digital nature, invites readers to think not just about the content of the message but also about its methods of presentation, which may include a variety of media including text, audio, video, and still images. Because it can be openly decorative, flaunting special fonts, text colors, and graphics generally not found in traditional text, electronic text encourages users to look both at and through it, in what Lanham believes represents the primary negotiation of Western reality:

This is a toggle to boggle the mind. It means that the two basic theories of language [ornamental or purposive] are placed in permanent oscillation. Language was in origin ornamental; language was in origin purposive. It is the founding contradiction of rhetoric as well—and of all Western culture. We solve it by a characteristic decorum that oscillates, at different frequencies and wavelengths, between the two. We have hidden that oscillation from ourselves, as a behavioral necessity, and electronic text now brings it to light (p. 82).
Mackey (2002), for example, found that her participants, experimenting for the first time with new types of electronic text, were more aware of their own oscillating attention between looking through and looking at the text when they were engaging with an unfamiliar media. Murray (1997) suggests that as technology becomes more familiar, it also becomes more transparent, so that readers are less aware of the medium itself. I suggest that it is the same with teachers and technology. We have seen some digital technologies such as LCD projectors and word processing software absorbed possibly to the point of transparency, but Mishra and Koehler (2006) suggest that in this age of rapid transition, such transparency will not be achieved any time soon for most digital technologies. Teachers, similar to the readers of Lanham’s electronic texts, return to a self-consciousness of their craft and will have to toggle continuously among looking at technology, pedagogy, and content; and looking through them to the instructional environments they create for students if they and their students are to make effective and efficient educational use of technology.

As teachers move through the professional learning, planning, and implementation processes related to a new technology, how do they experience the rhetorical act of teaching? For instance, while it makes sense that they would begin by looking primarily at the technology, when, if ever, would teachers start to look through it to pedagogy, content, and combinations of the different TPACK elements? To answer these questions, it would be most effective, I believe, to examine planning processes during which teachers presumably begin to make decisions about how they will (or won’t) integrate a particular technology into professional practice in their classrooms. This perspective will also provide insight into how teachers employ different types and
combinations of knowledge as part of their practice. To date, little contemporary literature deals in any substantial way with how teachers plan, either generally or for the use of technology.
Chapter Two

Introduction

Wicked Problems in the Classroom

This study focuses upon teachers—individual teachers—each working in a complex, ill-structured environment (Joyce, 1978). The purpose of that focus is to bring more detail to the black-and-white depictions of teachers as Luddites, resistant to change, and interested only in sustaining the status quo, which they do by creating classrooms designed around printed text and teacher-directed instruction. In The Children’s Machine, Seymour Papert (1993) uses photography to compare classrooms from the 50s and the present day. Each photo displays a “typical” classroom with wooden desks in rows, facing the front, suggesting that very little has changed in education. Yet, a recent Internet search on images of “classrooms” revealed a variety of configurations, some of which even included laptop computers for each student.

This kind of stereotyped depiction ignores the complexity of both the classroom and the act of teaching. The classroom is a “relatively ill-structured, dynamic environment” (Leinhardt & Greeno, 1986, p. 75), characterized by ill-defined problems and unpredictable events. Doyle (1977) identified three characteristics of the classroom environment that lead to its complexity: multidimensionality, simultaneity, and unpredictability. Multidimensionality refers to the variety of purposes served by the classroom, some of which may be incommensurate. Simultaneity describes the nature of
events, which generally occur at the same time rather than serially. Unpredictability focuses upon the changing nature of the classroom that makes it difficult for teachers to make predictions. Yinger (1979) concluded, "By adding to these characteristics those of urgency and spontaneity—or as Jackson (1968) refers to it—‘immediacy,’ the teaching environment is pictured as dominated by two features: complexity and unpredictability" (p. 163).

According to Mishra and Koehler (2006), "teaching is a highly complex activity that draws on many kinds of knowledge," including "knowledge of student thinking and learning, and knowledge of subject matter" (p. 1020). The addition of digital technology to the classroom complicates this already complex picture, creating a "wicked problem" (Rittel & Webber, 1973) for teachers (Mishra & Koehler, 2007). Rittel and Webber (1973) applied this label—wicked as in "malignant," "vicious," "tricky," "aggressive"—to social science planning (e.g., city planning), where ill-defined problems have no simple or definitive solutions, and where partial solutions reveal additional problems to be solved. Because such problems occur within an increasingly heterogeneous social context, the notion of there being "one best answer" to any particular issue is becoming increasingly impossible over time (Rittel & Webber, p. 167). Certainly the classroom is a microcosmic reflection of this larger social heterogeneity, and problems associated with working in that environment are of the wicked variety.

Integrating technology into this highly complex environment does not proceed according to one best method either. Mishra and Koehler (2006) wrote:

"There is no single technological solution that applies for every teacher, every course, or every view of teaching. Quality teaching requires developing a nuanced
understanding of the complex relationship [among] technology, content, and pedagogy, and using this understanding to develop appropriate, context-specific strategies and representations (p. 1029).

Understanding technology integration requires expanding notions of teacher knowledge to include technology in addition to content and pedagogy (Mishra & Koehler). One process where we may be able to "see" this new knowledge in action is as part of teacher planning, a practice that plays an essential role in the classroom (Yinger, 1979). Both teacher knowledge and teacher planning are woven into the complexity of the classroom context (Yinger, 1979; Clandinin & Connelly, 1996; Mishra & Koehler, 2006). Like technology integration, teacher planning is a wicked problem as it takes place in a complex environment with no optimal solutions (Clark & Dunn, 1991).

Planning for Wicked Problems

Teacher planning is an important area of research because it connects curriculum and instruction (Clark, 1988; Brown, 1990). By understanding teachers’ planning, we "understand how they transform and interpret knowledge, formulate intentions, and act from that knowledge and those intentions" (Clark, 1988, p. 8). Despite its wickedness, the practice is ubiquitous, with all teachers doing something called planning (Clark, 1988; Searcy & Maroney, 1996). Clark and Dunn (1991) wrote, “One can theorize with the best of intentions about how teaching and school learning could be improved, but the finest ideas and proposals still pass through the funnel of teacher planning” (p. 184). The nature of that planning is both individualistic and contextually situated.

Clark and Dunn’s (1991) review of research on teachers’ planning called for a “new direction for educational research in which planning is viewed and studied in
contexts” (p. 183). Teacher planning—an individual, context-based practice—does not lend itself well to generic statements. Brown (1990) described the importance of context on teacher planning when she wrote, "Teachers will make plans in a timely fashion that fits their own information-processing style, the needs of their students and the many unique contextual factors that influence their schools and classrooms" (Brown, 1990). While researchers have done some empirical investigation into the planning process, Brown suggested that this is an area in which much more study is needed before any generalizations can be made.

Unfortunately, much of the research into teacher planning took place prior to the introduction of digital technologies to the classroom, some of it as much as 20 or 30 years ago. Classrooms have changed substantially in those two or three decades, particularly in terms of the availability of digital technologies (McCutcheon & Milner, 2002). Almost no research has been done into how teachers plan for the use of technology (Tubin & Edri, 2004). Clearly, the teacher planning literature needs updating (McCutcheon & Milner). One simple way in which this could be done would be to expand the sample. Much of the early research focused on elementary school teachers (McCutcheon & Milner). Furthermore, it did not look at the differences in planning based on subject matter domains (Tilemma, 2003).

In addition, new theories offer new frameworks for understanding. In particular, teacher knowledge theories offer ways to think differently about teacher planning (McCutcheon & Milner, 2002; Hashweh, 2005). Specifically, McCutcheon and Milner point to pedagogical content knowledge as articulated by Shulman (1986) as providing a new and helpful way to understand the planning phenomenon. This framework, however,
does not address the lack of knowledge about teacher planning for educational technology use. By adding TK to Shulman's original formulation, the Technological Pedagogical Content Knowledge framework (TPACK) provides an interpretive lens for reconsidering teacher planning in light of the proliferation of digital technologies in schools. As Mishra and Koehler (2006) asserted, "The [TPACK] framework allows us to conceptualize and discuss a complex web of relationships in a methodological, grounded manner. It respects the richness of the field of study even while offering analytic tools that allow us to study it" (p. 1044). By focusing on the knowledge used by particular teachers using particular pedagogies with particular content in particular classrooms, TPACK can help researchers to account for the complexities of the contexts in which teacher planning takes place.

This literature review argues that researching teacher planning through TPACK's lens will provide insight into both teacher planning and knowledge by helping to update the outdated teacher planning literature and by contributing to the nascent TPACK literature. Studies formed at the intersection of these two foci will help us better understand teachers as active, goal-oriented professionals—a view that has been largely ignored by the educational technology community (Zhao & Cziko, 2001). By seeing teachers in this new way, research can help fill in the gray areas of an often black-and-white picture of teachers and the classrooms in which they work, offering a more robust depiction of teachers as professionals.

Understanding TPACK

The TPACK model developed by Mishra and Koehler (2006) focuses on teachers' technological pedagogical content knowledge. The model has its roots in Shulman's
(1986) description of pedagogical content knowledge, the framework that pulled together what was conceptually separated in earlier work: subject matter knowledge and instructional knowledge. TPACK adds technology to the content/pedagogy mix identified by Shulman. In particular, the TPACK model addresses the overlaps among different types of teacher knowledge, characterized by Mishra and Koehler as technological content knowledge (TCK), technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK), and finally, technological pedagogical content knowledge (TPACK). These overlapping types of knowledge reflect the complex nature of teaching—its “wicked” nature as problem-based practice.

Some critics of TPACK believe that Shulman included materials and resources—and therefore, technologies—within his definition of PCK, making it unnecessary to add technology as an individual element to the model (Harris, 2007, personal correspondence). Shulman did not expressly mention digital technologies, but he does include “software” as part of content knowledge. This omission was not an oversight; instead, when Shulman was writing, digital technologies were not as widespread and the technologies that were available—blackboards and textbooks, for instance—were well-integrated so as not to be seen as unusual (Robertson, 2008). In the two decades since Shulman’s PCK work was published however, digital technologies, particularly computers, have become more prominent in both society and the classroom (Mitani, 2007). For instance, in 1989, the student-to-computer ratio in United States’ schools averaged 25 to 1 (Kulik, 2003). By 2007, that ratio had dropped to approximately 4 to 1 (Mitani, 2007), with nearly a quarter of all schools providing a computer to every student and teacher in the school (Hightower, 2009). Unlike more traditional classroom
technologies like textbooks and blackboards, digital technologies like the Internet or
digital cameras are not so easily accommodated by content or pedagogy. In addition,
despite large expenditures for the purchase of computers, they are not widely used in the
classroom, and those uses that are reported are often pedagogically unsophisticated or not
too well integrated into instruction (Harris, et al., 2009). This lack of integration with content
and pedagogy makes it seem necessary—at least for the time being—for technology to be
a conceptually distinct aspect of the teacher knowledge landscape.

The TPACK framework reconsiders the relationship between technology and
education, recommending that educators move away from what Papert termed a
"technocentric" view of technology (Harris, Mishra, & Koehler, 2007). Such a
perspective—which begins with a focus upon technology before moving to content or
pedagogical concerns—leads to researching questions about what teachers need to know
about technological tools and resources. A more important focus of research at this time,
however, is upon understanding "how [and why] the technology is used" (Mishra &
Koehler, 2006, p. 1018). TPACK is one framework for furthering that understanding
from teachers' points of view.

*Understanding TPACK Through Design*

The TPACK theory was developed over the course of a multiyear design study
(Mishra & Koehler, 2006). As part of their research, Mishra and Koehler studied how the
use of design-based activities contribute to the development of TPACK, believing that
engaging in design activity is particularly useful in building understanding of complex
ideas. The design approach offers to learners "authentic and engaging ill-structured
problems that reflect the complexity of the real world" (p. 1035). Participants in design
workshops—university instructors and practicing teachers in Mishra and Koehler’s design experiments—created digital artifacts such as videos, Web sites, and online courses. In the process of working through design problems, participants developed TPACK, learning technology skills within the contexts of particular content and pedagogies. Engaging in this design work helped participants move from a divided view of technological, pedagogical, and content knowledge to a unified perspective of the ways in which the different types of knowledge overlap. These studies are guided by the TPACK framework, and at the same time they help to more clearly delineate it, providing empirical support for further understanding and expansion of the framework.

At present, Mishra and Koehler’s work is concerned primarily with further definition and development of TPACK, including the creation of a survey tool that can be used to measure it. Another recommended method for developing TPACK focuses upon operationalizing it in the classroom through the use of learning activity types in teachers’ planning.

*Understanding TPACK Through Activity Types*

Activity types represent a more “teacher-friendly” version of activity structures (Harris, et al., 2007), which are a way to characterize interactions in the classroom. Windschitl (2004) defined “activity structures,” a term he borrowed from sociocultural theorists, as “a set of classroom activities and interactions that have characteristic roles for participants, rules, patterns of behavior, and recognizable materials and discursive practices associated with them” (p. 25). Activity structures have grown out of the literature related to classroom-based discourse and focus on the semiotic patterns of actions in the classroom (Harris, 2008). Activity structures combine activity segments, or
parts of lessons, and are “recognizable to and used by teachers when planning instruction” (Harris, et al., 2007, p. 13).

Mehan (1979) is credited with identifying the first classroom-based activity structure (Harris, 2008). His I-R-E framework—teacher initiation, student reply, teacher evaluation—describes the dominant pattern of classroom-based discourse (Polman, 1998). Polman suggests that Lemke’s “Triadic Dialogue” or “Question-Answer-Evaluation” (Q-A-E) describes a similar dominant discourse pattern. Lemke (1987), however, takes a broader view of these discourse structures (Harris, 2008). Two particular discourse structures—thematic structures and activity structures—provide meaning to classroom-based discourse patterns (Lemke, 1987). Thematic structures, also sometimes referred to as thematic formations, are the "recurring patterns of semantic relations among the themes and concepts of a particular way of speaking about a subject" (Lemke, 1987, p. 219). Activity structures are “recurring functional sequences of actions” (p. 219).

Examples of classroom activity structures include taking attendance, having a discussion, doing an experiment, reviewing homework, working blackboard examples, or completing brainstorming activities (Chapman, 1993; Windschitl, 2004; Harris, et al., 2007). These structures seem to be applicable across the content areas, with teachers and students in a variety of curriculum-based classes engaging, for example, in discussions or homework review.

Polman (1998), however, discovered that activity structures were influenced by a variety of classroom-based factors, including the curriculum content being addressed. His project-based activity structure—BNIE (bid-negotiate-instantiate-evaluate)—was
developed as part of a research project in a middle school science classroom. When Polman attempted to apply the structure to an after-school history program, he ran into difficulties, which he attributed to differences in a variety of context-based factors. According to Harris (2008), Polman’s work highlighted a fundamental question about the nature of activity structures. She wrote, “Polman’s work with the same activity structure in two disparate disciplines raises the question of the extent to which activity structures or types are discipline-specific or transdisciplinary” (p. 259). Windschitl (2004) seemed to want to have it both ways: transdisciplinary activities taking place in discipline-specific classrooms. He said that activities are “specific phenomena occurring in classrooms,” while structures are “more general and applicable across multiple contexts” (p. 25). Windschitl’s own work with activity structures, however, focuses exclusively upon science learning activities, which seems to point to an underlying assumption of discipline specificity for the structure of those activities. Harris, et al. (2007) identified a similar “underlying assertion” in Lemke’s work “that meaning cannot be separated from action; the structure of curriculum content, therefore, cannot be separated from the structure of content-related learning activities” (p. 14). TPACK shares this assumption about the interdependence of content and activities, suggesting that tool use cannot be separated from content/theme and activity structure (Harris, 2008).

Harris (2008) concluded that in order to help teachers develop TPACK, activity types should be differentiated by curriculum area. She further connects learning activity types with a teacher’s TPACK by saying:

Since content, pedagogy, and technology knowledge are so interrelated and interdependent (Koehler & Mishra, Chapter 1), and given the socially situated,
event-structured, episodic, and pragmatic nature of experienced teachers’
knowledge (Moallem, 1998; Putnam & Borko, 2000), it serves to reason that there
are identifiable TPCK-related activity types, within and across curriculum-based
disciplines (pp. 256-257).

These two approaches—design and activity types—are concerned with helping
teachers to develop TPACK. In order to facilitate that development, however, it would be
useful to develop a better understanding of TPACK’s role in planning for instruction.
Examining contemporary teaching planning practices in light of the TPACK framework
helps further that understanding, providing a firmer foundation on which to base future
development efforts.

Understanding TPACK Through Teacher Planning

Wilson, Shulman, and Richert’s (1987) definition of teacher knowledge is firmly
grounded in the context of individual classrooms. They wrote:

In teaching, the knowledge base is the body of understanding, knowledge, skills,
and dispositions that a teacher needs to perform effectively in a given teaching
situation, e.g., teaching mathematics to a class of 10 year olds in an inner-city
school or teaching English literature to a class of high school seniors in an elite
private school (p. 106).

Operationalizing this concept is difficult. Often teacher knowledge is described in terms
of college coursework or test scores, focusing on what a teacher knows about subject
matter. Wilson, et al. believed this is because of a faulty assumption:

The shared assumption underlying this research is that a teacher’s knowledge of
the subject matter can be treated as a list-like collection of individual propositions
readily sampled and measured by standardized tests. Thus researchers ask how much a teacher knows (how many such propositions) and not how that knowledge is organized, justified, and validated (p. 107).

This perspective of teacher knowledge ignores the contextual overlap between content and pedagogy. Similarly, research into teacher thinking has been concerned more with identifying generic processes rather than with how subject matter knowledge may help to shape teachers' practices. Teacher knowledge, however, is greater than the sum of subject matter knowledge and pedagogical practices (Shulman, 1986; 1987a). The heart of teaching is the transformation of subject matter in order to communicate it to students (Wilson, et al.).

Much of that transformation takes place during the planning process (Wilson, et al., 1987). Planning links knowledge to intentions (Clark, 1988). There is some evidence that both content and pedagogical knowledge influence how teachers plan (Zahorik, 1970). It is done within a specific classroom, with a particular teacher, students, content, and pedagogy:

Mrs. Warfel, when planning for her fifth-period American literature class, does not think about teaching generically. Instead, she thinks about teaching Moby Dick or The Color Purple to a particular group of students, who learn in particular ways at a particular time of the day (Wilson, et al., 1987, pp. 107-108).

Yet little research has examined how subject matter knowledge is incorporated into teacher planning (Shavelson & Stern, 1981). Wilson, et al. called this gap in understanding the "missing paradigm" (p. 108) in teaching research. Research that furthers an understanding of how teachers employ particular types of knowledge, such as
technology-related knowledge, in their planning would yield insight into both teacher knowledge and planning.

*Mining the Teacher Planning Research*

If we take its age and historic context into consideration, there is a rich reserve of teacher planning research. While there seems to be no agreed-upon definition of instructional planning, an overview of several definitions shows a similar focus on planning as a decision-making process. Lederman and Niess (2000) defined planning as "a set of basic psychological processes in which the teacher visualizes the future, inventories means and ends, and constructs a framework to guide his or her future actions." According to Tilemma (2003), "teacher planning can be categorized as decision making about prior knowledge and motivation of pupils and the organization of teaching procedures and activities, taking into account the structure and sequence of subject matter" (p. 68). Cruikshank, Jenkins, and Metcalf (2006) summarized succinctly, "Let’s define instructional planning as the process by which teachers decide (1) what to teach, (2) how to teach it, and (3) how they will determine whether students have learning and are satisfied" (p. 147). Planning takes place during what Jackson (1968) called the "preactive" phase (p. 12) of teaching that occurs when teachers are alone in the classroom. While teachers engage in a variety of activities during this phase, planning is the most important (Yinger, 1979).

The empirical research that has investigated teacher planning generally takes one of two approaches: descriptive or prescriptive. The descriptive research studies concern themselves with revealing the planning practices of teachers. The prescriptive research studies, on the other hand, concern themselves with teachers’ use of systematic planning
practices (Clark & Yinger, 1977; Joyce, 1978). These two approaches begin from different perspectives. Descriptive studies work from within the classroom walls; prescriptive studies, on the other hand, stand outside the classroom looking in.

**Descriptive Studies**

Clark (1978) classified the descriptive studies as examples of the cognitive information-processing approach, concerned with “basic psychological processes that occur in the mind of the teacher which organize and direct his behavior” (p. 54). Teacher planning is an important example of teacher thinking (Clark, 1978; Borko & Niles, 1987). Using either laboratory or classroom settings, researchers have investigated the types and sequences of decisions that teachers make during the preactive phase of teaching. The studies use a variety of methods, including questionnaires, interviews, ethnographies, simulations, process-tracing, and stimulated recall protocols (Peterson, Marx, & Clark, 1978; Shavelson & Stern, 1981). The process-tracing, or “think-aloud” technique asks teachers to describe their process as they plan a lesson, often having them speak into a recorder as they plan (Clark, 1978; Peterson, et al., 1978; Borko & Niles, 1987). The stimulated recall technique, on the other hand, occurs following the lesson delivery, when teachers review audio- or video-taped segments of the lesson and comment on their cognitive processes (Peterson, et al., 1978; Borko & Niles, 1987).

Studies of teacher planning have examined different facets of the process, including the different types of planning in which teachers engage; the details of the preactive planning process—an area that reveals the real difficulties of studying teacher planning; and the routines related to planning.
Types of Planning. Teachers do a variety of different types of planning throughout the school year, including yearly, term, unit, weekly, and daily planning (Clark & Yinger, 1979; Yinger, 1980). Most of their planning time, however, is spent on unit, weekly and daily planning (Yinger, 1980). Ornstein (1997) hypothesized that this may be because yearly and term planning materials are often provided by the school district or state. Teachers are "curriculum implementers" (Brown, 1990) since content goals are generally set by school districts. In a standards-based environment, teachers lose control of the curriculum because the state identifies the general content to be taught (Madaus, 1988; Kennedy, 1994). They are concerned primarily with classroom-based planning, with much of the literature reviewed focused specifically on teacher planning for classroom instruction.

Similar to the overall curriculum, instructional objectives are also often identified for teachers by the state or the local school district. This may explain why, as the teachers engage in weekly and daily planning, they spend the least amount of time on identifying objectives (Zahorik, 1975; Peterson, et al., 1978; Yinger, 1980). Instead, teachers are generally concerned with decisions about specific content and instructional practices (Zahorik; Morine-Dershimer, 1978; Peterson, et al.; Yinger).

The Difficulties of Studying Planning. The studies report some variation in the sequence in which teachers make these decisions and the emphasis that they place on content or activities (Yinger, 1980). Zahorik (1975) and Peterson, et al. (1978), on one hand, found that teachers focused primarily on content first and then instructional activities. Other researchers have found that the primary focus of planning and instruction was not on content, but on activities (Yinger, 1979; Yinger, 1980; Shavelson & Stern,
Yinger (1980) accounts for this discrepancy in the decision-making sequence by suggesting that he is using a more comprehensive definition of "activity." He identifies seven features of instructional activities in accordance with which teachers made planning decisions, including location, structure and sequence, duration, participants, acceptable student behavior, teacher's instructional moves, and content and materials (Yinger, 1979; 1980). Earlier researchers, according to Yinger, defined "activity" narrowly as "teachers' instructional moves," separating it from the other features. Yinger's elementary school teacher participant, however, did not seem to distinguish among the different features. He wrote, "In her planning, content and materials were features that helped define an activity; thus, activities were not separate from subject matter" (Yinger, 1980, p. 123). Shavelson and Stern (1981) avoided this semantic confusion by using "task" to identify the basic structural unit of planning. Like Yinger, they identified multiple elements that teachers consider as they plan these tasks for their students—content, goals, students, activities, materials, and social community. However, within the more all-encompassing definition of "activity," Yinger found that decisions about content and materials were the most frequent activity-related decisions made; findings that seem similar to those of Zahorik (1975) and Peterson, et al. (1978).

The discrepancies in the descriptions of teacher planning processes in terms of what comes first—content or activities—may be more than simply a matter of refining definitions, however. The problem with conceptualizing the process in this manner may
be that teachers do not plan using discreet categories such as “activity” or “content;” instead, teachers’ decisions draw from across different categories. In addition, the categories used by researchers to describe planning, often derived from prescriptive planning models, may not match the kinds of planning statements made by teachers (Tilemma, 2003).

Alternatively, the problem may simply be a result of the seemingly ungeneralizable nature of teacher planning (Shavelson & Stern, 1981). Shavelson and Stern (1981) commented, “The sequence of elements considered and the compromises that have to be made are, as yet, unknown. They probably depend on the particular task at hand as well as the proclivities of the particular teacher” (p. 25). For example, as the teachers in their study became more familiar with the content, Peterson, et al. (1978) found that they began to emphasize instructional processes instead of content concerns. In describing the large standard deviations reported in their study, they concluded that teachers vary widely in their planning practices. Indeed, researchers have identified a variety of factors that influence teacher planning. These wide-ranging factors include knowledge and experience, schedules, school administrators, facilities, technology, resources, students, personality, the national curriculum, and textbooks (Zahorik, 1970; Brown, 1989; Ball, Knobloch, & Hoop, 2007; Yildrim, 2003). John (2006) summarized that teachers plan in simultaneous consideration of teacher, learner, context, resources, and methodology. Tilemma (2003) accounts for the discrepancies in the results of teacher planning studies by noting differences in planning related to specific subject matter domains.
Describing teacher planning is difficult because teachers engage in a considerable amount of mental planning that may not show up in any written documents (McCutcheon, 1980; Yinger, 1980; Borko & Niles, 1987). The shorthand descriptions found in teachers' planbooks really serve only as reminders of a larger plan created via the process of mental planning (Morine-Dershimer, 1978; McCutcheon, 1980). This mental planning occurs throughout the process of planning and instruction (Earle, 1996). Indeed, much teacher planning is intuitive and holistic (Ornstein, 1997), with teachers being guided by broad intentions, intuition, tacit knowledge, and lesson images (John, 2006). McCutcheon and Milner (2002) summarized the literature as showing that planning is primarily a cognitive activity. They wrote:

That is to say, teachers envision themselves enacting the plan, what they will say, questions they will ask, when to pass out what materials, where they will stand, how to arrange the students, and they anticipate potential difficulties and how to deal with them, among other matters they consider (p. 82).

There is difficulty with this notion, however, as the planning literature does not adequately define this imagining. In addition, McCutcheon and Milner could find no evidence of this kind of envisioning being used by the high school English teacher they studied.

Use of Routines in Teacher Planning. One reason teachers may focus more on content and materials than activities is because other aspects of their practice, such as classroom management, may be more subject to routinization (Yinger, 1979). Teachers develop routines—mechanisms used to establish and regulate activities and to simplify planning (p. 111)—related to classroom organization and management (Yinger; May,
These routines arise from the implementation and evaluation of the plans created during pre-active planning. Once they have had a chance to try out a particular activity, teachers tinker with it, eventually honing it into a routine. This routinization is part of the last stage of Yinger's (1980) teacher planning model, happening outside of the pre-active planning process. I will describe his model in some detail in a subsequent section of this chapter; for now, it is enough to know that the teacher planning process Yinger describes is cyclical, so that while initially routinization of activities occurs following implementation and evaluation of the plan created during the pre-active phase, as routines are formed, they then inform subsequent pre-active planning.

Yinger (1980) identified four types of routines: activity routines, instructional routines, management routines, and executive planning routines. Of the four, only one—executive planning routines—occurs prior to classroom instruction. These routines "are a system of established thought patterns set off by specific planning tasks and results based on experience in numerous similar situations" (Yinger, 1979, p. 167). These metaroutines "activate and guide" planning. The teacher Yinger studied used consistent methods for planning, with particular patterns for unit planning that differed from those patterns used for weekly or daily planning. For example, her first step in planning a unit, whether in science or social studies, was to gather materials.

The other three routines—activity, instructional, and management routines—are observed during the interactive phase of teaching, but they inform the proactive planning process. As their name suggests, activity routines "control and coordinate the features of classroom activities," with activity defined as the basic structural unit of planning and
action in the classroom (Yinger, 1979, p. 165). Yinger relates activities to behavior settings, which are, according to ecological psychologists like Barker (1963) and Doyle (1977), ecological units of behavior. These behavior settings are characterized by four features, including temporal and spatial boundaries, a physical component, predictable behavior patterns, and a relationship between the physical component and the patterns. The teacher is influenced by the setting, but the teacher is also largely instrumental in creating that setting. It is during the preactive phase of planning that the teacher sets the parameters for behavior in the setting.

Yinger (1979) identified seven features of instructional activities. They include location, structure and sequence, duration, participants, acceptable student behavior, instructional moves, and content and materials. According to Yinger, “the teacher made planning decisions about these features for each instructional activity. For some activities, decisions were made quite often, but in most cases, only one or two were necessary, as the activity became fixed or routinized” (p. 165).

Instructional routines, which are components of activity routines, are related to instructional strategies or teaching styles, what Yinger calls “teacher moves” (p. 166). These moves include giving instructions, demonstrating, instructing, monitoring, reviewing, and questioning. Different activities might incorporate similar instructional routines.

Management routines address classroom organization and behavior not related to instruction. Examples include transitions between activities, passing out or collecting materials, leaving the room, cleaning up the room, and so forth (Yinger).

These routines have an effect on both the teacher and the students; they reduce the
teachers' planning time, and they increase the predictability of classroom events for the students. According to Ornstein (1997), by the middle of the school year, nearly 85% of activities are routinized. Many of these routines are established during the first weeks of school (Clark & Elmore, 1979). The planbook, which contains shorthand versions of teachers' mental planning decisions, is an example of one of the routines of teaching related specifically to planning (McCutcheon, 1980). McCutcheon described the typical information that is recorded in these planbooks, saying: “Teachers tend to list activities, page numbers in the textbook or the teacher's guide, and perhaps a few words about concepts to be covered” (pp. 5-6).

The descriptive studies, then, come to one fundamental conclusion. Planning is an idiosyncratic, complex, context-based practice (Brown, 1990; John, 2006). While the descriptive studies come to this conclusion from a viewpoint situated within the classroom, the prescriptive studies stand outside the classroom, concerned not with how teachers plan, but with how they should plan.

Prescriptive Studies

Prescriptive studies enjoy a much longer research history than descriptive studies, reaching back to Tyler's curriculum planning model that was first introduced in 1950 (Zahorik, 1975; Clark & Yinger, 1977; Borko & Niles, 1987; John, 2006). Prescriptive studies generally take an "instructional design" (ID) approach to teacher planning; they are fundamentally concerned with how teachers should plan (Joyce, 1978; Earle, 1994). As its name implies, ID is concerned with a systematic approach to developing instruction (Branch, 1994). Branch defined ID as "a planning process for addressing the multiple backgrounds of the learner, the multiple interactions between the content, media,
teacher, and the learner, and the multiple instructional contexts for a specified period of
time” (p. 26). Systematic planning models—of which there are many (Andrews &
Goodson, 1980)—generally follow a three- or four-step process that begins with
identifying objectives, then moves to choosing instructional activities, and concludes with
an assessment that determines the extent to which students have mastered the objectives
(Moallem, 1998; Reiser & Mory, 1991). While there is a large body of literature related
to systems theory and its relationship to ID, the focus of this review is that selection of
literature that examines the relationship of teacher planning and ID. These studies used
surveys and scenario responses to determine the extent to which teachers are aware of
and use ID models for their planning (Branch; Kennedy, 1994; Reiser, 1994; Earle, 1998;
John).

In terms of teacher planning practices, the prescriptive studies agree with the
descriptive studies in their findings related to teachers' use of ID. Teachers do not follow
systematic planning models closely (Zahorik, 1975; Yinger, 1980; Shavelson & Stern,
1981; Branch, 1994; Kennedy, 1994). In addition, a disconnect exists between how
teachers are taught to plan and how they actually plan (Searcy & Maroney, 1996).
Researchers disagree as to just how many ID processes teachers use as they plan. For
instance, there is some evidence that teachers refer to pieces of the different models when
they discuss their practices (Branch). In his study of elementary school teachers, for
example, Earle (1996) found that more than half consciously used ID processes in their
planning. In their study of two experienced teachers, Reiser and Mory (1991) concluded
that teachers who had been trained in the use of a systematic planning model were likely
to use it as part of the planning process. Kennedy, on the other hand, in her case study of
five secondary teachers, found that they used "personal heuristics" rather than ID practices. Searcy and Maroney reported that special education teachers did not use a planning model and only used a few components found in ID models. Even in a school district that had adopted the Madeline Hunter seven-step planning model, teachers customized the model (Brown, 1990). Brown (1993) observed that novice teachers who had used the Hunter model during student teaching abandoned the model in favor of decisions related to content and activities during their first year of teaching. These findings seem to reinforce the understanding that teacher planning is an idiosyncratic, context-based practice.

Modeling Teacher Planning

Despite the widespread consensus that teachers do not systematically plan instruction, some researchers suggest that the problem is with the models, and if instructional designers hope to have any influence on teacher practice, they simply need to design a better model for instructional planning. This concern begins with a shared assumption that teachers' planning would be more effective if they used a model (Reiser, 1994). Reiser, for example, wrote, "Those of us who believe in the power of the systems approach to instructional design are often frustrated by the fact that the approach is rarely used in one environment in which it is sorely needed, namely the public schools" (p. 11). This belief, however, is not borne out by research. The complex nature of the classroom makes it difficult to make connections between design and achievement. Earle (1994) asserted, "The scientific application of instructional theories cannot guarantee successful teaching or learning because the dynamic, every-changing interaction of people, ideas, objects, and events involved in the teaching-learning process tends to be complex and
often unpredictable" (p. 7). Early evidence that planning leads to improved student learning is mixed (Reiser). While there is general evidence that teachers who plan are more effective than teachers who do not plan, researchers have not determined if any particular planning method is more effective than any other (Lederman & Neiss, 2000). This is an area in which more research is needed (Reiser).

There are some scholars who question the need for models at all. They have several objections which revolve primarily around the way these models oversimplify the complex process of planning for classroom instruction. For instance, Ornstein (1997) suggested that most lesson planning models focus solely on planning for direct instruction. Use of planning models, then, may conflict with the use of more innovative teaching practices such as whole language in reading (Brown, 1990). In addition, Ainley and Luntley (2007) believe that professional standards focus almost solely on lesson planning, which leads to an "impoverished" view of teaching because it ignores the importance of teachers' interactions with students in the classroom. There may also be limits to the usefulness of ID models for individual teachers, since ID is a collection of processes that users sequence as their needs dictate, rather than a linear approach (Dick, 1993). This failure to reflect the complexity of the classroom environment is one major drawback of most instructional design models. Clark and Dunn (1991) wrote, "Ends-means models have been made to work in training novices and in simplified experimental situations, but they do not fare so well against the demands and complexities of classroom teaching" (p. 186).

In addition to suffering from an oversimplification of the classroom context, another drawback to design models for teacher use is their inability to accommodate the
mental planning in which teachers engage. Instructional designers need greater understanding of the mental processes of teachers (Reiser, 1994; Driscoll, Klein, & Sherman, 1994). Driscoll, et al. noted the difference in focus between instructional designers and teachers, suggesting that some of that difference occurs because designers do not have access to teachers' mental schema. When the instructional designers in their study responded to the planning scenarios presented by the researchers, they focused on design. The teachers in the study, on the other hand, focused on a variety of "intangible" teacher-student variables, such as student understanding or classroom management. Unfortunately, teachers' mental planning is often ignored or discounted by researchers (McCutcheon, 1980).

Discrepancies in reports of ID processes used by teachers have led to a debate over whether or not teachers can be classified as instructional designers (Branch, 1994; Kennedy, 1994; Earle, 1996). For some researchers, there is no question that they are (e.g., Earle; Hammerman, 2006), with Earle (1998) noting the similarities between teachers' planning decisions and the common elements of ID models. Kennedy rejected the notion outright, however, as the teachers she studied did not employ what she calls the “key elements” of instructional development: “the concept of systems or at least systematic design, and reliance on learning theory to guide the development process” (p. 22). Few of McClune’s (1970) participants seemed to have an understanding of either how to write behavioral objectives or how to classify them using a taxonomy of educational objectives. Branch, expressing a more moderate perspective, admitted that teachers use some ID processes, but called for future studies to determine whether or not they use enough to be considered true instructional designers.
Perhaps the problem is with the question itself: “Are teachers instructional designers?” This does not seem to be the most urgent question, focusing attention as it does more on the model than the person who is using it. Instead, a more useful question may be, “How can instructional models better serve teachers?” The answer, according to several researchers, is that more practitioner-based ID models are needed (Yinger, 1980; Branch, 1994; Earle, 1994; Moallem & Applefield, 1997). Moallem and Applefield suggested that ID models should reflect the "ecology of the classroom environment" (p. 9). Calderhead (1987) called for “more realistic models of teaching that help us conceptualize the nature of this practice more clearly, enabling supportive efforts, including training and policy-making, to be more productive” (p. 4). This general cognitive model would focus on the practices of designing, implementing, and maintaining learning activities (Calderhead, 2003).

According to Shavelson and Stern (1981), we should use the research findings about teachers' planning to create a tentative model of teacher decision-making. Earle (1994) suggested that a strategy based on Tessmer and Wedman’s (1990) "layers of necessity" model may be the best approach; instructional designers would “implement only those skills which best fit the practical processes described in the teacher planning literature” (Earle, p. 6). John (2006) also recommended that the development of a dialogical model of lesson planning—one which emphasized problem-level processes and attempted to reflect the natural planning practices of teachers—would be more useful to teachers than the more rigid models advocated by instructional designers.

Two models in particular attempt to describe, rather than prescribe, the teacher planning process. Yinger’s general-process design model (1980) rejected the design
models that are typically taught to teachers in favor of one that better reflects what teachers actually do as they plan: solve problems. The Model of Pedagogical Reasoning and Action (Shulman, 1987a; Wilson, et al., 1987) is built on the twin concepts of teacher knowledge and the transformation of subject matter for teaching.

**General-Process Design Model.** The purpose of Yinger's teacher planning model was two-fold: to accurately describe how teachers plan and to lay the groundwork for future research. He wrote, "The focus of the process model is the individual, preactive, deliberate information-processing involved in planning, from an initial idea to its execution in the classroom" (p. 113). This process is one of discovery, rather than rational choices.

Yinger's general-process model of teacher planning includes three steps: problem-finding, problem formulation/solution, and implementation and routinization. The first two stages occur prior to instruction. During the problem-finding stage, the general planning task is transformed into a specific planning problem. During the second stage—in which Yinger's teacher spent more of her time—the teacher designs instructional activities. Yinger wrote, "During this cycle, the initial idea is repeatedly elaborated and tested mentally until a satisfactory solution is found" (p. 115). Yinger describes the design process in the second stage as being similar to musical composition, chess playing, and architecture. His description of the type of problem confronted by teachers as they plan is reminiscent of Rittel and Webber's (1973) wicked problem of social planning: "The problem is not well specified or agreed upon, no formal language with precise problem-solving methods is available, and the goals to be achieved are open to interpretation" (Yinger, p. 116). Yinger's model of the second phase of planning
underscores the cyclical nature of the planning process as teachers move through the
three phases of elaboration, investigation and adaptation, considering possible solutions
while also refining understanding of the problem. At each phase, the teacher draws on
knowledge and experience as well as her changing conception of the problem. The
problem is solved when it is finally formulated and addressed.

The last stage of Yinger’s model moves beyond the preactive phase to classroom
implementation, when the teacher tries out the plan in the classroom. Clark and Yinger
(1979) found support for Yinger’s model in their own study, describing the planning
process their teachers used as “cyclical” (p. 18). In her case studies of 12 middle school
teachers, Brown (1989) determined that Yinger's model provided an accurate description
of yearly, unit, and weekly planning done by the teachers.

*Pedagogical Model of Reasoning and Action.* Yinger’s model, however, grows
out of the early planning literature and does not take into account newer ideas about how
teachers use knowledge—especially content knowledge—in the classroom. The purpose
of the Model of Pedagogical Reasoning and Action is to describe the process in which
teachers engage as they transform subject matter for teaching (Shulman, 1987a; Wilson,
et al., 1987). At the time of its introduction, Sackett (1987) questioned the descriptive
nature of the model, suggesting instead that it was meant to serve as a checklist for
teacher evaluation. “It is,” he wrote, “a prescription of how teachers ought to conduct
themselves” (p. 154). It seems ironic that he then went on to criticize the “loose-limbed”
nature of the model because Shulman refused to codify the process. Of course, according
to Shulman, the model was not meant to be a specific set of stages or steps. Shulman’s
(1987b) response to Sackett made the descriptive nature of the model clear. Shulman
wrote, "Contrary to Sackett’s assertions, our model of pedagogical reasoning and action grows directly out of our case studies of teachers, both novices and veterans" (p. 480).

The model includes six processes related to teaching: comprehension, transformation, instruction, evaluation, reflection, and new comprehension. The model begins with comprehension, which refers to a teacher’s critical understanding of subject matter. The transformation process includes four sub-processes, which taken together produce a plan. These subprocesses are critical interpretation, representation, selection, adaptation, and tailoring. During the critical interpretation process, teachers critically review the instructional materials for reliability and validity. Then, as part of the representation process, teachers choose appropriate ways of representing subject matter. During the selection process, they consider different ways to teach, organize, and manage the activities. During the adaptation process, teachers consider the general characteristics of their students, and conversely, during the tailoring process, they consider how to adapt material to specific students.

Following the planning process, teachers move into instruction, when they implement their lessons in the classroom. The evaluation process—which refers to teacher evaluation of students’ learning—takes place both during and after instruction, and may include both informal checks for understanding and formal quizzes or tests. Teachers also evaluate themselves as part of the reflection process, and through that reflection, come to new comprehension.

Both models—the general-process model, with its focus on problem-solving, and the pedagogical reasoning model, with its focus on teacher knowledge—attempt to describe the complexity of teacher planning. Neither of these models is easily translated
into a systematic approach to planning as preferred by instructional designers. Instead, they reveal an individualized, cyclical practice (Yinger, 1980; Wilson, et al., 1987; Feng & Hew, 2005) and challenge us to come to a better understanding of teacher mental planning practices (Earle, 1998).

*Updating the Teacher Planning Literature*

This challenge has largely not been met. The teacher planning literature that might guide us in this understanding was published more than 20 years ago (McCutcheon & Milner, 2002). Most of it does not take either technology or teacher knowledge into consideration. “Planning research came on the heels of the behavioral objectives movement,” wrote McCutcheon and Miller (p. 89). Interest in behavioral objectives may have led researchers to focus on whether or not teachers used such objectives, rather than exploring other aspects of teacher planning. In addition, the objectives movement may have influenced teacher planning itself. The authors wrote:

> Since teachers could not help but view knowledge as objective, they prepared lectures and sessions for drill and practice. As a result, the objectives movement may have influenced not only researchers' designs for studying planning, but also the very nature of the planning itself being studied (p. 89).

In addition, there is little literature related specifically to how teachers plan for the use of technology (Tubin & Edri, 2004). The few studies that have been done, however, help advance the emerging connections among teacher planning, technology use, and teacher knowledge that form the framework for this study.

*Updating a Model and Foreshadowing a Framework*

Three studies, in particular, focus upon technology and teacher knowledge in the
context of teacher planning. The first—Feng and Hew’s (2005) qualitative study of seven in-service teachers—built on the pedagogical reasoning model of teacher planning developed by Wilson, et al. (1987), adding technology-related pedagogical processes. The second—Moreno’s 1999 study of four elementary school teachers integrating word processing in their classrooms—noted how teachers’ pedagogical knowledge both influenced and was influenced by the ways teachers chose to integrate technology into their classrooms. In its attempt to describe the interconnected relationships within teacher knowledge, Moreno’s Teacher Knowledge Structure framework foreshadows TPACK. Finally, in their recent study of seven secondary social studies teachers, Harris and Hofer (2009b) make an explicit connection between TPACK and teachers’ planning.

As described earlier, the pedagogical reasoning model is concerned with how teachers transform subject matter for teaching. Feng and Hew (2005) found support for a revised pedagogical reasoning model that includes six processes: comprehension, interpretation, reflection, specification, selection, and caution. These processes correspond roughly to those in the original model. Finding the concept of preparation to be confusing, Feng and Hew expand it to include interpretation and reflection. In addition, they collapse representation, selection, and adaptation into one process called specification. They wrote:

Our specification process allows for different teaching philosophies rather than just structured instruction as referred to in Shulman’s representation process. It also refers to the instantiating of the standards or instructional objectives and the adaptation of activities in order to meet the needs of different students (p. 7).

Despite these changes, the revised model is closely related to the pedagogical reasoning
model developed by Wilson, et al. (1987).

The primary difference between the two models is found in the inclusion of two new pedagogical reasoning processes related to the use of technology. These processes are selecting technology tools and exercising caution in the use of technology. Selecting technology refers to a teacher choosing a technology that seems to support the selected activities. The latter process—caution—describes teachers’ concerns about and plans for what will happen if the technology does not work successfully. For the teachers in Feng and Hew’s study, technology played a separate role in the transformation process, yet was related to teachers’ pedagogical and content choices.

Moreno’s (1999) study found similar connections among pedagogy, content, and technology knowledge. Pedagogical knowledge influenced the teachers’ choices related to technology as well as their beliefs about student achievement. Their use of technology, however, had a reciprocal influence on their belief about students, “such as the belief that elementary school children’s short attention span would interfere with students’ performance of using the word processor” (Moreno, p. 206). In fact, these reciprocal relationships are found throughout her Teacher Knowledge Structure framework. Moreno described the framework:

It focuses on how teachers’ general pedagogical knowledge (GPK), subject matter knowledge (SMK) of language arts, SMK of word processing, and knowledge of context, influenced the PCK of language arts and PCK of word processing. It also shows how the PCKs of language arts influenced the PCKs of word processing (p. 204).

The model demonstrates the overlapping nature of teacher knowledge, and identifies the
triad—pedagogy, content, and technology—that forms the foundation of the TPACK framework.

While Moreno’s work only foreshadowed TPACK, Harris and Hofer (2009b) specifically adopted the framework as the basis for their interpretivist study of seven secondary social studies teachers. They stated, “We sought to discover clues to the nature and development of these teachers’ TPACK-in-action as it was expressed in their planning processes” (p. 1).

Describing Teacher Planning for Technology

While these studies use teacher knowledge as a framework for understanding planning, three other studies adopt a more descriptive approach, reminiscent of that used by the early teacher planning researchers. Tubin and Edri (2004) provided insight into the different planning patterns that teachers adopt in general, including planning for the use of educational technologies in instruction. Olson and Eaton (1987), meanwhile, found connections between technology use and the original teacher planning literature dealing with teacher routines. Kuhn (2006) also emphasized the importance of both teacher knowledge and routines in the differences between the ways that novice and experienced teachers approach technology decision making.

Tubin and Edri (2004) conducted their study of 12 teachers in a school that had included technology as part of its school-wide planning. They found three general patterns of planning used by the teachers. The teachers who followed the “flow” pattern sketched out general plans, then allowed the details to emerge during the implementation process. These teachers focused upon processes, and they “flow with the students’ ideas as they emerge, and merely respond to ongoing events” (p. 186). They described
themselves as "flexible, spontaneous and open to change" (p. 186). The teachers who followed the "flexible" pattern engaged in more preactive planning, with the understanding that changes might have to take place during the implementation phase. The teachers who followed the "fulfiller" pattern created detailed plans that were implemented precisely. Of the three patterns, Tubin and Edri concluded that the "flexible" pattern was the most efficient in terms of planning for the use of instructional technology, because teachers were better able to adjust the actions envisioned during pre-active planning to accommodate the changing environment of the classroom. In addition, this pattern may be better suited to the "turbulent situation" created by the addition of technology as well as issues related to the "rigid timetable" of school and student variability. In considering their findings, the researchers suggested, "[It is an] effective fallacy to invest more time in detailed planning assuming it will cause greater improvement" (p. 188).

Tubin and Edri (2004) do not describe how teachers use routines in their planning. Yet the early teacher planning literature found that much of the pre-active planning process was routinized. Olson and Eaton's (1987) study of eight teachers who were experimenting with the use of computer technologies linked teachers' technology use to their use of routines and found that teachers were more likely to adopt those features of an innovation that fit into existing routines. This use of routines provided an alternative to the usual explanations for why teachers do not use technology in more innovative ways. As is often argued, teachers were not unaware or resistant to innovations such as digital technologies. Instead, analyses that are critical of teachers' apparent resistance to technology integration "ignore the fact that teachers operate well-functioning routines
which for them may solve many difficult problems and fails to appreciate the slow process of working out the implications of new visions of schooling” (Olson & Eaton, p. 179).

In fact, it was those routines that made it possible for the experienced teachers in Kuhn’s study to take “more time to learn about, experiment with, and use technology” (2006, p 194). Novice teachers, on the other hand, were more concerned with what Kuhn calls the “fundamentals of teaching,” which include “curriculum requirements, covering content, and classroom management” (p. 188). In addition to the routines, the experienced teachers had access to a knowledge base that allowed them to consider how technology would enhance their students’ learning. This knowledge, according to Kuhn, “helped experienced teachers realize that technology sometimes allows them to teach something better than before or teach something that they could not teach without it, whereas novice teachers did not have a basis for comparison” (p. 194). As the experienced teachers planned, they pulled from both their knowledge and their routines to make choices about technology.

*Connecting Teacher Routines and Activity Structures*

Understanding teacher routines might help researchers make connections between the descriptive and the prescriptive literatures related to teacher planning, particularly if we investigate how teachers’ well-established routines are related to activity types, Harris’s (2008) reconceptualization of activity structures. Activity types—“cognitive structures that experienced teachers use regularly (albeit subconsciously at times) to plan and carry out instruction” (p. 257)—seem similar to Yinger’s (1979) instructional activities. There are differences, to be sure. Activity types are content-specific, while
teacher routines, as conceptualized by Yinger, are not. In addition, activity types are a form of professional development and are used to help teachers build TPACK to support technology integration. Yinger’s routines, on the other hand, were conceptualized to help us understand how teachers plan.

Yinger (1979) defined instructional activities as the basic structural units of the classroom in which most actions and interactions took place. These activities were established and regulated through the use of routines, and activities and routines were closely related. In fact, most of the activities in which Yinger’s teacher engaged were routinized to some extent. Routines, according to Yinger, “played such a major role in the teacher’s planning behavior that her planning could be characterized as decision making about the selection, organization, and sequencing of routines” (p. 165).

The connection between activity structures and routines has been made in the past, but in a rather off-hand way, without particular reference to the teacher planning literature. Chapman (1993) directly related activity structures to routines when she wrote, “Activity structures are the routines that make up classroom life” (“Meaning and Context” section, para. 3). Activity structures and routines share several common characteristics. They both make planning easier (Yinger, 1979; Harris, 2008). In addition, they make the classroom more predictable for teachers and students by reducing the complexity of the classroom environment (Yinger; Kolodner & Gray, 2002). Finally, just as Olson and Eaton (1987) discovered with teachers’ use of routines, activity structures are difficult to change because they govern both teachers’ and students’ expectations of classroom interactions (Polman, 1998).

Perhaps we can understand routines as those activity structures that are adopted
by teachers for ongoing use in their classrooms. Kolodner and Gray (2002) described "ritualized" activity structures as those that are carried out repeatedly, taking different content into account. They wrote, "By "ritualizing," we mean articulating and normalizing a sequence of activities and setting expectations about how and when to carry them out" ("Ritualized" Activity Structures section, para. 3). As activity structures are ritualized, they become routines. This concept of activity structures provides a useful framework for updating the teacher planning literature, particularly with regard to how these structures eventually become routines, and in terms of how they are related to TPACK.

Ideas about activity structures and teacher knowledge have arisen during the past two decades, after the bulk of the teacher planning research had been completed. McCutcheon and Milner (2002) called for more research "in order to develop a fuller portrait of how teachers plan to inform teacher education, policy studies, curriculum, instruction, and supervision" (p. 92). One of the ways to develop that portrait is to update the teacher planning literature by examining it through the lens of teacher knowledge as it incorporates instructional uses of technologies, such as the work begun by Harris and Hofer (2009b). By using the concept of teacher knowledge as it relates to practice to study the planning-observation-reflection cycles of the teaching process, we can discover "rich data on the connections among teachers' comprehension of the content, their planning, their teaching, and their reflection" (Wilson, et al., 1987, p. 112).

Adopting a Metaphor for Teachers

Filling in the details of that portrait may also require exploring a new metaphor for teachers' work. According to Clark and Yinger (1987), two dominant images of
teachers have arisen: teacher as skilled manager and teacher as decision-maker. The former aligns with the mechanistic, industrial age and the behavioral objectives so influential on the older planning literature. Calderhead (1987) called this the "mastery" view that equates effective teaching with the mastery of particular behaviors. The decision-maker, on the other hand, arises from the cognitive view of teachers as thinkers. These metaphors have developed within particular paradigmatic views of teaching. Both may limit our understanding of the complexities of planning for learning and teaching.

The view of teachers as skilled managers and technicians originates in the teaching process paradigm. With its behavioral perspective, this view focuses on the relationship between teacher behavior and student learning, treating the teacher herself as a "black box," and failing to account for teacher planning and decision making (Borko, Shavelson, & Stern, 1981; Calderhead, 1987). By not accounting for teacher thinking, the behavioral perspective limits researchers' understanding of the complexity of the classroom (Lowyck, 2003). On the other hand, the teacher thinking paradigm is almost exclusively concerned with teacher decision-making (Lowyck). The metaphors it uses to describe teachers—decision maker, hypothesis tester, information processor, problem solver, and planner—focus on rationality.

One example of this rational perspective can be seen in Zhao and Cziko's (2001) Perceptual Control Theory. This model of teacher behavior is based on control theory, which "maintains that human beings, and all other living organisms, control perceptual input, or reference condition, not motor output. In other words, they have internal goals which they strive to meet" (p. 10). Zhao and Cziko's choice of metaphor for control theory—the cruise control system in an automobile that is used to keep the car moving
steadily at the same speed—highlighted the rational nature of their model. Like most control systems, the cruise control system works by comparing the system’s current speed with the desired goal speed. These goals are hierarchical, with lower-level goals providing the means to achieve higher-level goals. Maintaining a particular speed is a lower-level goal influenced by higher-level goals such as the driver’s desire to drive safely or get to work on time. Zhao and Cziko applied this rational system of goals to the question of why teachers do not use technology more in teaching. Their mechanical rhetoric emphasizes the rationality of decision making; for example, they suggest that until teachers receive “error signals” that result from a discrepancy between the perceived input and the reference condition, they will not perceive a need to make changes in their practice.

Loyyck (2003) warned against overreacting to the behavioral paradigm by seeing teachers as exclusively rational thinkers, who work through problems in a linear, predictable, systematic fashion. This extreme view may also limit an understanding of the complexity of teaching. While they do not name it, Kynigos and Argyris (2004) identify a more recent paradigm shift in notions of teacher thinking. In this view, teachers are seen less as rational decision makers and more as “professionals who make reasonable judgments and decisions within a complex and uncertain community, school and classroom environment” (p. 249).

These professionals are reflective rather than rational thinkers (Calderhead, 1987)—Moallem (1996) called them “sense makers”—who grapple with wicked problems on a daily basis in their classrooms. Acknowledgement of wicked problems has caused a general shift in our understanding of professionalism in the social sciences
(Rittel & Webber, 1973). In the early part of the 20th century, the professional was a rational problem solver, who saw a problem (for example, unpaved roads or a lack of schools) and fixed it, striving to do so in the most efficient way possible. While some of the problems these rational thinkers solved were broad in scope and impact, they were comparatively tame problems, according to Rittel and Weber's definition. Wicked problems, particularly in the social sciences, require a different type of professional thinker: one who can embrace increased heterogeneity and function in a much less rational world.

It is this new definition of professional that provides a powerful metaphor for teachers’ work—one that helps sketch the gray areas of teacher practice. It is a relatively new way of thinking about teachers (Borko, et al., 1981) and will require fundamental shifts in perception and interpretation. Calderhead (1987) wrote:

Viewing teachers as active agents in the development of their own practice, as decision-makers using their specialist knowledge to guide their actions in particular situations, underlined the autonomous, responsible aspects of teachers’ work, and provided an appealing rationale for considering teaching as a worthy, complex, demanding profession, especially when contrasted with the previously dominant view of teaching as the mastery of a series of effective teaching behaviours (p. 5).

In his development of the metaphor of teaching as a professional activity, Calderhead (1987) outlined three characteristics of professionalism possessed by teachers. First, “teachers possess a body of specialized knowledge acquired through training and experience” (p. 1). Second, they are goal-oriented in relationship to their
clients. Calderhead admitted that defining “client” for a teacher may be more difficult than for a doctor or lawyer, which simply adds to the complexity of the educational environment. The third characteristic has to do with the types of problems confronting professionals, which “are often complex and ambiguous, and professionals must use their expert knowledge to analyze and interpret them, making judgments and decisions as they formulate a course of action intended to benefit their client” (p. 2). They are faced with wicked problems. The practice of teacher planning lies in the intersection of these three characteristics.

The educational technology community has also largely ignored the view of teachers as active, goal-oriented professionals when identifying issues related to technology integration (Zhao & Cziko, 2001). Teachers’ goals, motives, knowledge, plans, and decisions must be taken into consideration (Borko, et al., 1981; Clark & Dunn, 1991). Teachers should be seen not as technical managers implementing standardized models but as professionals who apply the skills of problem discovery, design, invention, and flexible adaptation in complex, uncertain environments (Calderhead, 1987; Clark & Dunn,; Lowyck, 2003; Kynigos & Argyris, 2004). In moving towards this new view of teachers, we might borrow a first step from Earle’s (1994) suggestions to instructional designers about how they could be of better use to teachers. We must understand that drawing a black-and-white distinction between the perspectives of teachers and instructional designers creates a false dichotomy (Earle). Both teachers and instructional designers have perceptions and misperceptions of each other that need to be resolved (Martin & Clemente, 1990). For Earle, the dichotomy results from the tension between those who believe teaching is an art—“the exercise of intuitive faculties and innate
talent”—and those who believe it is a science—“the careful selection and implementation of the appropriate formula for a given classroom situation” (p. 7). It is possible, he claimed, to merge the scientific perspective of instructional designers with the artistic perspective of classroom teachers. Earle wrote, “In reality, one uses scientific elements from ID theory and blends them with the ‘artistic’ selection of activities to implement the design principle” (p. 7). Teachers themselves seem to understand this relationship, since they do not completely reject the science of ID. Instead, while they do not strictly follow planning models, they do believe that student teachers should be exposed to such models as part of their education (Cain, 1989). The rational decision maker meets the reflective artist, and a new metaphor for teachers—one that tries to take all of the wicked problem-solving into consideration—emerges.

By “seeing” teachers as professionals, both artist and scientist, we may come to have more respect for their practices, and planning can be understood as more than just a preparation process or “the enactment of particular routines or recipes” (John, 2006, p. 495). Instead, as John suggested, “Planning, and the teaching of planning models, might then be viewed less as a preparation for practice and more of a practice itself” (p. 495). This view could result in planning being understood to be much more of a complex, nuanced, and professional activity.

Why do we need to see teachers? Why do teachers’ voices matter? Because without them, we may not be able to fully understand the complexity of the teaching practice. Such an understanding is key to overturning naïve assumptions about the simplicity of making changes in the classroom (Calderhead, 1987). These assumptions “leave out of account the real-life planning processes of teachers and how objectives
might or might not figure within them” (p. 4). We cannot lose sight of the classroom (Calderhead, 2003). Before we—researchers, instructional designers, policy makers—can engage in training or support for teachers we must first, following Earle’s (1998) recommendation to instructional designers, “seek to understand” (p. 30).

Clandinin and Connelly (1996) looked for that understanding through narrative, using stories to learn how teachers use knowledge in their classrooms. They took issue with Fenstermacher’s (1994) challenge to researchers to discover if teachers know, and whether they know they know. Teachers both know and know that they know; the problem is that they have been led to devalue their professional knowledge (Clandinin & Connelly). The epistemological basis of my research is one of respect for teachers’ knowledge of their craft. Using technological pedagogical content knowledge and how it is operationalized via activity types as an analytic framework, we can learn more about how teachers plan for the use of technology to transform subject matter knowledge.
Chapter Three

Research Paradigm: Interpreting Teachers' Planning Practices

A paradigm, according to Guba (1990), is “the net that contains the researcher’s epistemological, ontological, and methodological premises” (p. 17). As I hoisted the sails for my first major journey as a researcher, I hauled up my own net from the paradigmatic ocean and peered closely at its contents. What did I find spilling out on the deck? Perhaps most importantly, I found a fundamentally interpretive orientation to the world, particularly when it comes to human beings and the ways they come to know and understand. I am comfortable living in what I see as an ontologically relativist world. In other words, while I might be willing to admit to some immutable laws in the world of nature—gravity, for instance, seems a given—I can find no such objective truth in the world of human beings that can be ascertained through disciplined inquiry. This paradigmatic view, according to Rossman and Rallis (2003), includes “status quo assumptions about the social world” (p. 46) and how individuals experience that world. Researchers working within the interpretivist paradigm believe that the world is an orderly place and research can contribute to the improvement of social life (Rossman & Rallis, 2003).

In addition to a relativist ontology, Rossman and Rallis (2003) suggest that the interpretivist paradigm is grounded in a subjectivist epistemology. Several assumptions underlie this epistemological stance. Subjectivists believe that there are multiple
perspectives of the world. "Humans," according to Rossman and Rallis, "are viewed as creators of their world; thus, agency in shaping the everyday world is fundamental to the paradigm" (p. 46). Researchers who take this stance believe that inquiry should focus upon the study of multiple realities—different notions of what is real about a particular phenomenon that are created by different individuals as they interact with their environments (Patton, 2002, p. 98). The interpretivist paradigm, then, is particularly appropriate for a study like this one, which investigates several individuals' planning processes. It is important to me that multiple representations of realities be considered, and individual voices be heard—particularly those of the teachers involved in the study.

Teachers' voices are missing in many areas of education, including educational research (Moen, 2006; Lortie, 2002). Moen wrote:

What is remarkable is that the voices of teachers are virtually absent from the public debate on teaching. Teaching has become increasingly demanding, and teachers' classrooms today are characterized by diversity and variety, full of complexities and multidimensionality. In these environments we expect that the teachers will teach our children to be reflective, thoughtful, responsible, and active human beings. This demanding task does not have any simple solutions; there is no tried and true formula. ...Research in which teachers' voices are heard in their stories of experience offers an opportunity to present the complexity of teaching to the public. (p. 9)

Uncovering teachers' decision-making practices, particularly as they are related to the use of educational technology, allows exploration of the complexities of both teaching and learning.
While interpretivism is often used as a synonym for qualitative research in general, according to Schwandt (2001), interpretivists can be distinguished from other traditions by their assumption "that the meaning of human action is inherent in that action, and the task of the inquirer is to unearth that meaning" (p. 134).

Epistemologically, interpretivist researchers believe that it is possible to gain an objective understanding of the subjective meaning of human actions. That objective interpretation, however, is informed by a researcher's own experience (Creswell, 2007). It is possible, considering the subjectivist epistemology of the interpretivist tradition, to construct multiple interpretations from data (Corbin & Strauss, 2008). While, like Corbin and Strauss, I agree with the constructivist notion that, as a researcher I am constructing my results, and, furthermore, my readers will go on to construct their own interpretations of those results, I also agree that this should not negate the usefulness of generating concepts that can support further research and development.

According to Corbin and Strauss (2008), these concepts are useful in furthering our understanding of individual experience and providing the common language that is essential if we are to reach shared understandings. In addition, the development of these shared concepts facilitates the dissemination of knowledge-based practices. This is the fundamental balancing act of qualitative research: "the desire to step beyond the known and enter into the world of participants, to see the world from their perspective and in doing so to make discoveries that will contribute to the development of empirical knowledge" (Corbin & Strauss, p. 16). Creswell (2007) suggests that the role of the researcher is to interpret others' meanings about the world. Readers expect researchers to take on a dual role. Creswell writes, "Most readers want the straight story, but they also
expect researchers to put themselves in the interpretation, finding meaning that others cannot grasp" (p. 62). This focus on meaning is a fundamental aspect of interpretive research (Maxwell, 2004). The concepts that arise from data and data analysis contribute to the possibility of drawing generalizations.

Once the paradigmatic net has been opened to reveal its contents, the next step is to adopt a particular strategy of inquiry. The focus of this study was on a particular phenomenon: instructional planning, especially in terms of the use of educational technology. This choice of phenomenon to frame the study's focus helped determine the research strategy that was used.

**Strategy of Inquiry: Experiencing a Phenomenon**

A strategy of inquiry is, according to Denzin and Lincoln (2000), "a bundle of skills, assumptions, and practices that the researcher employs as he or she moves from paradigm to the empirical world" (p. 22). Because I am particularly interested in studying a phenomenon, I used one strategy—phenomenology—to move into that empirical world.

Phenomenology is the study of human beings' lived experience (Rossman & Rallis, 2003). According to Patton (2002), its foundational question is, "What is the meaning, structure, and essence of the lived experience of this phenomenon for this person or group of people?" (p. 104). In the case of this study, the phenomenon to be studied is how several teachers experienced the process of planning for the use of technology. While I followed teachers through the entire process—which is outlined in more detail in the methods section below—for the purposes of the study, I examined their processes only inasmuch as they relate to planning.
Classic phenomenology is concerned fundamentally with the essence of the experience of the phenomenon being studied (Patton, 2002). A purely phenomenological study focuses on individual experiences; the researcher approaches the study by "bracketing" or setting aside assumptions and personal beliefs in order to be able to investigate the nature of a phenomenon (Schwandt, 2001; Van Manen, 1990). The study then analyzes individuals' experiences and looks for the commonalities across experiences (Schwandt). Two of phenomenology's leading thinkers—Husserl and Heidegger—felt that the role of phenomenology was to get past individual experience to the objective nature of things (Schwandt). According to Patton, however, it is possible to adopt a general phenomenological approach that emphasizes the importance of capturing individual experience without a concern for identifying the objective nature of the experience.

In this study, I am using the term phenomenology in the way that it is used by what Schwandt (2001) calls "contemporary versions of qualitative inquiry in North America" (p. 192). This strategy of inquiry is epistemologically the reverse of the classic view of phenomenology, since it focuses on subjective experience, communicating the points of view of the participants, and eschewing critical evaluation (Schwandt). Situated as it is in the interpretivist paradigm, however, this study falls in the middle ground between classic and contemporary phenomenology. It begins with individual experience and then moves towards interpretation of that experience, looking for shared concepts that can lead to potential logical generalizations. These generalizations do not rise to the level of "objectified essence" that is part of the classic phenomenological research study, but instead provide insight into the planning practices of teachers.
I want to understand as completely as possible how my participants experience the process of planning for the use of educational technology as part of the lessons in their classrooms. This focus on the importance of understanding what people experience has methodological implications, as it requires the researcher to experience the phenomenon as directly as possible (Patton, 2002).

**Methods: Tools of the Researcher**

Researchers use methods as tools for collecting and generating data. Charmaz (2006) writes:

> How researchers use methods matters. Mechanistic applications of methods yield mundane data and routine reports. A keen eye, open mind, discerning ear, and steady hand can bring you close to what you study and are more important than developing methodological tools (p. 15).

The researcher behind the tools brings a lifetime of experience with her. My own attitudes towards educational technology are detailed in the Researcher as Instrument Statement, which can be found in Appendix 1 of this report. In this statement, I describe how my perceptions, beliefs, and values related to technology and its educational use have developed over the past 20 years. During the past two decades, I have played an active role in educational technology, first as a classroom teacher, and now as an educational technology consultant. In the latter position, I have worked with a variety of educators in a variety of settings with a variety of technologies. I have watched technology move into both the classroom and the culture in sometimes-unbelievable ways.

So how do all these experiences shape my perspectives as a researcher—especially a researcher whose plan is to investigate the ways teachers
experience the phenomenon of planning for the use of technology? I am convinced that we need a richer picture of these practices, and I want to come into the worlds of my participants, particularly the teachers, without judgment or pre-conceived stereotypes.

In order to ensure that my research leads to these kinds of rich data, careful planning is required. It helps guide the researcher in collecting, generating, and analyzing data in a timely manner (Stake, 1995). Chosen methods must be rooted in the research questions (Stake; Charmaz, 2006). Choosing participants with a wide variety of experiences is an important first step in this process.

Choosing the Sample

As described earlier, the study focused on 12 fifth, sixth, and seventh grade English/language arts, social studies, math, and science teachers. These teachers came from three different school districts and five different schools. My final sample differed in size and scope from my stated plan. I originally proposed to use six to eight middle and high school English and social studies teachers, all drawn from the same school district. Several events occurred that led to the change in my sample. The first school with which I worked was only able to locate teachers in fifth, sixth, and seventh grade who were willing to be part of the study and met the criteria for participation. I began to work with three teachers there and realized I would need to add a second district in order to have enough participants for my sample. I did so and found three additional humanities teachers willing to participate in the study. But I also met Wanda¹, who while she taught one section of writing, was first and foremost a science teacher. After conducting the initial interview with her, I decided that I wanted to include her in the study, but as a

¹ All proper names are pseudonyms, used to protect the identities of the participants.
science teacher. That led to the expansion of my sample to include science and math
teachers in grades five, six, and seven. Because I was using small school districts, I had to
add a third school district to form a sample that was large and diverse enough to fully
explore the study’s phenomenological focus.

I drew my sample from teachers who worked in three rural school districts, all
located in the same Southeastern state. The state has published statewide curriculum
standards and administers standardized tests in all four content areas represented in the
sample. These districts—Elm School District, Oak School District, and Maple School
District—are similar in size and demographics. Teachers in these districts have similar
types of access to digital resources and training. The choice of middle school teachers
was deliberate, since most of the past teacher planning research has focused on
elementary school teachers (McCutcheon & Milner, 2002).

Stake (1995) recommends choosing those cases that will maximize opportunities
for learning about individual experiences of the focus phenomenon. Patton (2002) calls
these “information rich” cases and recommends using a purposive sample that will lead
to “in-depth understanding” (p. 46). I used maximum variation sampling in order to
communicate a wide variety of experiences via my study’s results (Patton). Several
different parameters were used to identify potential sample participants.

Since the study focuses on educational technology, I reviewed potential
participants’ technology experiences, including any special certificates they might have
or their participation in technology professional development. I was looking in particular
for teachers who fall in the middle of the continuum in terms of how long they have used
technology in their classrooms; that is, not the earliest users, but also not those who do not use technology at all.

There are five categories of adopters, based on time to adoption, in Rogers’ (2003) innovation adoption curve. The first two—innovators and early adopters—are the earliest to adopt innovations. Early majority adopters and late majority adopters are more deliberate about innovation adoption decisions, and, in the case of the late majority, even skeptical about the innovation. The laggards are the last group to adopt; Rogers describes them as “traditional,” with a focus on how things were done in the past. Much of the research related to teachers’ use of technology has focused on more advanced users (Zhao & Cziko, 2001). The purposive sample for this study focused as much as possible on early or late majority adopters as identified by Rogers’ adopter categories, trying to avoid both the innovators and the laggards. As digital technologies have become more widely available in schools, it serves to reason that there are teachers who fall into the later adopter categories, perhaps only adopting technology within the past three to five years. Hearing the voices of these users provided a more logically generalizable view of how technology is used in the classroom, since early and late majority adopters make up roughly two-thirds of the population, according to Rogers.

In addition, I chose participants who had differing numbers of years of professional teaching experience in middle school English/language arts, social studies, math and science. In looking for variety, I was not hoping to optimize generalizations. Instead, I was looking for particularization (Stake, 1995, p. 8); that is, the details of particular teachers—something this sample allowed me to find.
In order to find participants who fell within these parameters, I used snowball sampling, a process that entails asking key members of the organization to identify potential participants (Patton, 2002). These school district contacts, all of whom I knew professionally previous to doing this research study, helped direct me to potential participants. In addition, one of my participants indicated that she planned in collaboration with a technology coach, whom I was able to include in the study. The table on the following page provides an overview of the characteristics of the teachers in the sample. More detailed information about each teacher will be provided in the results section.
Table I

*Study Participants*

<table>
<thead>
<tr>
<th>Teacher</th>
<th>School</th>
<th>Subject</th>
<th>Grade</th>
<th>Number of Years Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amy</td>
<td>Elm Middle School</td>
<td>Social Studies: American History</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Beverly</td>
<td>Oak Middle School</td>
<td>Math</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre-Algebra</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonnie</td>
<td>Maple Middle School</td>
<td>Social Studies: Civics and Economics</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Carol</td>
<td>Maple Middle School</td>
<td>Language Arts</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Deirdre</td>
<td>Maple Middle School</td>
<td>Math</td>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td>Kelly</td>
<td>Elm Middle School</td>
<td>Language Arts</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Marion</td>
<td>Oak Elementary School</td>
<td>Science</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Mark</td>
<td>Maple Middle School</td>
<td>Social Studies: American History</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Michelle</td>
<td>Elm Middle School</td>
<td>Reading</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Samantha</td>
<td>Oak Middle School</td>
<td>Science</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Susan</td>
<td>Maple Middle School</td>
<td>Science</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Wanda</td>
<td>Elm Elementary School</td>
<td>Science</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
As I reflect on my sample, I believe it meets the criteria I established. As indicated, I added to the sample over the course of the study. During that time I was collecting and generating data with individuals.

Data Collection and Generation

Charmaz (2006) recommends allowing research problems to determine data collection methods. Whichever methods are used, the ultimate goal is to gather rich data, which Charmaz says, “are detailed, focused, and full. They reveal participants’ views, feelings, intentions, and actions as well as the contexts and structure of their lives” (p. 14). In this phenomenological study, my primary interest was in how the teachers experienced the phenomenon of planning for the use of technology in their classrooms. Patton (2002) suggests that, in order to really understand participants’ experiences, the researcher must experience them as directly as possible through the use of in-depth interviewing and participant observation. The ultimate goal of qualitative research is “to remain as open as possible to whatever we see and sense in the early stages of the research” (Charmaz, p. 17). We must be careful not to force preconceived theories or models on the data we generate and collect. Interpretivist researchers seek rich data. I used a combination of different data generation and data collection methods, including interviews, observations, and document analysis, in order to yield such rich data.

In particular, I adopted the data collection and generation process used by Wilson, et al. (1987) in their study of teacher knowledge. They began by constructing intellectual histories of their participants. Then they worked through a “planning-observation-reflection” cycle, which they describe below:
We talked with the teachers as they prepared to teach a particular piece of subject matter, focusing on what they know about the content and what they wanted their students to learn about the content. We then observed the lessons as they were taught. Finally, after the observations were completed, we talked with our informants about their teaching in an effort to detect changes in their knowledge of the subject matter, of pedagogy, and of the perceived sources of those change (p. 111).

Wilson, et al. grounded this cycle not in any particular teaching model, but rather in notions of teacher knowledge; a focus that they believed yielded richer data related to actual planning practices. It seems appropriate to adopt this process since my own research is grounded in the Technological Pedagogical Content Knowledge framework (TPACK), which draws from Shulman’s work on teacher knowledge. While I used their process, however, I redirected the focus of the research process onto how teachers incorporate considerations of technology as they prepare to teach particular subject matter.

*Interviews.* In an interpretivist study concerned with revealing multiple realities, interviews are an important data-generating tool (Stake, 1995). In particular, interviews in a phenomenological study are used to elicit detailed information about the participants’ experiences of the phenomenon in order to reach a deeper understanding of that phenomenon (Van Manen, 1990). I conducted multiple interviews with the study participants as they planned for and implemented digital technologies as part of their classroom instruction. I used a semi-structured interview guide. Lofland and Lofland (1984, 1995) describe an interview as a directed conversation. This intensive interview
approach allows “an in-depth exploration of a particular topic or experience” (Charmaz, 2006, p. 25). While Stake recommends using a short list of issue-oriented questions, I adopted Charmaz’s more open-ended approach, coming to each interview with a few broad questions designed to “encourage unanticipated statements and stories to emerge” (Charmaz, p. 26). During the course of each interview, I allowed the participant to have the dominant voice, using my comments and questions to facilitate the participant’s articulation of his or her experience, and to clarify and expand upon details.

The table below lists each interview that took place with each study participant, along with several broad, open-ended questions that guided these data-generating sessions.
Table 2

Interview Events and Questions

<table>
<thead>
<tr>
<th>Initial Interview:</th>
<th>Second Interview:</th>
<th>Third Interview:</th>
<th>Fourth Interview:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Biography</td>
<td>Conducted as teachers engage in the planning process</td>
<td>Conducted immediately following the time of the implementation in the teacher’s classroom</td>
<td>Conducted at the end of the study</td>
</tr>
<tr>
<td>Tell me about your experiences with educational technology.</td>
<td>Describe your planning process.</td>
<td>What’s working?</td>
<td>What kinds of realizations, if any, did you generate from your participation in the study?</td>
</tr>
<tr>
<td>How, if at all, do you use technology in your classroom?</td>
<td>What, if any, are the requirements for planning in your school/district?</td>
<td>What’s not working, if anything?</td>
<td>How, if at all, have you and/or your planning practices changed over the course of the study?</td>
</tr>
<tr>
<td>How, if at all, do you think your students use technology either in or out of school?</td>
<td>Tell me about your plan.</td>
<td>What, if anything, did you notice about your students as they worked on the learning activities that you planned for them?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How does your plan use technology?</td>
<td>What changes, if any, are you considering?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What kind of instructional strategy does your plan use?</td>
<td>Tell me about your thoughts and feelings now that you have implemented the plan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>On what content does your plan focus?</td>
<td>Describe the next steps you anticipate taking in implementing the plan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tell me about your expectations, thoughts, and feelings as you consider implementing the plan.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As mentioned earlier, one of the participants—Deirdre—indicated that she planned her lesson collaboratively with Regina, the school district’s technology coach. I interviewed Regina, asking her specifically about that collaboration.

I audiotaped the interviews and created verbatim transcripts. Samples can be found in Appendix 2. My concern with presenting teacher voice demanded that their words should comprise the raw data from which tentative themes emerge after data
analysis, rather than my own reconstruction of their comments. The goal was, as much as possible, to uncover participants' constructions relative to the focus of the study, and one way to do this was by using their words as the basis for any analysis that takes place. I gave participants the opportunity to verify or correct my reconstructions of these interviews. This process, known as member checking, allows participants to make corrections to both factual and interpretive information (Guba & Lincoln, 1989). Member checking will be described further in the data analysis section to come.

While interviewing was the primary data generation method used, additional data were generated through observations that were conducted throughout the course of the study.

Observations. Observations allowed me to generate data related to the teachers and the classrooms that might not be accessible through interviews. Through the use of close observation, I was able to enter what Van Manen (1990) calls the "lifeworlds" of the participants—in this case, their classrooms. Stake (1995) recommends keeping a detailed record of events in order to create an "incontestable description" to be used for analysis and eventual reporting. Charmaz (2006) suggests that researchers, particularly novices, might want to adopt several questions that will help them focus their observations. The questions I adopted are detailed below as part of each observation description. However, I was also open to the unexpected, as I looked for what Stake calls "good moments to reveal the unique complexity of the case" (p. 63).

Stake (1995) recommends doing repeated observations in order to get a representative view of the case being explored. I conducted two different observations throughout the course of the study. Samples of observation notes can be found in
Appendix 3. The first observation took place at the beginning of the study at about the same time I was conducting the first interview. I conducted the observation in the participants’ classrooms in order to see how they approach instruction. These observations generally took the entire period. My general questions for these observations concerned process: "What is going on? What specific acts comprise this activity?"

The second observation took place during the implementation of the technology-based lesson that had been the focus of the second interview. My general question, derived from the study’s focus, was, “What technologies does the teacher use in the classroom and how are they related to pedagogy and content?” I was particularly interested in the teachers’ instructional strategies and their demonstrated use of digital and nondigital technologies to teach curriculum-based content. During the implementation observation, I also referred to the instructional plans that each participant developed. More details about these plans as a data source can be found in the Document Analysis section below.

In addition to using focusing questions to guide observation, I also recorded detailed descriptions of the classrooms or computer labs in which the events took place. Stake (1995) writes, "The physical space is fundamental to meanings for most researchers and most readers" (p. 63). Since teachers’ technology use is often impacted by its physical location in the school, I paid attention to the availability of technology within the school environments observed. Detailed observations allow the researcher to provide what Stake calls "vicarious experiences" to the reader. The researcher, however, may not be able to observe everything. Documents, according to Stake, "serve as substitutes for
records of activity that the researcher could not observe directly" (p. 68). I will include extant texts as part of this study.

**Documents.** Charmaz (2006) identifies two types of texts: elicited and extant texts. Elicited texts are those created by the participants for use in a research study. Extant texts, on the other hand, are those in which the researcher was not involved in construction, and which exist independently of the study. I used extant texts—in particular, any documents that teachers create as part of the planning process—as part of my research. Charmaz suggests that these documents, when compared with observation notes, can support a researchers' understanding. She writes, “Comparisons between field notes and written documents can spark insights about their relative congruence—or lack of it—between words and deeds” (p. 38).

These texts, which varied quite a bit in their format, were used in two ways. First, I used them as the basis for one interview session with each participant when I asked them to reflect on the planning process for the particular lesson that I was going to observe. Second, I referred to them as part of the observation of the lesson implementation and, following that implementation, asked the participants to once again reflect on the plan and how they might have modified it during the classroom instruction in order to document the thinking behind any “spur-of-the-moment” changes that they felt were necessary. Examples of these documents can be found in Appendix 4.

The interviews, observation notes, and extant texts comprised the data that I analyzed, the results of which are presented in Chapter Four.
Data Analysis

In qualitative research, data analysis begins almost immediately (Stake, 1995). In fact, Corbin and Strauss (2008) recommend beginning analysis immediately following the first data collection since it will build a foundation for subsequent data collection and the analysis to follow. I used a grounded theory data analysis strategy to analyze the data collected and generated in the study. Schwandt (2001) points out that "grounded theory" can be used in a general way to refer to any theory building that arises from data. It describes an inductive approach to research (Patton, 2002, p. 127) in which theories emerge from inductive analysis of data, so that the study’s results are "grounded" in the data and hence, the empirical world from which those data were collected. Grounded theory methodology also refers to specific techniques for building that data. It is the latter—what Schwandt calls "a specific, highly developed, rigorous set of procedures for producing formal, substantive theory of social phenomena" (p. 110)—that I used to build theories related to how teachers plan for technology use. I used a software program that assists with the organization and labeling of data segments to facilitate the data analysis process.

Grounded theory analysis rests on the practice of coding, "a procedure that disaggregates the data, breaks it down into manageable segments, and identifies and names those segments" (Schwandt, 2001, p. 26). Strauss and Corbin (1998, 2008) inspired my coding methods. Their grounded theory method includes three levels of coding—open, axial, and selective. Each level of coding moves further away from the original data to a higher level of abstraction in analysis. During open coding, labels are applied to segments of data. Axial coding begins the process of pulling together the
concepts generated during the open coding phase, finding relationships between and among the categories and subcategories (Charmaz, 2006). These relationships lead to the development of theories, which occurs during the selective coding phase. I used different levels of coding depending on the type of data being analyzed.

I applied each of these three levels of coding to the interview transcripts to ensure that my participants’ voices are represented in the final themes that emerged from data analysis. My unit of analysis for the interview transcripts was the line. Charmaz (2000) suggests that using line-by-line coding makes it more difficult for researchers to impose their own external impressions on the data being examined than using other types of units (e.g., discrete idea) because it forces them to look more closely at the raw data (p. 515). I created these labels or codes from either my own or my participants’ words. Codes that arise from the participants’ words are referred to as “in vivo codes” (Glaser & Strauss, 1967) and, in a study concerned with the voices of participants, using such codes seems particularly appropriate. Samples of interviews coded with open codes can be found in Appendix 5.

As I began the coding process immediately following the first interviews, I also began keeping memos in which I documented the analytic process. Corbin and Strauss (2008) provide a detailed description of the use of memos in a research study:

I am making notations in memos that reflect the mental dialogue occurring between the data and me. In the memos I am asking questions, making comparisons, throwing out ideas, and brainstorming. Though this system of dialoging with the data may seem tedious, and at times rambling, it is important to the analysis because it stimulates the thinking process and directs the inquiry by
suggesting further areas for data collection. Most of all, it helps the analyst to get inside the data, to start to feel them at a gut level (pp. 169-170).

Data analysis is a process that, while it is guided by the researcher's knowledge of existing protocols that help prevent misinterpretations, also includes "much art and much intuitive processing to the search for meaning" (Stake, 1995, p. 72). Memos are the place where this process finds its voice. On a practical level, memos are the place where the real work of meaning-making in grounded theory occurs: that of making comparisons (Corbin & Strauss). Samples of these memos can be found in Appendix 6.

Making comparisons is an essential part of grounded theory (Charmaz, 2006; Corbin & Strauss, 2008). The constant comparative method directs researchers to make ongoing comparisons among participants, among data units from the same participant, between data and the categories used to describe it, and among categories (Charmaz, 2000; Charmaz; Corbin & Strauss). I used the constant comparative method throughout data analysis to compare data, codes, and categories.

During the open-coding stage, I made these comparisons primarily among data and codes, as I worked through the process of assigning codes to each segment of data. As I encountered each line of data, I either assigned an already-established code or created a new one that better reflected the content of the data segment.

During the axial coding stage, I made these comparisons primarily among codes and categories as I begin the process of linking common concepts into more abstract categories. According to Strauss and Corbin (1998), after the data are broken apart in open coding, axial coding begins the process of putting them back together. At this level of coding, categories are related to their subcategories in order to “form more precise and
complete explanations about phenomena” (p. 124). I began to develop the categories in terms of their properties or characteristics as well as their dimensions or variations within properties (Corbin & Strauss, 2008). Strauss and Corbin also suggest the use of subcategories, which provide additional information about a category. I used the software to create code maps that showed the links between open codes and the more abstract categories to which they were related. Samples of these code maps can be found in Appendix 7.

As mentioned earlier, these axial codes were used to analyze interviews. In addition, they were applied to the data collected from observations and documents. I did not apply open coding to these data because they are not connected directly to my participants’ words. The observation notes are written in my own words. While the teachers did create the documents I analyzed, these lessons were usually in a short-hand bulleted format that did not provide any type of written narrative. Instead, I began the coding of observations and documents at the axial level, using categories and subcategories that emerged during the open coding process of the interview transcripts, adding to these as observation and document data suggested, an approach recommended by Corbin and Strauss (2008). Samples of coded observations can be found in Appendix 8 and samples of coded documents can be found in Appendix 9.

As connections were made and relationships were explored during axial coding, I moved into the selective coding phase. During this phase, core concepts emerged. These concepts represent the main themes of the study that organize the presentation of data in the study’s results (Corbin & Strauss, 2008). According to Corbin and Strauss, this final step of integration is the most difficult. They write:
It requires sifting and sorting through all the memos and looking for cues on how all the categories might fit together. Rereading memos, creating the story line, doing diagrams, and just plain thinking are all techniques that analysts can use to help them arrive at final integration. Just remember that doing qualitative analysis is an art as well as a science and that there is nowhere in the analysis where this becomes as apparent as in the final integration (p. 274).

One concern that can emerge during the integration phase is how well the story line matches the data. As I worked through this phase, I became aware that, as they discussed their planning process and their use of technology to support teaching and learning, the teachers were more generally providing evidence of their knowledge. The data provided the cues that led me back to the conceptual framework that guided me in the development of this study, and the categories that had developed during the axial coding phase fit into place within the different TPACK knowledge types. I returned to the data and recoded the interviews using these selective codes, which allowed me to see how the open codes related to the main themes that had emerged. Samples of the recoded data can be found in Appendix 10. As I worked through the three levels of coding, I assembled a codebook that defines the abstract codes and shows their relationships to the open codes. The complete codebook that shows the relationships among the selective, axial, and open codes can be found in Appendix 11. It is in this most artful of stages that my methods were most emergent, and I relied on the careful comparative work done at earlier stages to provide guidance during this phase.

This artfulness is also what makes it difficult to define quality in qualitative research (Corbin & Strauss, 2008). Corbin and Strauss write, “Quality in qualitative
research is something that we recognize when we see it; however, explaining what it is or how to achieve it is much more difficult" (p. 297). The relativist ontology that forms the cornerstone of the interpretivist paradigm makes it difficult to apply traditional positivist criteria such as internal and external validity to determine the quality and creditability of interpretive research results. Alternative notions, including trustworthiness and authenticity, can be used (Patton, 2002).

**Trustworthiness and Authenticity**

Trustworthiness and authenticity are two sets of criteria used to evaluate qualitative research (Manning, 1997). Trustworthiness is concerned with "that quality of an investigation (and its findings) that made it noteworthy to audiences" (Schwandt, 2001, p. 258). These criteria are meant to parallel postpositivist notions of reliability and validity, but because they are used within a nonpositivist paradigm, are quite different. Authenticity, on the other hand, has no parallel in the postpositivist paradigm, focusing instead on the ethical actions in which researchers must engage relative to study participants (Manning). Both sets of criteria were addressed throughout the course of this research study in a variety of ways.

**Trustworthiness**

The quality of qualitative research is judged by four criteria of trustworthiness: dependability, transferability, credibility, and confirmability (Guba & Lincoln, 2001 Assessment criteria section). Each criterion relates to a more traditional quantitative criterion.

Transferability is concerned with "case-to-case transfer" (Schwandt, 2001, p. 258) and parallels the positivist criterion of external validity. While I am concerned with
presenting the individual cases, I am also concerned with developing generalizations; my study results present shared themes arising from data analysis. One way to facilitate such generalization is by providing detailed narrative description in the final report, demonstrating the understanding that this report is the vehicle for communicating the study's findings. I have attempted to provide just such detail in the results, which are presented in Chapter Four. Of course, the subjectivist epistemology reminds us that transferability is really in the eye (and mind) of the reader, and Stake (1995) suggests that the job of the researcher is "providing readers with good raw material for their own generalizing" (p. 102).

Credibility and confirmability were addressed directly throughout the research process. Credibility, which parallels internal validity (Schwandt, 2001), focuses upon how well the findings represent the participants' perceptions (Guba & Lincoln, 2001, Assessment criteria section, 1a). Confirmability, which parallels objectivity (Schwandt), is concerned with how well the data and their interpretations can be traced primarily to the focus of the inquiry, rather than the researchers' beliefs and expectations (Guba & Lincoln, 2001, Assessment criteria section, 1d). In other words, to what extent can the findings be traced back to the data? I used four methods—researcher as instrument, reflexive journaling, member checking, and triangulation—to demonstrate both the credibility and confirmability of this study's results.

Revealing my experiences with, ideas about, and relationships to the inquiry focus through the use of a Researcher as Instrument Statement enhanced both the credibility and confirmability of this report because it helped distinguish my own ideas and concerns from those of my participants. While I have made every effort to communicate
participants' voices without bias, my own ideas and concerns cannot be completely
divorced from the inquiry. Corbin and Strauss (2008) write:

Though some analysts claim to be able to “bracket” their beliefs and perspectives
when analyzing data, we have found this impossible. Bias and assumptions are
often so ingrained and cultural in nature that analysts often are unaware of their
influence during analysis. We find it more helpful to acknowledge our biases and
experiences and consciously use experience to enhance the analytic process (p.
85).

As mentioned, this statement can be found in Appendix 1.

Corbin and Strauss (2008) recommend the use of a personal journal. In fact, I
began making entries in a journal during the conceptualization and writing of the study
proposal document, and I continued to keep that reflexive journal in which I reflected on
the research process, wrote memos, began to identify emerging themes, and generally
recorded events and ideas associated with the research project. By keeping track of my
own perceptions, beliefs, and values, I was better able to understand and communicate
the constructions of my participants. Samples of the reflexive journal entries can be found
in Appendix 12. The use of the reflexive journal contributed to both the confirmability
and credibility of the study’s results. The participants themselves also contributed to the
confirmability and credibility of the study’s findings by working with me in the process
of member checking.

Member checking, also known as member or respondent validation, is the process
of confirming the accuracy of relevant materials with the study participants. Participants
are given the opportunity to verify or correct the researchers’ constructions. Thus they are
able to make corrections to either factual or interpretive errors (Guba & Lincoln, 1989). According to Guba and Lincoln (2001), member checks are the most important way to further credibility in an interpretivist inquiry (Assessment criteria section, 1a). This use of member checking furthers the credibility of the report because it helps confirm that what is reported is indeed an accurate reconstruction of the participants' constructions (Guba & Lincoln, 1989).

Member checking was done in three ways. During the interview, participants were asked to confirm or correct my understandings of what they said or clarify information offered. Samples of this type of member checking can be found in Appendix 13. I also provided each of the participants with a printed summary of each interview and asked them to make any changes or clarifications necessary. Samples of this type of member checking can be found in Appendix 14. Finally, prior to the publication of the study, participants reviewed and corrected as necessary the information they provided that is included in the report of the study's results. Samples of this type of member checking can be found in Appendix 15.

Careful member checking also aids in establishing the confirmability of the results of an interpretivist inquiry, as member checks are part of a larger study audit trail which includes all of the data generated and records of data analysis performed. This trail aids researchers as well as external auditors in tracing assertions and constructions to study participants rather than researchers' beliefs or expectations (Guba & Lincoln, 2001 Assessment criteria section, 1d). The audit trail can also be used to contribute to the dependability of the study's results.
Dependability parallels reliability and is concerned with the inquiry process. It requires the researcher to be responsible for "ensuring that the process was logical, traceable, and documented" (Schwandt, 2001, p. 258). Because it was used to record methodological decisions, the reflexive journal serves as the record of the study's process. Using the reflexive journal, I kept track of methodological choices and actions. In addition, I carefully organized all documents related to the study such as interview transcripts, observation notes, and code notes so that the audit trail could be used by an auditor to evaluate design decisions and adherence to professional standards (Whitmore & Ray, 1989). While I established the audit trail, I did not engage an external auditor for my study. Since the study is being completed as part of a doctoral program, a committee of professional researchers with experience in qualitative research has overseen my work. I believe this close scrutiny makes an external audit unnecessary. In addition, I utilized triangulation as a way of establishing the trustworthiness of my study's results.

Triangulation is the process used by researchers to look for across-data consistency (Patton, 2002, p. 556). Stake (1995) suggests that qualitative researchers use triangulation as a way to discover multiple interpretations, rather than as a way to confirm the existence of a single meaning. This study used methodological triangulation, which is the most frequently cited triangulation protocol. In this protocol, the focus is on using multiple methods for generating and collecting data related to the phenomenon of interest (Stake). Interview, observations, and document analysis took place throughout the course of the study. I also used multiple source triangulation, because I used interviews, observations, and documents from multiple participants (Yin, 2003).
Tools such as member checking and triangulation are more concerned with the "science" of qualitative research (Corbin & Strauss, 2008). They do not capture the more creative, artistic aspects of research. In addition, the relativist ontology and subjectivist epistemology, which provide the foundation for this study and espouse a constructed nature of knowledge, make it difficult to apply positivist criteria, which generally assume an objective reality. Unlike positivists who use tenets like external and internal validity to help judge how successfully the findings present a single reality, interpretivists are interested in how well the findings represent multiple realities. Thus, while trustworthiness criteria can help provide some sense of the trustworthiness of a qualitative study's results, additional criteria related to the authenticity of the study have been developed.

*Authenticity*

The four trustworthiness criteria are concerned with the methodological dimensions of quality in nonpositivistic research (Lincoln & Guba, 2000). The five authenticity criteria, on the other hand, are concerned with representing the human aspects of the processes and outcomes of nonpositivistic inquiries. They are used to address the ethical dimensions of quality when doing research with people. The five criteria include fairness, ontological authenticity, educative authenticity, catalytic authenticity, and tactical authenticity.

*Fairness.* I have made every effort to include "all stakeholder views, perspectives, claims, concerns, and voices" in this study, in order to meet the criterion of fairness as defined by Lincoln and Guba (2000, p. 180). I was careful to include all perspectives concerning the developed themes in order to prevent marginalization of disparate views.
The methods described above which contributed to the trustworthiness of the study’s results, including the researcher as instrument statement, reflexive journal, member checking, and triangulation, also contributed to the fairness of the study (Manning, 1997). Manning identifies several other approaches to ensuring fairness. These include informed consent, prolonged engagement, persistent observation, and peer debriefing.

Informed consent, which concerns itself with legal and ethical implications of research, focuses upon informing participants of all aspects of the study, especially those that require their participation, and protecting the confidentiality of the participants’ identities. In a larger sense, it concerns itself with the relationship of the researcher and participant before, during, and after the research study. Manning (1997) suggests that informed consent is really a "misnomer" (p. 101) since it is impossible for researchers to anticipate all the potential consequences of their research. She writes, "Despite the unforeseeable pitfalls, researchers have an obligation to discuss as many of the anticipated circumstances as possible" (p. 101). Prior to beginning this research project, each participant was provided with a consent form that described the expectations for participation. Samples of the consent forms can be found in Appendix 16. I discussed these issues with my participants throughout the study. In addition, because my study incorporated prolonged engagement and persistent observation (see below), the positive relationships that I developed with the teachers allowed me to gauge how they were feeling about their roles as research participants while I was generating data with them.

Prolonged engagement refers to the length of time during which the researcher is involved with the participants. It "can be assessed by judging whether the researcher has interacted closely with the participants for a sufficient period of time to build any
understanding of their perspectives, ways of life, and culture" (Manning, 1997, p. 102).

While this project did not last the suggested anthropological and ethnographic minimum of one year, data generation and analysis occurred on an intensive schedule for approximately ten months, allowing adequate time for me to engage with the teachers and their classrooms. In addition, since I practiced persistent observation, which involves the "in-depth pursuit of those elements found to be especially salient" (Lincoln & Guba, 1986, p. 77), I gathered and generated a broad scope and large amount of in-depth data from a variety of sources. I have attempted to provide a range of examples of these sources in the Appendices to this document. Throughout the study, I took the time to "expend the effort necessary to discover the important issues in the research context" (Manning, p. 103).

As a final method for ensuring fairness, I participated in ongoing peer debriefing, in which I discussed the study with colleagues who are knowledgeable about my research design and methods but not directly involved in the study (Manning, 1997). This dialogue took place with the members of my dissertation committee, particularly my advisor, who is extremely knowledgeable about the methods as well as the content of my study.

While the fairness criterion can be met using methods similar to those that help to establish and demonstrate trustworthiness, the other four authenticities are more concerned with the experiences of and benefits to the participants both during and after the course of the study. Through careful planning and thoughtful implementation, I hope that my research study's results have contributed to the personal and professional growth of my participants, and will encourage new practices among both teachers and teacher educators who read the results of my study. While I put the essential conditions into place
to support ontological, educative, catalytic, and tactical authenticity, I had no way of ensuring that participants experienced these authenticities.

Still, the study design described earlier in this chapter creates a high probability for ontologically and educatively authentic experiences for participants. These authenticities are concerned with participants' increased understanding of their own and others' practices.

**Ontological Authenticity.** Ontological authenticity emphasizes the growth of the participants (Manning, 1997) as a byproduct of their roles in the research. One way to demonstrate this criterion is by viewing interviews not as one-way communications, but rather as "dialogical conversations" (p. 105) in which participants can feel safe in expressing their responses. However, as with informed consent, it is the relationship of the researcher and participant, rather than the specific methods used, that is important. Manning asserts that qualitative research cannot be conducted without care and trust between researcher and participant. This care and trust is built through informed consent, prolonged engagement and persistent observation. I was willing to negotiate the terms of research through informed consent, and was committed to remaining open and curious throughout the research process, so that I avoided arriving at conclusions too early (Manning). In some cases, participants did make statements about their ontological growth (Manning). These assertions are included as part of the final report of the study's results, and as evidence of meeting this criterion.

**Educative Authenticity.** While ontological authenticity and educative authenticity are related to each other, they differ in the focus of the participants' awareness. In ontological authenticity, participants learn more about themselves. In educative
authenticity, they learn more about others (Manning, 1997). As with ontological authenticity, I looked for participant statements that indicate growth and awareness. However, since the participants worked with me as individuals, an increased awareness of others may not have resulted from the research process. I will be providing participants with copies of the results of the study, however, which may help them to understand others’ perspectives upon planning for technology integration. Ontological and educative authenticity then, are concerned with what participants have learned about themselves and others as a result of being in the study. Catalytic and tactical authenticity, on the other hand, are more concerned with the effects of the research on participants’ study-related decisions and actions.

*Catalytic Authenticity.* Catalytic authenticity, according to Schwandt (2001), “refers to the extent to which action is stimulated and facilitated by the inquiry process” (p. 11). Research results should be worthwhile to participants, stakeholders, practitioners, and researchers. In order to be useful to the larger community of scholars and practitioners, it is important that the study findings be made widely available so that those who may benefit have an opportunity to encounter them (Manning, 1997). I will make the report available to my participants as well as the school district administrators with whom I worked as I was planning my study. I will also report the results through both academic and popular conferences and scholarly and practitioner-based journals related to educational technology. By including popular, practitioner-based venues for dissemination, I will help ensure accessibility of the research to teachers and administrators. The focus on teacher planning practices related to the use of educational
technology should be useful to those who work with both pre-service and in-service teachers, as it provides insight into the mental processes in which teachers engage.

Accessibility is not enough to claim catalytic authenticity, however (Manning, 1997). Ultimately, the participants must determine the usefulness of the research for themselves. I will not be conducting any follow-up activities with my participants, so I will probably not observe whether or not the research findings are used to help them to make productive decisions about integrating educational technologies into their instructional planning. I cannot claim that my study will catalyze potentially beneficial decisions, but it is possible that it will.

*Tactical Authenticity.* Tactical authenticity addresses the questions of "whether the participants are empowered to act on the findings as a result of the research process" (Manning, 1997, pp. 110-111). Ensuring tactical authenticity means recognizing research respondents as co-participants in the research and "necessitates that the researcher fully understand that the respondents' meaning is not his or hers for the taking. Academic degrees and even human subjects' approval do not grant the researcher rights to assume data ownership" (Manning, p. 111).

Manning (1997) identifies the use of consent forms, interview conversations, member checking, and report accessibility as all contributing to tactical authenticity. I have put these conditions into place as a way of showing a fundamental respect for my participants and encouraging them to see themselves as "knowing subjects with the power to transform their world" (Manning, p. 111). But, as with catalytic authenticity, I cannot claim that my study will lead to beneficial action on the parts of the study's participants, as that is really a decision for them to make, independent of me.
Carefully planned methods form a solid foundation for a research study. These tools allow the research to unearth and create rich data and share the results of data analysis with participants and readers alike. Evaluation criteria provide a framework for both designing research and judging its findings and should be considered throughout the research process (Manning, 1997). Still, Manning reminds us, authenticity criteria “cannot be applied prescriptively, but rather only as they fit the research context” (p. 112). A complex research context requires a complex inquiry. According to Manning, while “it should be possible to trace the research conclusions to the field notes, data analysis, and inquiry product drafts of the research,” the path is “usually ambiguous” (p. 112), winding between the science and the art that is qualitative research. It is both an empirical and a creative endeavor that should balance “elegant and innovative thinking” with “reasonable claims, presentation of evidence, and the critical application of methods” (Whittemore, Chase, & Mandle, 2001, p. 527). In finding that balance, my primary concern is with providing insight into the thoughts and practices of my teacher participants.
Chapter Four

Introducing the Teachers

The twelve teachers who participated in my study represent a wide range of background and teaching experiences. All were able to identify at least one or two ways that they used technology as part of their lessons, and each planned and implemented a particular lesson using technology as part of their participation in the study. Since part of this study is to give voice to teachers, I have chosen a verbatim quote to begin each description that I felt best represented each participant’s general feelings about their planning process and the use of technology in the classroom.

*Elm Elementary School: Wanda*

There are very definite things the state...says I must teach but that does not mean that I am confined. I am not stuck in this little box that says I must write a research paper on this date. There's a lot of freedom there that I can easily switch over to the movies. I think it's important that I stay excited in order for the kids to be excited. And switching to the movie did that. It's important to be able to allow yourself that freedom.

Wanda has taught fifth grade science at Elm Elementary School for two years. She described using technology in a variety of ways as part of the teaching and learning process including showing digital video clips and multimedia presentations, using Web-
based activities, and taking digital still images and video. Like many of the teachers, Wanda uses an interactive whiteboard, a tool that, when coupled with a computer and digital projector, allows users to control the computer screen, which is projected on the board, using their finger or a pen on the board. As she begins planning a new unit, Wanda spends time searching the Internet for resources that support the content. In the past, Wanda’s students have done Web-based research and created multimedia presentations. Wanda said that her use of technology often happens in spontaneous ways, noting, “It’s not often that I necessarily plan it. It just happens. There’s a time when it fits naturally and it just happens.”

She described a recent experience where, because a planned activity took less time than she had anticipated, she found herself with an empty, unplanned day. She used a search engine to search the World Wide Web for activities and found a multimedia presentation of famous paintings that focused on identifying the types of clouds depicted by the artist. She shared the presentation with her students and then they created their own versions of the paintings.

In her classroom, she has access to an interactive whiteboard, an LCD projector, a laptop, a television, and four desktop computers. She does not use the desktop computers very often during class, other than occasionally looking up some information. They are available for students outside of class time to work on assignments. Her school has one computer lab and a cart of laptop computers available for sign out by any teacher in grades kindergarten through fifth grade.

Wanda’s observed lesson was part of a unit on oceans. In order to learn about ocean food chains, Wanda’s students chose an ocean animal and used a search engine on
the World Wide Web to research its place in the food chain. As they worked, they completed a handout that Wanda created.

Once they had identified their chain, Wanda’s students located images of each organism on the chain and, using software available on the computers in the lab, they created movies that depicted their chains. Wanda provided a cheat sheet for them that gave directions for creating the movie. In addition, Wanda had enlisted the aid of the computer lab teacher who had practiced the necessary skills with the students including how to log in, how to save to a specified location and how to use the movie-making software. Most students were able to finish their movies during the two days that Wanda had reserved in the computer lab.

Wanda had done this lesson the previous year, but instead of creating movies, the students had written reports about their ocean animal. She decided to change the final product to a video because she felt it was better aligned to the content she was teaching and that the students would benefit from using the technology. In addition, it fueled her own excitement. As she considered her options, Wanda commented, “It's still up in the air. I enjoy...stepping it up a notch. It makes it more fun for me and I think the kids get more excited. I like to keep it changing too. I think the end product is better if they are getting my excitement too.”

Elm Middle School: Michelle

I just know so many other teachers who are using computers more than me. I feel really old when I use them. I think of it as a certain aptitude that you have to have. And I obviously don't have that. It doesn't come natural to me. I feel like I'm going to break it or lose something or mess it up. I'm afraid if I touch this, press
this, it may be irreversible. Well it's just a mindset. My mind isn't programmed to use technology.

Michelle has been teaching sixth grade for nine years at Elm Middle School, primarily as a reading teacher. She currently teaches reading and one section of science. She described several ways she had used technology with her students, including showing content-related digital videos, playing online games for review, and having students create Venn diagrams using graphic organizer software, but she indicated that she did not do any of this very often. Michelle also described her own use of a search engine to locate materials to use in her classroom.

At the beginning of the study, Michelle had a laptop and four desktop computers in her classroom. Students used the desktop computers primarily for taking reading tests. Occasionally, they might use them to look up information. She had access to a digital projector that was shared with five other teachers. During the course of the study, she received a digital projector and an interactive whiteboard. Michelle has access to a computer lab and a cart of laptop computers that could be reserved by the sixth grade teachers. However, she was not sure about the status of the computers in the lab in terms of functionality. She said she would not consider using the laptop cart unless she were doing a multi-day unit as the preparation for setting it up and reconfiguring the classroom was simply not worth the time.

For her lesson, Michelle used her recently installed projector and interactive whiteboard to play a Jeopardy-type game with students as a review for a prefix quiz that would be held the following day. She found the game by searching the World Wide Web for activities. Following a homework review at the beginning of the period, students were
formed into teams and then a team member came up to the board to select each question. The game took most of the rest of the period. With just a few minutes left, Michelle accessed another game on prefixes.

In the past, Michelle used flash cards to review for the quiz. This year, her students created the flash cards. But Michelle decided to use technology with the lesson because she was able to locate Web-based resources that aligned with her content and could take advantage of the whiteboard activity to get students more engaged in the review. She commented, “It’s something they can manipulate and they have fun doing it.”

*Elm Middle School: Amy*

[The state curriculum guidelines] are my bible. This is the required knowledge. The required knowledge is basically my notes. In some cases, I put it into a chart form or that kind of thing. That information is in different representations. This is what I look at when I plan a lesson. What do they need to know on this particular topic? When I'm planning a unit, this is my notebook.

Amy has been teaching elementary and middle school for nine years. She currently teaches sixth grade social studies and science. She tries to use technology as much as she can and described a recent use of primary sources from the World Wide Web to support her social studies instruction. She has also used the computer lab for review games. The previous year, her students were permitted to use multimedia software to create visual representations for a project related to Native Americans. She also allows students to use Web sites to locate articles for their weekly current events assignment.
In her classroom, Amy has access to a laptop and two desktop computers, which are used primarily for students to take reading tests. Like her colleague Michelle, Amy can reserve a computer lab or cart of laptop computers. She does not have a projector or interactive whiteboard in her room but could sign out a projector. An interactive whiteboard is available in the computer lab that she could reserve and use with her laptop computer.

For her lesson, Amy signed out the computer lab and took each class in to play a game with her students to review for a test on the American colonies that following day. The game—a variation on the television game called *Who Wants to Be A Millionaire*—was available through an online subscription service paid for by the school district. Activities on the Web site are aligned with the state curriculum standards. Since Amy’s students were already assigned to cooperative teams in the classroom, they remained in those teams to play the game. A team member came up to select each question. The game took the entire period. Amy indicated that she often used games for review, creating them herself by drawing the game board on the whiteboard and writing her own questions. Amy commented on her use of games, saying, “It's so that kids see it in a fun way. It gives them a fun way to review the information.”

*Elm Middle School: Kelly*

But in a way that [staying late to create interactive whiteboard activities] just makes me feel more prepared I think. Lots of times my examples were generated from the kids but now I generate some of my own and I get that all typed up. So I just feel that much more secure when I'm delivering my instruction... And I feel like maybe because I am there later, typing in all these things, getting in my own
examples, leaving room for their examples, and after having done all that, I feel like maybe I'm delivering the instruction better. Maybe the kids will have less questions. Because I am just like super prepared and so in a way it hasn't been the most positive thing getting home and doing bath and bed right away but as far as instructing and delivering that instruction, I definitely feel like it has forced me to have myself together...So it definitely forces you to bring your A game on a daily basis.

Kelly has taught middle school language arts and social studies for 12 years. She currently teaches seventh grade writing and one section of seventh grade social studies. While she feels that her own skills sometimes limit her use of technology in the classroom, she also thinks that she is getting better, although she has not yet found ways to integrate some of the tools she has learned about such as software to create digital videos. Her primary use of technology is to create multimedia presentations to use with her students including one to accompany her unit on quotation marks that presented a variety of famous quotes. She also described a lesson she had done in collaboration with the previous math teacher in which her students created restaurant menus in support of a unit on percentages.

Kelly has access to a computer lab located in the seventh grade wing of the building. Over the course of the study, a projector and interactive whiteboard were placed in her room. She also has access to a cart of laptop computers.

For her lesson, Kelly used her recently installed interactive whiteboard as part of a grammar review of sentences, sentence fragments, and run on sentences. The review occurred at the end of the class period. The class began with students taking a quiz and
then writing the sentences in their notes before reviewing together. Individual students came up to the whiteboard to record their answers. Kelly indicated that in the past she did have students come up to the board, but often they just did the review from their seats. Kelly’s use of the interactive whiteboard was driven in part by its location. It had been mounted over the part of her regular whiteboard that she used for writing. The rest of the whiteboard space was taken up with information such as the daily objectives and homework assignments. But, Kelly had specially requested the interactive whiteboard because its interactivity was engaging to the students. She said, “I’m looking forward to getting the kids interactive with it. And I think they’ll enjoy it because it gives them some movement.”

*Oak Elementary School: Marion*

I think that sometimes we’re limited by just miscellaneous things. Like for example, the cow [laptop cart]. Not trying to obsess over the cow. I mean the modem, the router is broken and so we can’t use the cow because the computers cannot communicate with the network. When little miscellaneous things happen and just sort of fails, it kind of puts a road block on your process and what you are trying to accomplish with your class. But again like I said, the teaching profession is a profession of adapting. So you learn, you adapt, and you make it happen. So like I said I decided we are going to have those lessons. I just need to rearrange and figure out my Plan B if the cow's not available. What am I going to do? But I'm going to make it happen.

Marion has taught fourth and fifth grade at Oak Elementary School since 2001. She currently teaches fifth grade science. Her primary use of technology is to take her
students to the computer lab to do Web-based research, complete interactive activities, or create multimedia projects related to the content. Some of the activities are part of an online subscription service provided by her school district. Marion creates her own multimedia presentations, which, along with digital video clips, she shows as part of classroom instruction. She is working on a Web site where she will consolidate Web-based resources and activities.

In her classroom, Marion has a laptop, projector, and interactive whiteboard. She also has six desktop computers available for student use. Her school has one computer lab and a cart of laptop computers available for sign-out by any teacher in grades kindergarten through fifth grade.

Marion’s lesson focused on the geological, physical, and biological characteristics of the ocean. Using a handout to guide them, students accessed several Web sites to answer questions about the oceans. When they finished, they were able to visit some other interactive Web sites related to the ocean. The computer activity was one of three stations that students visited over the course of the three-day lesson. In addition to the computer activity, students completed an experiment and created a graph at one station and used a handout to guide their reading of textbook content at another one. All three activities focused on the characteristics of oceans. Most students were able to complete the computer activity in the allotted time.

Marion has done a version of this lesson for the past four or five years. However, in previous years, she had used the computer lab. Over the course of two days in the lab, students would complete the research and use a spreadsheet program to create a graph. Marion would use the interactive whiteboard and the projector in the lab to guide students.
in the research process. This year, however, she was unable to reserve the computer lab due to schedule changes and the laptop cart was not working, so she restructured the lesson to take advantage of the desktop computers in her room, adopting the stations approach. Marion was disappointed that she could not include the spreadsheet program this year because she felt it was important for students to have the experience of working with data in that way. However, she chose to include the Web-based research because the information was current. Deciding between doing the chart or the research wasn't hard, according to Marion, because she said, “We don’t have that many up-to-date paper resources...It was much easier to make sure I had up-to-date information by using reliable Web sites.” In addition, she felt it was important for her students to learn to locate information on the World Wide Web, noting that many of them did not have access to the computer outside of the school.

**Oak Middle School: Samantha**

Being part of your study? It gets you thinking about when did you learn the technology and when did you start using it? Because some of your questions, I told you, you just take for granted. It's there. You use it. I didn't have a SMART Board until this year and now it's nothing to go put up a lesson on the SMART Board and my PowerPoints work with the SMART Board perfectly without it being a SMART Board lesson in their format. So it's kind of nice just to have it there. You can make it interactive or not. You can do whatever you choose. So you just kind of do get used to it. But this made me go back and rethink it through again.
Samantha has been teaching sixth grade science for six years. She described several different uses for technology including having her students use software to create both graphs of scientific data and content-related multimedia presentations. She creates her own multimedia presentations as well that she displays along with digital videos and images on her interactive whiteboard. Students often come up to the board to interact with content.

The interactive whiteboard is located in her classroom along with a projector and laptop. She also has four desktop computers for student use. They might use them to research or to complete assignments. Samantha has access to a computer lab as well as a cart of laptop computers.

Samantha used the computer lab for her lesson. As part of a unit on water pollution, her students completed an online activity in which they used a scientific identification tool called a dichotomous key to identify organisms found in stream water. Using this data, students could determine the health of the stream under investigation. The day before they went to the lab, Samantha completed one stream identification activity with the students as an introduction. Then students worked independently in the lab although Samantha allowed them to help each other if necessary. Students accessed the link to the Web site from Samantha’s science bookmarks that she maintains as part of a school Web page.

Samantha had done the lesson several times in the past. One year, when she did not have Internet access, the students completed the activity using a printed key. Samantha indicated that she would not do it that way again as it was not as engaging as using the interactive key on the Internet. While student engagement is important,
Samantha said that she generally chooses activities and technologies that make sense to help her students understand and learn. She commented, "Technology is part of the world they will enter so if you're doing what you're supposed to do, you will use technology. It just makes sense."

Oak Middle School: Beverly

And it's [the interactive whiteboard] intimidating at first. It takes awhile to get used to it. But it's wonderful. The manipulatives that you can get. Incredible. I love doing probability on there because you can get dice that roll. Spinners that spin. The kids love it. Quarters that flip. So probability is fun to do instead of what I used to do. We would all have dice and we would all roll them and they'd be all over the class. Kids would be cheating, flipping the coin, they'd be cheating and there'd be quarters all over the class. This is more controllable; kids still have fun with it. They are still flipping coins and everybody takes their turn and all that. So I like it.

Beverly has taught middle school math for 20 years. She currently teaches seventh grade math and two sections of pre-algebra. She has had an interactive whiteboard in her classroom for nearly three years and uses it every day as part of her instruction. Her lessons have been created in advance using the software that comes with the whiteboard and her students interact with the board on a regular basis. She occasionally shows digital video clips or investigates a Web site with the students. Beverly uses a digital camera to document student work. In addition, she creates content-related bulletin boards using digital pictures of her students. Both groups of students use
five-function calculators, and the pre-algebra students will also use graphing calculators later in the year.

In her classroom, Beverly has a laptop, projector, and interactive whiteboard. She also has several desktop computers that neither she nor her students use. Her school has a computer lab that she can reserve. Beverly takes her students to the library every six weeks or so and once students have exchanged their books, she usually takes them into the computer lab where they do online test review and preparation or use Geometer’s Sketchpad, a software program that allows users to create and manipulate geometric figures.

For her lesson, Beverly used an online subscription service provided by her school district to review seventh grade math concepts with her pre-algebra students. These students will be required to take the state’s seventh grade math test despite being exposed to a pre-algebra curriculum. Beverly used the service to create a 25-question multiple-choice test to assess the seventh grade skills. She chose several general categories including fractions and decimals and scientific notation, and the program supplied questions from a database. At the completion of the test, Beverly and her students were able to access detailed reports on their performance. Beverly planned to use these reports to determine where she needed to focus some attention over the next few months before the test.

*Maple Middle School: Susan*

I mean volcanoes and earthquakes, you can do a volcano in a jar or the plastic bottle kind of thing but really the kids do get a lot out of, or at least it seems to me that they do, they get a lot out of seeing actual footage of a volcano erupting. It's
kind of hard to describe what the ocean floor looks like or what you're going to see on the ocean floor so for them to be able to see a video that has real photographs of the ocean floor or the submersibles actually going down to the bottom of the ocean and showing video of that. I mean there's certain things you really can't get across to students without them seeing, I mean you can't take them down. I mean those are field trips you can't take. So that's the next best thing for them to be able to see it. I find myself using more videos whether it's Bill Nye videos or United Streaming or whatever the case may be more than I probably thought I would. But there are really some good videos out there. So I don't know, it's kind of a toss up. Sometimes I feel guilty about having them watch videos.

Susan has taught elementary reading, language arts, and social studies since 2001. This is her first year teaching fifth grade science. She generally uses digital technologies to display information and resources to her students. She uses her laptop and a projector to show students digital video clips, multimedia presentations, and Web-based animations. She described locating a multimedia presentation on weathering and erosion that she planned to use and also a Web site she used to demonstrate the sizes of different planets. She uses the document camera, which is similar to an overhead projector, to display artifacts, write notes, complete worksheets, and guide student activities. Susan’s school owns a Jeopardy game that can be customized and displayed on the television. She uses that to review with students.

Susan has a laptop and a desktop computer in her classroom. She has been able to check out a projector and document camera from the librarian to keep in her classroom.
However, if someone else requested them, Susan would have to share them. Susan has access to two computer labs that she can reserve for student use.

For her lesson, Susan planned to use a video clip about fossils as part of a general review for a test the following day. After beginning with an activity in which the students brainstormed ideas related to fossils, she planned to show a video clip for which she had prepared questions to prompt student thinking as she showed particular sections of the clip. By using the video, Susan was able to share different kinds of fossils with her students. She said, “We are at the end of our rock unit so I thought it would be a good way for students to see some examples of fossils that obviously I can’t bring into class like dinosaur fossils and things like that.” Susan was unable to get the video to display on the projector. She tried rebooting the system but when the video would not display a second time, she moved on to the book. Because she viewed the video as enrichment rather than an essential part of her curriculum, she did not plan to try to fix the problem or choose another video.

*Maple Middle School: Deirdre*

So I think that was just my main thing was finally seeing them wanting to do something in math and can't wait to solve someone else's problem and email them back. I mean, I'm still at sort of a disadvantage because I've not seen enough of it to know where I want to take it from here. So like I told them, I've got a lot to learn, too, to know what I want to do with it. But I am excited about them communicating with each other on the computer and publishing things.

Deirdre has been teaching for 32 years. She spent the first 15 years teaching middle school special education. For the past 17 years, she has taught fifth grade science
and math. Approximately 8 years ago, the fifth grade joined the middle school and Deirdre began to teach only math.

She has downloaded multimedia presentations from the World Wide Web to share with her math students on rounding, adding and subtracting decimals, and the place value of whole numbers and decimals. She has used digital videos in the past, although access has become a problem during the current year. Her students will be taking the state standardized tests on the computer this year, so she has been creating benchmark tests using an online subscription service provided by the school district. She maintains a Web page with Web sites related to math and in the past, she has taken her students to the computer lab to access those sites, although she has not done that during the current year.

In her classroom, she has access to a laptop, a projector, and a document camera, which she uses almost every day. The projector is shared with other teachers who, so far, have not needed it. She says, "And they know that I would cry if they took it from me. I would sit down and beg. I have come to rely on it." The school, which houses grades five through seven, has two computer labs available for teachers to reserve. In addition, during the course of the study, each grade level received a cart of laptop computers that were also available for teachers to reserve.

Deirdre planned her lesson in collaboration with Regina, the school’s technology coach. Regina had begun working with the district at the beginning of the current school year and her role was to work with teachers to help them use technology in their classrooms. As part of this role, Regina would send updates to teachers with information about new resources. Dierdre, who had learned about blogging over the summer, contacted Regina after she described ThinkQuest, a free subscription service that allows
teachers and their students to easily create Web pages and collaborate on projects. Together, they brainstormed potential uses for the tool that would fit with Deirdre’s curriculum. Finally, they settled on having students create and publish word problems on the Web site that could then be solved by other students in the school. They used the laptop cart for the fifth grade, and planned for Regina to take students through the process of logging into the computers and the Web site and publishing their word problems. Two weeks later, they planned to bring the laptops back into the classroom so that students could log their answers to another student’s problem. As part of the project, students were also able to create a personal homepage.

While Deirdre and Regina eventually completed the lesson with their students, it did take longer than expected. On the first scheduled Friday, students were unable to access the ThinkQuest Web site due to a network problem within the school district. After Regina attempted to solve the problem without success, she and Deirdre decided to postpone the lesson for the following Friday. The next week, the network was working properly, and they were able to complete the lesson. For Deirdre, using technology was a way to spark both her own and student interest. She said, “I just wanted to introduce more technology and get them more excited. Plus, I’m really excited and I want to learn about blogging, so it’s a personal interest also.”

**Maple Middle School: Carol**

I worked with the computer, which we’ve talked about before, for years, 14 or 15 years before I got into teaching. I'd like to get more back into it. It's been awhile since I've actually sat down and learned something new on the computer and took advantage of what the computer can do for me. There are a lot of other things that
I want to read about and get into hopefully now that I've got my curriculum set up and hopefully now next year there won't be any changes. So I can take time to go in and find more things or to develop more things. I like finding things but I like to develop things more than I like to find them. Because I like working with the computer. And I got away from doing that and I need to get more back into that. I used to love the computer and still do but I just don't take the time to do it like I should.

Carol has taught fifth grade English at the middle school for the past five years. Prior to that, she had a job in the private sector for many years. She uses a traditional overhead projector almost every day as part of the students' daily oral language drills. In terms of digital technologies, she accesses online materials such as multimedia presentations or interactive activities to use with the students. She occasionally takes her students to the computer lab to complete practice tests.

The school, which includes grades five through seven, has two computer labs available for teachers to reserve. In addition, during the course of the study, each grade level received a cart of laptop computers that were also available for teachers to reserve. Carol could sign out a digital projector for use in her classroom with her teacher laptop. She had one desktop computer in her classroom.

For her lesson, Carol created a Jeopardy-type game using PowerPoint to help the students review for a grammar test. While she knew that templates were available, she wanted to create it herself. She used the projector to display the game. Students divided into two teams and in order to earn the right to answer a question, they had to correctly spell a word faster than the other team's player. They were able to complete the lesson in
the class period. Carol indicated that, while this was the first time she had created a digital version of Jeopardy, she often used games to review before tests. But, she liked how the computer game generated excitement among her students. She said, “Just to come in with that enthusiasm that they wanted to be in here, they wanted to learn...And I love it when they come in with that attitude. It makes my job easier.”

*Maple Middle School: Mark*

My recent experiences have me a little gun shy in trying to do that [use technology] because the system hasn’t always been on my side...a new program ... was put in over the summer and the beginning of the year, I had no idea what that was. I took kids in, did research for two days, shut the system down and when we booted back up there was nothing there. The old folder that I had them saving under from the previous year still had an icon on the desktop but it had no information. None of the kids’ folders were in there. So that was after 2-1/2 days of research and I kind of got a bad taste for doing it.

Mark has taught for four years at the middle school. He has been a teacher for 13 years. He currently teaches sixth grade American history. Mark uses both analog and digital video in his classroom. He shows multimedia presentations to his students along with Web sites. He also takes his students to the computer lab several times a year to either do research or create their own multimedia presentations.

In his classroom, Mark has access to his laptop computer and a digital projector. He has a desktop computer on his desk. The school, which includes grades five through seven, has two computer labs available for teachers to reserve. He also has access to computers in the library.
For his lesson, Mark’s students used a word processor to create one-page newspaper articles about either an important person, invention, or event of the Industrial Age. Students chose from a list provided by Mark and spent three days in the computer lab researching their topic and creating the newspaper article. Mark provided students with a template that included a headline, space for at least one graphic, and two columns for text. Most students were able to complete the project in the three days provided. In the past, Mark had done a similar lesson in which his students used print resources for research and then created their newspaper article using construction paper. He chose to make it electronic because it provides an opportunity for the students to use digital technologies. He said, “Technology is only as good as the people operating it…So that’s an opportunity to use that, to practice. Hopefully, by the time they are my age, they can use it quite efficiently.”

Maple Middle School: Bonnie

I think the thing is as a teacher with technology, I really have to, when I'm planning I want to make sure that I think about its purpose and how it's going to facilitate the children and what goal I'm trying to accomplish out of the lesson that I'm doing. Am I doing it to review and remediate? Am I using it to expand upon instruction? You also have to stop and think about how you're going to instruct the children with the program. Because some kids are obviously going to be—it's just like anything else—some will have more experience than others with technology and I think that it's important that we consider that and that we have to realize in our instruction we can't just assume that sometimes they already know all the things and the parts of it.
Bonnie has been teaching for 16 years, beginning with first grade and then moving to middle school math. She currently teaches seventh grade civics and economics, a position which she has held for four years. Bonnie uses technology in a variety of ways in her classroom. One important way for her is to make her class more accessible for special education students through the use of portable word processors and text-to-speech technology that can read documents to students. In her classroom, she shows video clips and sometimes brings in the interactive whiteboard to complete review activities with the students. She checks out a student response system to use for review and assessment. In the computer lab, her students use software to create items such as flow charts and brochures. She takes advantage of a Web site provided by a local university to participate with her students in a program related to youth leadership and the political process.

In her classroom, Bonnie had access to a laptop and desktop computer. The school, which includes grades five through seven, has two computer labs available for teachers to reserve. She also has access to computers in the library. She indicated that she is able to sign out a digital projector and interactive whiteboard.

For her lesson, Bonnie planned to have her students create informational brochures related to voting. Students would take on the role of a member of an interest group whose job it is to convince people to vote. They created rough drafts in the classroom, and then Bonnie signed out the computer lab for two days to complete the assignment. The students would use a desktop publishing program that Bonnie had located and for which the school had purchased licenses for one computer lab.
On the first scheduled lab day, an illness prevented Bonnie from coming to school. She did not wish to have a substitute teacher take the students to the lab, so she planned an alternative assignment for that class period. When she returned to school, Bonnie discovered that the computer lab where the software was installed was not available for several weeks. Therefore, she decided to postpone the creation of the brochure until the end of the school year when she would use it as a review for the state test. She gave students a grade on their rough drafts.

Bonnie has done this lesson for four years, only introducing the technology during the past two years. She has several reasons for using technology as part of the project. It is a way to introduce the students to a software program they will be using throughout the year. In addition, because the final products look more professional, Bonnie feels the students take more pride in their work. Finally, she feels it is important for teachers to incorporate technology as they prepare their students for the future. She said, “I think the technology is just really important for the world we are living in, so if we can start to teach them at all about technical design and the use of technology, it’s going to benefit them in the long run.”

Through these introductions, we see that all the teachers in the study were using technology to support learning activities in their classrooms. Table 3 provides a summary of each teacher’s planned lesson.
Table 3:

Teachers’ Planned Lesson Activities

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Planned Lesson Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carol</td>
<td>Used a digital game to review for a grammar test</td>
</tr>
<tr>
<td>Michelle</td>
<td>Used a digital game with the interactive whiteboard to review for a quiz on prefixes</td>
</tr>
<tr>
<td>Kelly</td>
<td>Used the interactive whiteboard to review a grammar activity</td>
</tr>
<tr>
<td>Mark</td>
<td>Students conducted web-based research about an important person related to the Industrial Revolution and created a newspaper article in Word</td>
</tr>
<tr>
<td>Bonnie</td>
<td>Students published a brochure about voting using desktop publishing software</td>
</tr>
<tr>
<td>Amy</td>
<td>Used a digital game with the interactive whiteboard to review for a test on the 13 colonies</td>
</tr>
<tr>
<td>Deirdre</td>
<td>Students used blogging software to write and solve word problems</td>
</tr>
<tr>
<td>Beverly</td>
<td>Used an online review program to assess student knowledge of seventh grade math problems</td>
</tr>
<tr>
<td>Marion</td>
<td>Students used Web sites to answer research questions related to the oceans</td>
</tr>
<tr>
<td>Samantha</td>
<td>Students completed an online simulation to classify organisms</td>
</tr>
<tr>
<td>Susan</td>
<td>Presented a digital video using a laptop and projector to review fossils</td>
</tr>
<tr>
<td>Wanda</td>
<td>Students created a digital video to illustrate a food chain found in the ocean</td>
</tr>
</tbody>
</table>

These lessons included several different types of activities, including review and assessment, student research and publishing, and simulations and technologies ranging from interactive whiteboards to Web sites to digital video and desktop publishing software.
Identifying Teachers’ Knowledge

As the teachers discussed their general planning processes, the impact of their use of digital technologies on those processes, and the specific details related to the lessons they would be teaching as part of the study, they demonstrated their uses of different types of knowledge, including evidence of the domains included in the TPACK model. Since one of the goals of this study was to determine how, if at all, teachers employ this knowledge as they plan, I have used these knowledge constructs to organize the results, beginning with the three individual domains—content knowledge (CK), pedagogical knowledge (PK), and technology knowledge (TK)—and then describing the four overlapping types including technological content knowledge (TCK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK).

CK

According to Koehler and Mishra (2008), “content knowledge is knowledge about the actual subject matter that is to be learned or taught” (p. 13). All the teachers in my study demonstrated their knowledge of their subject matter, which also included their knowledge and understanding of the applicable curriculum standards defined by the state. In fact, for most of them, their CK was almost synonymous with the state-defined curriculum. When asked to describe the lessons they would be teaching, the teachers all started with the content with which they would be working, specifically in terms of how it related to the state curriculum standards for their subject area. In the case of the three fifth grade science teachers—Marion, Susan, and Wanda—their content included both
fourth and fifth grade science since the test that would be administered at the end of the year would include two years' worth of content.

These standards were outlined in several different state-created documents, which Marion had put together in a bound version. Amy referred to these documents as her "bible," suggesting that all of her decisions about classroom learning began with a consideration of the state-defined content. She commented, "This is what I look at when I plan a lesson, what do they need to know on this particular topic."

While the other teachers did not refer to the standards' documents as sacred texts, they were clearly driven by the content of the standards, often able to quote them chapter and verse in terms of specific information for which the students would be held accountable. Bonnie, for instance, was helping her students understand elections and voting. Her students, according to Bonnie, needed to know "information about the predictors of who might vote: education, age, and income. And we talk about what causes people not to participate in voting, which is lack of interest and failure to register." Her language parallels the specific language of the standard.

All of the teachers in the study were aware of the state standards in their content area; however, language arts teachers did not refer to them as specifically as the other teachers did. This may be because of the nature of their standards. According to Michelle, the standards for language arts were somewhat vague. She said, "There are so many skills that are underneath those standards that aren't really spelled out...There are just so many skills that aren't listed. Comprehension, well, comprehension is a lot of stuff."

For the two sixth grade social studies teachers, it was not the vagueness of the standards but rather the factual specificity that caused concern. Amy and Mark both
described their efforts to balance factual knowledge with a sense of the connections that they felt were essential to fully understanding history. Amy, in particular, wrestled with this balance because her previous year’s test scores were lower than she and her district would have liked, and she wondered if it was because she was providing too much background information. She commented:

If I just went through the American Revolution and said, “OK, here’s the important people you need to know, here’s the events you need to know,” they are going to think, “Well why did this lead, how did this lead to this?” So I try to give them some of that, and I do want to tell it as a story because it is a story. The kids are interested in that. They want to see that story. They want to see the progression. But I don’t focus quite as much on that and there’s none of that in their notes. Their notes are the required knowledge. And I’ve been doing that for several years, but it’s a hard game to play.

Mark also saw the need to help the students make connections between historical events and people even if it meant teaching content that was not specifically stated in the standards. He said:

I feel like there are a lot of connections that aren’t made in the standards themselves. They are very general skeletons. But I think to understand them, the in-between connections have to be made. For instance, Theodore Roosevelt isn’t even mentioned in the standards, but I still teach about him because he is a major impact on American life and the spirit of the industrial age. I don't see how you can understand American history without having some exposure to one of the major players in the early 1900s. So I teach about him.
Both Amy and Mark struggled with their own understanding of the content and the way it is interpreted by the state.

The teachers were also aware that technology was not part of their state-defined content. Several expressed the concern that using technology moved their focus away from the state-defined content for their subject area. “Technology standards,” commented Mark, for example, “are not officially under my umbrella.” As she thought about ways to integrate technology, Wanda had to remind herself that she was first and foremost a science teacher. And Deirdre had to remind her students that while the technology might be fun to use, the main objective of the class was to learn about math. Bonnie was the only teacher who identified technology as part of her content since she felt that it was important in a civics course to understand technological innovations and the impact they will have on students’ careers and everyday lives.

In addition to their CK, each teacher in the study had some level of technology knowledge.

TK

Koehler and Mishra (2008) suggest that, of the three “core” knowledge domains in the framework, TK is the most difficult to define, mostly because of its fluctuating nature. They align their definition with that of the Committee of Information Technology Literacy of the National Research Council for fluency of information technology or FITness. The committee defines this fluency by saying:

People fluent with information technology (FIT persons) are able to express themselves creatively, to reformulate knowledge, and to synthesize new information. Fluency with information technology (i.e., what this report calls
FITness) entails a process of lifelong learning in which individuals continually apply what they know to adapt to change and acquire more knowledge to be more effective at applying information technology to their work and personal lives (p. 2).

Cox (2008) prefers to confine her definition of technology knowledge to knowledge of emerging technologies, believing this helps distinguish between the constructs. Older nondigital technologies, such as books or pencils, have been so completely absorbed into everyday use that they are no longer considered technologies and, due to their transparency, knowledge of their use is incorporated into pedagogical knowledge. This process of absorption is ongoing and, as we shall see in the discussion, even some emerging technologies, such as interactive whiteboards, are becoming increasingly transparent to teachers.

As they discussed their planning practices, particularly as they planned for the use of technology, the teachers in the study often commented on their own technology knowledge. All the teachers in the study were able to use technology to support their own productivity as well as the teaching and learning in their classrooms. Most of them mentioned using a computerized grade book, accessing a search engine to locate information and resources on the World Wide Web, and downloading instructional videos from an online database. All had taught lessons in which either they or their students used technology. For the most part, they seemed confident in their uses and their potential for learning more. Kelly believed she had gotten better with technology over time but felt that her knowledge was still fairly limited and that kept her from doing more technology-based activities with her students. She, however, was optimistic that she
would continue to learn and grow in her use and was looking forward, at the beginning of the study, to getting her interactive whiteboard installed.

The exception to this sense of optimism was Michelle who, while she could describe several ways she used technology for classroom instruction, felt as though she did not have the aptitude for using computers. She said, “I feel really old when I use them. I think of it as a certain aptitude that you have to have. And I obviously don’t have that. It just doesn’t come natural to me…My mind isn’t programmed to use technology.” She worried about doing something “irreversible” to the computer.

Getting past this concern for making mistakes was all part of the learning process for Beverly and Samantha. Both reflected on their initial fear and feelings of intimidation with using their interactive whiteboards. Beverly said, “It takes a while to get used to it.” Samantha described her own concerns as she first started using the board with her students. Both she and the students had problems with it, and these technical issues during the first few weeks made her question whether or not she wished to continue using the board. Like Beverly, however, she and her students eventually got used to it and now Samantha has trouble imagining being without her interactive whiteboard.

The technological knowledge the teachers had was built in several different ways. They had learned to use technology through a combination of school-provided training, their own explorations, and interactions with other colleagues including teachers and technology coaches.

Most mentioned having access to some formal training provided by their school districts, but reactions to this training were mixed. The timing of the training was a concern for several of the teachers. For instance, Deirdre and Kelly both described having
to miss out on training for new equipment due to scheduling conflicts. Both were hoping more training would be scheduled. Michelle and Amy also shared concerns about the timing of training they had received. Michelle had received training on the interactive whiteboard, but she commented, “We did have a training like a year ago. Before I think anybody much had one... Of course, anything I learned way back then, I didn’t use it so I lost it.” And Amy also noted that the training was often inconvenient, describing a workshop on a new testing program that was held at the beginning of school when teachers were more concerned about setting up their classrooms. She would have preferred to have an opportunity to work with the program on her own rather than being part of an organized class. Carol noted that her school had purchased a student response system but there had not been any training scheduled. She was hoping they would learn how to use it over the summer. Of all the participants, Marion was the most positive about the summer training offered by her school district because she used it to keep up to date with new resources as well as to create her own materials for use during the school year when she simply did not have time to do that kind of preparation.

In addition to organized training, the teachers either taught themselves or learned from other teachers. Carol, prompted by an example shown by the technology coach at her school, found directions to create her own Jeopardy game from scratch in PowerPoint. While she knew there were templates available, she wanted the learning experience that would come from doing it by herself. She had plans for learning additional skills that would allow her to add advanced features such as sound to the game. Wanda described learning about the student response system by searching online for
information. For Susan and Kelly, technology knowledge was gained during the process of using the technology in their classrooms as they worked through technical problems.

Several teachers mentioned colleagues within the school who helped them with the technology. For Samantha, it was primarily the librarian, but she also relied on other teachers to help her remember how to use software. Amy also found it helpful to consult with other teachers when she had forgotten how to set up the interactive whiteboard. And she described her frustration when she was unable to get a projector to work and could not locate her colleague who, according to Amy, was “usually pretty good with technology.” For Kelly, it was a teacher on her team who was an interactive whiteboard expert. Michelle was able to create an interactive lesson on prefixes using information gained from a colleague. At least two teachers—Samantha and Kelly—mentioned learning new information about their interactive whiteboards from the students in their classes.

Elm Middle School was tapping into this informal learning network. Both Amy and Michelle mentioned that their school had adopted a “train-the-trainer model,” so that as one teacher learned to use a technology tool, she would teach the next teacher what she learned.

Finally, several teachers in the Elm and Maple schools mentioned taking advantage of the technology coach provided by the school district to further their technological knowledge. The coach helped them set up equipment, sent links to resources and, in Deirdre’s case, provided the technology knowledge necessary to implement her word problem lesson. She commented, “If it hadn’t been for her, I would
not know anything about ThinkQuest. And I probably would not take the time to figure out how to do it on my own.”

Most of the teachers in the study had a sense that there was more for them to learn about technology. For Michelle and Kelly, it was the feeling that they were not using their interactive whiteboards to their fullest potential. Susan, meanwhile, wondered how she could improve her own use of the document camera. Kelly and Mark both commented on the importance of challenging themselves to learn more. Kelly said, “Each time, I just kind of challenge myself a little bit to do a little more and I enjoy it.” Mark felt that improving his own skills would benefit his students, allowing him to “bring the kids along to another level.”

Mark’s concern for doing the best for his students was echoed by other teachers. And, this concern for students also played a central role in teachers’ PK.

According to Koehler and Mishra (2008), “Pedagogical Knowledge is deep knowledge about the processes and practices of methods of teaching and learning and encompasses (among other things) overall educational purposes, values, and aims” (p. 14). This kind of knowledge is generic in that it applies to any students, teachers, and classrooms, regardless of content, grade level, or school environment (Cox 2008).

All the teachers in the study demonstrated the use of general PK as they planned for both instruction and classroom management. Many of the general instructional and management practices they described were routinized, and the teachers demonstrated all four of the routines identified by Yinger (1980), including executive planning routines, activity routines, instructional routines, and management routines.
The teachers had very different planning practices in terms of how they wrote and stored their lesson plans. Some used a traditional plan book while others used a district-provided form. Some stored their units in binders while others chose folders. Some typed their lessons while others hand wrote them. But while the outline and actual written formats were different, the processes in which they engaged—what Yinger (1979) called executive planning routines—were very similar. They began with a yearlong plan that included a pacing guide. With that in place, they broke the content into units, which were generally related to the main categories of the state curriculum standards. They further broke those units down into more specific topics and, finally, daily lessons that incorporated different instructional activities, some of which where general in nature, such as using games to review for tests or having students complete worksheets as they read. Many of the teachers were using “interactive notes,” a style of note taking that encouraged student interaction with content. Students were given note sheets on which they circled and highlighted words in the notes themselves, wrote concepts and definitions in their own words, and drew pictures related to the notes, all as a way to encourage their engagement with the information.

As they planned, the teachers drew on their repertoires of other routines, including activity, instructional and management routines. Their activity and instructional routines took the form of patterns for their classes. Several described having general routines for presenting their instructional units regardless of the specific content that guided their planning. Bonnie, for instance, began her units by brainstorming with the students as a way to assess their current understanding. From there, she moved on to vocabulary study.
They also structured their daily classes around routines. Most had some kind of warm-up activity in which students engaged as the class began that helped to focus student attention. They described their routines for testing, including pre-test review—many of them used games for this—and post-test review.

In terms of management routines, they had systems for assigning and collecting homework and checking student agendas. When they adopted a new pedagogical activity—Carol and Wanda had both begun using journals with their students, for example—they also developed management routines around those new activities. Each had developed instructional and management routines for their classrooms related to how the students accessed and used their journals.

The teachers were willing to tweak these routines, however, mostly in response to students’ needs. Samantha and Amy both used cooperative learning groups with their students, but they varied the use of those groups depending on the students. For instance, Samantha felt as though this year’s group of students were not as productive when they worked in groups, so she tended to plan more independent work for them.

While some tweaking took place from year to year as the teachers reflected on the overall structures of their classrooms, they also made changes as they planned and implemented individual lessons. These changes were based on their knowledge of students as well as student responses to the planned activities. For example, as she developed her Jeopardy game and planned for its implementation, Carol considered ways to have students “ring in” to answer a question. She had initially planned to use a whistle that students would grab, but her knowledge of students’ reactions to games—“they get out of hand”—made her choose a different method which involved students writing a
spelling word. Amy and Michelle shared this knowledge of how students reacted to classroom games, expressing concerns about keeping control over students when they played games.

Such tweaking also took place as they were implementing the lesson. Several teachers described their first period class as “guinea pigs” because they used them to determine the success of their lesson. Samantha commented:

I’ve always told my first period that they are guinea pigs. They are. Even if you are not tweaking your lesson, they are the guinea pigs because you’ve got it planned out, you know where you want to go, and you get part way through the lesson and you realize that they are going blank.

Avoiding the “blank stare” by engaging and motivating students was one of the teachers’ primary concerns as they considered their pedagogy. Kelly mentioned trying to “spice things up,” while Amy described how her lessons were always changing:

Because certain classes respond differently to certain things so I may have a store of things to use but I’m constantly tweaking them as I go and I’ll say I can change this. I can make this better by doing this or adding this. So they are constantly changing. It's a work in progress. And even for different classes. Like first period might respond to something and third period doesn't so I've got to switch it up and do something different with them. It is just being reflective and constantly mixing things up so you can reach a group of kids.

Both Samantha and Beverly evaluated activities partially on how “kid friendly” they were. Samantha determined this kid friendliness in part by thinking about her own
reaction to it. She said, “To be honest, if the lesson bores me, I think it’s going to bore my sixth graders. If I’m having fun, they are having fun.”

All of the teachers demonstrated some level of these individual knowledge types; however, when they talked about their planning processes, they generally focused on the different combinations of the knowledge types. For the teachers in my study, the transformation of subject matter for teaching that occurs during the planning process happened in the overlapping sections of the TPACK framework as teachers used their TCK, PCK, and TPK to create learning experiences for their students. While the teachers demonstrated all three of these types of knowledge, evidence of TCK was the weakest.

**TCK**

Technological Content Knowledge is primarily concerned with the relationship of technology to a particular discipline. This relationship, according to Koehler and Mishra (2008) is one of both influence and constraint:

Teachers need to master more than the subject matter they teach, they must also have a deep understanding of the manner in which the subject matter (or kind of representations that can be constructed) can be changed by the application of technology. Teachers need to understand which specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology—or vice versa (p. 16).

This type of knowledge separates technology and content from pedagogy. “An individual with this type of knowledge understands the impact of technology on the representations of a discipline without a need to understand how those representations might be used in teaching” (Cox, 2008, p. 75).
Koehler and Mishra (2008) call TCK the "most neglected aspect" of the framework (p. 17). The experienced social studies teachers in Harris and Hofer’s (2009b) recent study reported little TCK except for a shared idea that it was the content that led to the choice of resources to use for instruction. The content was not changed because of the resources used for instruction. Instead, Harris and Hofer write, "To the teachers participating in this study, using digital resources is a way to extend students' learning; the depth of content learned is increased, rather than fundamentally changed" (p. 18).

Technological content knowledge was the weakest area of knowledge reported by my teachers as well. The teachers were aware of content-based resources and how tools might be used with particular content. They rarely, however, considered the relationship of technology and content without including pedagogical concerns. This concern for pedagogy has led Robertson (2008) to suggest that TCK simply does not exist. He writes, "One cannot have meaningful expressions of technological content in education without first having a specific set of students, goals, and environment in mind" (p. 2219). While the lack of TCK among my teachers may seem to support this suggestion, I believe there are several examples of the more "pure" interaction of content and technology that characterize this type of knowledge, enough to consider that it does exist, albeit rarely.

For example, most of the teachers were aware of Web-based resources that addressed their content. Amy and Mark, for example, described accessing several Web sites that included primary source documents related to American history. Susan, meanwhile, was aware of and even a little overwhelmed by the number of science-related Web-based resources that she was able to find as she planned her unit on weathering and erosion. Wanda also discussed bookmarking Web sites related to science.
Content was what usually prompted Mark to locate or create a curriculum-based multimedia presentation. He said:

Generally if it's, some of the [standards] are pretty straightforward and some of them have an awful lot of information. For instance, the 1920s. There's a lot of people. The kids have to know a lot of people from the 1920s. There are several. They have to know artists from the Harlem Renaissance. They've got to know artists and musicians and writers and some are from the Harlem Renaissance. Some are not. So one of the things that might be done would be either to find books or find pictures or things from this time period and show them. Alright, here's what this person did. Here's what their book cover was. Here's or even if you can find a picture, here's who that person is. You kinda make it real. If there's a situation where the text is too extensive and wordy or complicated, sometimes I'll condense it into the essential facts that need to be known and put that on the sequence of slides.

Similarly, Bonnie determined appropriate technology use if she could use it to provide relevant information to her students that would help expand upon the topic being studied. Their concern for content, however, was overshadowed about their ideas for how best to share the information with their students, a pedagogical concern.

Mishra and Koehler (2006) mention Geometer's Sketchpad, a software tool for teaching geometry, as an example of TCK. Beverly, who taught seventh grade pre-algebra, was aware of the software and used it as part of her curriculum. In addition, she discussed using graphing calculators as part of her pre-algebra class, another potential example of TCK. Cox (2008) would disagree, suggesting that because graphing
calculators are ubiquitous, they should no longer be considered separately from content. Whether or not the use of calculators rises to the level of TCK is an interesting conceptual debate outside the purposes of this study, but to which this study might contribute. For Beverly, the main concern was with finding a way to display the calculator to her students as they used them as part of classroom instruction, which was a pedagogical concern.

Beverly was also aware of the tools available through the interactive whiteboard, specifically mentioning manipulatives such as dice and spinners that she used for her probability unit. However, her awareness of the tools was, once again, tempered by her pedagogical enthusiasm; rolling virtual dice was a more orderly and accurate activity than using real ones. She did not like the virtual protractor, not because it was not accurate, but because it was difficult for the students to manipulate, again, a pedagogical concern.

The strongest example of TCK in my study is Samantha’s use of the dichotomous key. She was aware of the key as a tool used by scientists to identify organisms and the health of streams, something she covered as part of her unit on watersheds. Like Beverly, however, Samantha’s main concern with using the interactive tool was how best to structure the lesson to support students’ learning. She indicated that she had had to take time to understand the tool before she could incorporate it into her pedagogy.

Determining pedagogy was the primary concern of my teachers. As described earlier, they shared PK of general practices related to teaching. Each one, however, also wrestled with how best to teach a particular content area, and for that they drew on their PCK.
Pedagogical Content Knowledge is based in Shulman’s work and focuses on the knowledge of how to use pedagogy to teach specific content. Knowledge in this domain relates to helping students understand the content through an awareness of their prior knowledge and possible misconceptions. Koehler and Mishra (2008) describe PCK in terms of Shulman’s notion of transforming content for teaching. They write, “Specifically, according to Shulman (1986), this transformation occurs as the teacher interprets the subject matter, finds multiple ways to represent it, and adapts and tailors the instructional materials to alternative conceptions and students’ prior knowledge” (p. 14).

This transformation occurs as teachers combine knowledge of both content-specific activities and representations (Cox, 2008). Subject-specific activities can be used across the content area while topic-specific activities are used with specific topics in the content area. Teachers also make use of topic-specific representations such as models, timelines, or graphs. Cox concludes, “Thus, a teacher with PCK knows how to utilize topic-specific representations in conjunction with subject- or topic-specific activities to help students learn” (p. 74).

Before my teachers began choosing specific activities, however, they demonstrated their PCK as they engaged in long-range planning, during which they considered how to organize and pace their content. In most cases, the general categories of the state standards formed the teachers’ organizational units. As part of this yearlong planning, the teachers thought about how best to organize those units to facilitate student learning. They might change this order from year to year. For Bonnie, a presidential election year meant changing the order so her students were learning about the political...
process during the election. Her mock election activity, which involved the whole school, fit into this unit. Wanda, meanwhile, was reconsidering the way that she organized her units. She usually began with having students take notes and then complete a lab. On reflection, however, she felt as though beginning with the lab would give students a chance to do some theory building on their own. She said, “Essentially, if they paid attention during ocean notes they could complete the whole lab sheet without even completing the lab. They knew exactly so I thought this year I would actually start off with the lab.”

Another pressing concern for teachers as they engaged in yearlong planning was how to pace the content in order to finish it by the time of the state tests that were given at the end of the school year. All of them had a pacing guide that they had created which established how long each unit of study should take. Each year, they honed these guides based on their experiences from the previous year as well their students’ test scores. While these guides were of particular concern for the teachers who faced tests at the end of the year, even teachers whose students were not tested were concerned about pacing. Samantha, for example, believed that she would eventually have to administer a state test so she had already begun to consider how to finish her content before the spring testing window.

Along with pacing, the teachers also had to consider the relative importance of the different areas of the content. The state had provided test outlines that identified how many questions would be asked in each general area. Unfortunately, sometimes this caused a PCK conundrum. Pedagogically, Amy knew that her students were always excited to learn about Native Americans. The state test, however, put much more
emphasis on the American Revolution. Amy wrestled with this conflict, but ultimately the test won. She said:

A lot of the time the kids will ask, they love the unit on Native Americans and they want to do more with that and I just say, we can't. There are like two questions on the [state] test about Native Americans. We just don't have the time to spend on it. So the focus has to be driven by the [state] curriculum. There's no question about that.

For Mark, this concern with pacing and emphasis led to eliminating an activity that involved students writing letters to Franklin Roosevelt. Mark said, "We haven't done that one for a while because it takes up more time, and it's during the Depression, which is not something that is heavily stressed."

Marion, Wanda, and Susan, the fifth grade science teachers, faced another concern related to the state tests as they organized and paced their content. The tests for fifth grade science were cumulative, including both fourth and fifth grade content. According to Marion, the content was complementary, with very little specific overlap. Wanda and Susan both commented on the difficulty students had retaining the knowledge over two years, and all three teachers indicated that they had to leave time for review of both years' content prior to the end-of-year test.

With their yearlong planning in place, the teachers began working on individual units, breaking them down into smaller concepts and then organizing those concepts in a way that would best facilitate student learning. Susan commented on her decision-making process, saying, "I tend to do that on which is going to be the most basic that they need to know. Before we cover tectonic plates, they need to know the layers of the earth." Bonnie
felt there was a “natural flow” to concepts that would help students. Samantha called it a “logical sequence,” suggesting that once she figured that out, the rest was easy. She said, “You know once you’ve figured out your sequence, you just put the pieces together. That makes it easy for the children to grasp it.”

Helping the students “grasp it” was of primary concern as the teachers moved to more detailed weekly and daily planning. They looked for multiple ways to expose students to the content. As described earlier, many of the pedagogical activities for which the teachers planned, such as interactive notes or review games, could be used across the content areas. Yet teachers used their CK to critically evaluate the resources they chose to use, focusing especially on how well they aligned with the state-defined standards. For instance, while they all used a textbook in some way, few of them used it to structure their curriculum, and most of them, but particularly the science and social studies teachers, were selective in their use of the textbook. Susan expressed surprise at the extent to which she did use the textbook, but her use was much different from what she remembered in her own schooling, where the text organized the content and the learning. She said, “I remember when in elementary school using a textbook where you went unit by unit in the book and what was in the book was what you learned that year.” Instead, like some of the other teachers, Susan would select particular pages and passages to read with the students that matched the content they were studying. She also used the textbook for images.

In one or two cases, the teachers did not use the textbook because the reading level of the textbook was too high for the students. But in most cases, it was done to ensure alignment with the state content. Amy commented that her textbook tended to
have too much information. She commented, "I might use it a few days here or there to read the information and even then I'm pulling. OK, we're going to read this page and then we're going to jump to this page and then we're going to jump to this page to keep it more aligned with the [state] curriculum."

This concern with alignment extended to the rest of the resources the teachers used as well. In addition, they were aware of which concepts often proved difficult for students, so they looked for resources that could provide different topic-specific representations of those concepts. As we shall see, this was an area in which they were beginning to use technology.

Besides finding different ways to represent concepts, the teachers looked for pedagogical ways to engage students in the content. For Mark and Bonnie, it meant tying their social studies content into current events. For Kelly, it meant using students as part of her grammatical practice exercises. For Michelle, it meant choosing examples from contemporary culture. And that concern—engaging students in their learning—was one of the primary reasons they chose to use instructional technology to support instruction and formed the foundation of their TPK.

**TPK**

According to Koehler and Mishra (2008), "technological pedagogical knowledge is an understanding of how teaching and learning changes when particular technologies are used" (p. 16). Teachers must understand the affordances and constraints of different technologies for use in teaching and learning activities. In some cases, this may mean that teachers must reconfigure a technology in order to use it effectively to support pedagogy. Cox (2008) elaborates:
An individual with this type of knowledge understands how technology could be used with general pedagogical strategies that could be applied independent of the specific content or topic being taught. These general pedagogical strategies are the same as those described under pedagogical knowledge.

Since it is impossible to teach without content, these activities will include content. But the nature of the activities is such that they can be used in any content domain (Cox).

The teachers demonstrated their TPK as they planned for the use of digital technologies in their lessons. The teachers took advantage of relatively easy access to content-based digital resources such as review games, digital images and videos, simulations, and assessments. They used digital projectors to display resources and called students up to the interactive whiteboard to participate in activities. Students conducted their research using Web-based resources and synthesized and reported that research using desktop publishing and movie-making software. Most of the uses they described supported their existing pedagogies.

This is also evident if we focus specifically on the lessons I observed. With the exception of Samantha, the teachers used technology to support activities they had done without technology in the past. Mark’s research and publishing project, now completely digital, had originally used library books and construction paper, as had Bonnie’s brochure project. Marion had always done research with her students but did appreciate the up-to-date information available on the Web. Wanda’s digital video project replaced a written report. Amy, Beverly, Carol, and Michelle used technology to support review and assessment activities, while Susan took advantage of an easily accessible video database.
to locate and download a clip about fossils. Kelly’s students had always come to the board, although she thought she did it more now that she had the interactive whiteboard.

Deirdre’s plan was the least “pedagogically familiar,” as she brought the new laptop computer cart into her classroom to have her students access a Web site where they could both publish their word problems as well as solve the problems created by others. Deirdre’s students had written word problems in the past and published them in hand-written books, so publishing them online might not seem as too much of a departure, but having all her students accessing the World Wide Web on laptop computers in order to do the publishing made the lesson seem much different from what she had done in the past. In addition, the Web site allowed more formal collaboration than the books, with students assigned to solve others’ problems. At its core, however, the activity was similar to an activity Deirdre had done in the past.

The main difference between Deirdre and the other teachers was the way she determined her technology use. Whereas most of the teachers began with a familiar pedagogy and chose technology to support it, Deirdre started with the technological tool and crafted an activity around it. She had seen a summer school teacher using Weblogs and was looking for a way to incorporate this collaborative publishing tool into her classroom. Like the other teachers, however, her main focus was using the technology to support student learning. As with everything the teachers did, the technology use had to support the content.

All the teachers talked about the importance of using technology in a purposeful way; none of them used technology just for the sake of using it or having fun. Bonnie commented, “It has to serve a need within your class. You don’t want to just have it as a
filler.” Marion made sure that her lessons all had a tie-in to the curriculum, and her technology use was always part of a structured activity. Mark worried a bit about what he called “bandwagoning,” which he described as happening when new technologies come out and everyone wants to use them without really having an educational purpose. However, the teachers balanced this concern with their belief that it was important to provide technology experiences for their students.

They chose to use technologies when they perceived that the use added a particular value to the pedagogy. For the teachers in my study, technology added value in two areas: encouraging student engagement and providing access to many different representations and activities.

As mentioned, a primary value in using technology was that it was engaging to the students. The students, they all agreed, loved technology. Marion commented:

I have quite a few reluctant learners. They are just so disengaged from school and what school is about. And I see technology as a way of engaging them. Of getting them and saying, you know what, this can be cool, too. This is not only about sitting there and writing something and being in a book.

Mark saw technology, particularly taking his students to the computer lab, as a change of pace from the typical day and inherently engaging to the students.

This engagement helped to make learning fun. Several teachers mentioned how gratifying it was when students seemed excited to come to their class because of the technology activities they had planned. Deirdre said, “My main thing was finally seeing them wanting to do something in math.” Carol echoed this sentiment when she described the students’ excitement about playing a review game. “Just to see them come in here
today all excited...And just to come in with that enthusiasm that they wanted to be in here. They wanted to learn...And I love it when they come in with that attitude. It makes my job easier,” she said.

In addition to student engagement, the teachers used technology resources such as digital images, videos, and simulations in order to offer new representations to their students. Susan commented on her use of video, saying, “I mean there’s certain things you really can’t get across to students without them seeing...those are field trips you can’t take.” For Marion, using the Web for research meant being able to access more up-to-date information than was available in the school library.

They all indicated that, as a regular part of their planning, they used both free and subscription-based Web sites to find digital resources. They applied the same critical evaluation to the Web-based resources as they did to their textbooks and print-based resources. Content alignment was the primary concern, and they often discovered that they had to tweak the resources they found in order to increase that alignment. While they would use premade resources when they were pressed for time, they preferred to create their own because they could better control the content. Both Amy and Michelle discovered errors in the games they were using with their students that they were unable to fix. Samantha generally preferred to start from scratch when she created interactive whiteboard activities, as she was not impressed with the quality of the materials that came with the board. Beverly set up her own assessment because the prefabricated test did not concentrate on the areas with which she was concerned. “I had to make it specific for my goal,” she stated.
As part of their evaluation, the teachers considered the grade level as well as how, to quote Samantha, “kid friendly” it was, thinking about the students in general as well as how individual students responded to technology use. Using technology, they felt, allowed them to appeal to a wider range of student interest and learning styles. In this way, teachers’ consideration of the use of technology resources was similar to their use of nondigital resources.

As they planned for the use of technology, however, the teachers had additional considerations that were not part of planning for nondigital resources, particularly when it was their students who would be using the technology. As the teachers in my study chose the technology tools they would be using, they made decisions about access, management, and instruction. These decisions were often influenced by what Koehler and Mishra (2008) call the “context,” which refers to the school environment in which the teachers work. The context determined their access to digital technologies as well as the way they managed and instructed their students in the use of technology.

Access. The teachers had to consider what equipment they would need in order to access the resources they planned to use. These needs varied with the activities they planned. For instance, in order to show her digital video, Susan needed a digital projector and a computer. In order for her students to create their brochures, however, Bonnie needed access to a computer lab in which the software she wished to use was installed. In some cases, an activity could be done different ways, and teachers drew on their knowledge of both their main purpose as well as their students to determine how they would use technology. For instance, Amy described a lesson in which she introduced her students to primary sources using several Web sites. In past years, she had taken her
students to the computer lab where they could explore on their own. However, as she considered this year's students, she decided to do the lesson in the classroom as a whole group. She commented:

As I was gauging my class, I decided that I didn't think they were really ready for that step. So we were just going to show them the different primary resources online through the LCD projector. So I guess it's a process of knowing your students as well as what technology resources you have available. It's kind of a balancing act.

For the teachers who were doing presentations or playing review games in their classroom, access to equipment was less of a concern, as most of them could make use of equipment located in their rooms.

Access became a more pressing concern when they were planning to use shared equipment such as computer labs and carts of laptop computers in order to provide students with individual access to computers. These resources had to be reserved in advance and, depending on their availability, might influence when teachers completed certain activities. Bonnie commented:

I think that, of course, you sometimes get frustrated, I guess, as a teacher, not having those computers available to you when you need them. And it really does affect your planning. You have to plan weeks in advance, sometimes, to figure out when the computers are available so it's not always the most conducive to when it's appropriate to teach it but when you get access to the computers.

In fact, this limited access caused Bonnie to postpone her students' completion of the brochure for several months. Due to an absence, she had to cancel her lab reservation.
When she returned, she found that she would be unable to schedule the lab in a timely manner, and her curriculum required that she move on. She chose to grade the students' rough drafts created with pencil and paper and planned to complete the digital portion as part of the spring test review. Her stoic reaction was typical of all the teachers in my study as they juggled the demands of their schedules: “You just sort of learn as a teacher to do the best you can with it and hope that you can get in there and if you have to reschedule, you replan, which can happen with any best laid plans.”

Management. Issues related to access forced Marion to do some replanning as well. In her case, she had to change the way she usually managed her students as they completed some Web-based research on the oceans. In the past, she had been able to use the computer lab or laptop cart so all her students could complete the research at the same time. However, neither the lab nor the cart were available when she was ready to implement her lesson. She restructured the lesson in order to take advantage of the six desktop computers in her classroom, designing a three-day lesson in which small groups of students rotated through different activities, including working on the computers. After completing the lesson, Marion felt positive about it and expressed surprise at the worries she had had prior to the implementation. She commented:

I didn’t realize how apprehensive I was going to be at first of trying something. Because I’ve always seen myself as being so open minded and I’m always like the first one OK, I want to learn about that. OK, I want to try that...But this one activity, I guess I was so comfortable with the way I had developed it up to this point, since it’s been quite a few years going, that I was so concerned.
She saw advantages to using the classroom computers in this way and was considering using the system for future lessons. Her TPK had grown as she figured out how to provide her students with access for their research. She echoed Bonnie’s sentiment about the need for flexibility, “I’m going to make it happen. We are going to use it. Because it is something that does complement the lesson very well.”

Two other teachers in the study also grew in their TPK in terms of managing student computers use. Both Wanda and Deirdre reflected on their whole-group approach to using computers. After completing their lessons that included individual students on computers, they pronounced themselves exhausted and began brainstorming ideas for how to reduce that exhaustion. Both were considering different ways to organize the students including having them rotate through the computer station, similar to Marion’s approach.

Once they had procured access to the necessary hardware and organized their students appropriately, the teachers had to determine what kind of instruction the students would need in order to be able to effectively use those resources.

*Instruction.* The teachers had different strategies for instructing the students in the use of technology. Bonnie commented:

You have to stop and think about how you are going to instruct the children with the program. Because some kids are obviously going to be—it’s just like anything else—some will have more experience than others with technology and I think that it’s important that we consider that...we can’t just assume that sometimes they already know all the things.
Bonnie showed them the basics and then let them explore on their own, using a system of trial and error as she facilitated their work. Samantha felt her students were successful using the dichotomous key because she had taken them through the process prior to bringing them to the lab. In addition, Samantha also used an informal “peer tutoring” process, relying on students to help each other as they worked through the lesson. Like Samantha, Marion also liked to introduce the activity using whole-group instruction. Wanda preferred to use a “cheat sheet” that outlined the various steps for creating a video. This allowed the students to work more independently while Wanda circulated.

Making the decision to use technology, then, required additional planning for the teachers. But the teachers were aware that no amount of planning could ensure success, and this awareness was part of their TPK. Feng and Hew (2005) called this awareness “caution,” the teachers’ concerns with what would happen if the technology was inaccessible or did not work for some reason. The teachers in my study had learned to live with the unpredictability of technologies, even those they used on a daily basis, such as the interactive whiteboard. All the teachers using the boards reported dealing with issues of alignment that made the board unusable until it was realigned. This was a short process, for sure, but one which, as Beverly pointed out, wasted precious class time. They had taught their students how to do it so they could quickly get back on track. The teachers had learned how to work around this particular problem. In other cases, however, problems with technology required a replacement lesson.

For the teachers in my study, this secondary lesson was known as “Plan B,” and most mentioned having such a plan in place whenever they worked with technology. For Samantha, it was essential when using technology. She commented, “Oh yes, whenever
you’re using technology, you should have a backup plan. Things go wrong.” She indicated that she had learned this lesson the hard way by having the technology fail.

These plans were essential whether they were using a familiar technology like Susan’s digital video lesson or a brand new one like Deirdre’s ThinkQuest lesson. In both of these cases, neither Susan nor Deirdre had followed the accepted wisdom of establishing a backup plan, which left them a bit flustered when the technology did not work as expected. Since Susan was using the video as reinforcement of concepts, she simply moved on to the next activity. She indicated that she would continue to use digital videos but in the future would test them using the laptop and projector to be sure that they would display.

For Deirdre, however, creating the ThinkQuest pages was a primary part of the lesson and could not simply be skipped over or replaced with something similar. Deirdre’s frustration was evident as she scrambled to plan for the rest of her day. She said:

You know because if you plan something, I mean we’ve been planning this since before Christmas. And letters have gone home and excitement has been built up and then now today they aren’t going to be able to do it... So that's the thing that concerns me. If you do all this planning and you get all psyched up and you just never know when there's going to be a glitch.

Deirdre was able to reschedule her lesson for the following week, because she did not wish to abandon the plan completely. For that second week, however, she indicated that she had a backup plan in place in case they encountered difficulties.
Other teachers also devised backup plans for the lessons they planned. For Amy and Carol, the plan was to do a similar activity without the technology. If, for instance, Amy had not been able to access the online game on the interactive whiteboard, she knew she could do the same activity, albeit without the interactivity, by drawing the game on the regular whiteboard in her classroom. For Mark, who worried about both network reliability as well as the content filter, the backup plan was to abandon the assignment altogether and move on, rather than trying to substitute print-based resources for the research. He said, “If it crashes completely, we will come back and pick up with the curriculum guide and keep moving forward and we will try again later in the year with something else. Just scrap it and move on… There's only so much trial and error and time that I can afford.”

Despite the “glitches,” the teachers were committed to using technology to support both their content and pedagogy. Each one combined technology, pedagogy, and content to create their lessons, demonstrating their TPACK.

TPACK

Technological Pedagogical Content Knowledge brings together the three domains and moves beyond all three individual types of knowledge. According to Koehler and Mishra (2008), TPACK is the knowledge that underlies the effective use of technology for teaching and learning. They write:

- It requires an understanding of the representation of concepts using technologies;
- pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge
of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones (pp. 17-18).

Harris and Hofer (2009b) describe their teachers’ TPACK by saying: “Overall, the teachers in this study matched the nature of the curriculum content to be “covered” (taught) with how they perceived their students learned best, and the ways in which different technologies can be best used to support that learning in the time available” (p. 19). The teachers in my study also demonstrated these different types of knowledge as they planned for the use of technology to support learning activities.

The way they chose to use technologies helps provide some insight into the complexity of the TPACK framework. According to Koehler and Mishra (2008), TPACK is an interaction between the three components, “a dynamic equilibrium” (p. 18) that creates a greater whole. While “equilibrium” suggests a static relationship among the parts, its dynamic nature becomes evident as we consider the way teachers move between and among the different types of knowledge. For example, for most of the teachers in my study—with the possible exception of Samantha and Wanda—all three components were present, but the interaction between technology and pedagogy took precedence during the planning process. In addition, technology seemed to play a lesser role in the interaction of pedagogy and technology as the teachers, for the most part, began by choosing a pedagogy and then identifying a technology that could support that pedagogy. And, because of contextual concerns related to access, reliability, and time, teachers sometimes deliberately planned for technology in a way that did not make it integral to their lessons. The teachers were able to identify affordances offered by the technology, but they were
also willing to give up those affordances if necessary in order to move forward with the curriculum. For instance, while Bonnie was disappointed that she could not take her students to the computer lab to complete their brochures, she felt that they had grasped the content by completing the rough drafts. Likewise, Mark indicated that he could abandon his research project without sacrificing essential content. Susan’s fossil video was supplementary, so when it failed to display during her first period, she simply skipped it during the next class. For the teachers who were playing review games with their students, the digital technologies were useful, but not necessary.

The teachers in my study also tended to choose pedagogies that seemingly could be used by any content area teachers. The uses of technology they described were in support of general pedagogical activities such as teacher presentation, review and assessment, and student research and publishing. While technology was essential for Deirdre’s lesson, her use of that technology was not specifically math-related. Almost all the teachers mentioned using electronic games as part of their review process. While the content and the question format varied based on their curriculum, the formats of the games were identical.

Cox (2008) believes that the difference between TPK and TPACK lies in the types of activities used as part of instruction. She writes, “I propose that TPK involves a knowledge of general pedagogical strategies while TPACK involves knowledge of content-specific strategies” (p. 98). I would suggest, however, that while the primary interaction was between technology and pedagogy, in this study, the teachers’ CK played a role in the choice of technology, as demonstrated by their concern for alignment and, in Deirdre’s case, with finding the appropriate content to use with the technology she had
selected. Harris and Hofer (2009a) seem to go further, suggesting that even though some activities may be used by different content area teachers, teachers’ concern with how these activities impact student learning of specific content must be considered as well. So while the teachers may emphasize certain interactions as they plan, all of the different interactions are present in the teachers’ decision-making, thus demonstrating the dynamic nature of TPACK.

A closer look at Samantha and Wanda, two of the science teachers, might help illustrate these different approaches. As described earlier, Samantha’s use of the dichotomous key with her students grew out of her TCK. In fact, it took her some time to work out the best way to use the simulation with her students. She commented on her learning process:

I think when I first discovered it, I didn't really understand what all was involved in it. We didn't do it. When I first found the site, I thought, “Well, this is seventh grade biology.” So I just kind of discounted it. But I did talk about the organisms and how some of them were sensitive to pollution and if you found these it meant that the water wasn't polluted because they were too sensitive to live in it. And I did use it in a way that wasn't as meaningful to the students. Didn't grasp their attention. Won't make them remember it when they find these things. And then I, once I understood the site better, I thought the seventh grade teacher, some of our objectives overlap so I gave it to him and he was going to do because it really does fit seventh grade biology perfectly. He didn't get to it. And when I found that out, well I'm taking it over again. I told him, “I'm taking it back over.” And by that time I was beginning to see a logical sequence of how I can fit it in and have
them understand it. But until I could find that logical sequence to just throw this in some teacher's lap and just say, "Hey look at this, do it," they would probably be bogged down too. You still have to figure out how it fits in and how it makes sense. And that does take a lot of getting used to what it is. Playing with it. I played with it on my own. I had to get really familiar with it before I let the kids do it.

Technology was an integral part of the lesson because of its interaction with both pedagogy and content.

The starting point for Wanda's movie-making activity was her PCK. In the past, students had used their Web-based research to write a research paper about an ocean animal. Wanda felt as though writing a research paper was important; however, she had come to believe that the activity did not support student learning as well as creating a video that showed the ocean food chain. Wanda stated:

And really it [the movie] accomplished my goal better than the research paper. Though they learned a lot of great facts about the animal, in a standards-oriented school situation, learning all these wonderful facts about the animals, individual animals, wasn't getting them better prepared for the standard itself. And I know we are not supposed to teach for the test but you know so early in the year most of my things need to be hitting in that direction. So in reviewing what they needed to know, this plan definitely went much better. I liked them writing an old-fashioned research paper. And probably would still come up with something else for them to write on but again, I'll find a topic that's more, instead of just any general animal, something that's more guided towards the standard.
So, even though she ultimately made a technological choice to support her pedagogy, Wanda’s initial concern was with the best way of having her students represent their content-based learning, which was a pedagogical choice.

Even in a small sample, then, differences in teachers’ TPACK is evident. Researchers are beginning to consider classifying different examples of TPACK as weak or strong (Cox, 2008). Niess (2008) has proposed a model, based on Rogers’ work on diffusion of innovations, which includes five different levels of TPACK. Cox writes, “The decision must be made as to whether or not the level of TPACK is a consideration when classifying examples as TPACK.” I would propose that rather than thinking in terms of levels or using judgmental terms such as “strong” or “weak,” a better way to understand TPACK is to consider which interactions (e.g., pedagogy and content, technology and pedagogy, or technology and content) seem to be more prevalent as teachers plan. This focuses attention on the teachers’ decision-making process and which areas of the framework were emphasized as they made choices between and among the three components and the four intersections. This consideration of process actively acknowledges the idiosyncratic nature of teachers’ knowledge. Park and Oliver (2008) describe teachers’ PCK as idiosyncratic, based as it is on the differing ways teachers combine the components as well as their individual experiences and knowledge. Certainly then, the addition of technology would only serve to add to this idiosyncrasy, making it difficult to characterize that knowledge as strong or weak, good or bad. Approaching examples of TPACK by considering teachers’ decisions seems to align better with the flexibility of the framework itself, which does not value particular pedagogies. By avoiding such judgments, TPACK can be useful for all teachers. As
Harris and Hofer (2009b) write, “The ways in which TPACK is cultivated and used should be as flexible and accommodating to the complete range of curricula and teaching approaches as possible” (p. 6). In this way, the TPACK model provides a conceptual framework for continued learning that allows for individual differences, an essential characteristic of successful continuing education for professionals (Houle, 1980).

Their uses of technology, as well as the processes the teachers used to determine them, reinforce much of what we already know about how teachers plan, while pointing us towards a better understanding of how to help them grow in their practice, both generally and through the use of technology.
Chapter Five

Connecting Past, Present, and Future

The good news of my study, especially for those who provide professional development for teachers in the area of educational technology, is that these 12 teachers, at least, are using technology in their teaching. If their difficulties getting access to computer resources are any indication, the teachers with whom they share those resources are also using them. Despite added time and glitches, the teachers in my study are finding ways to integrate technology into their instruction. These choices are made based on the content they are teaching, the resources which they have available to them, and their understanding of their students, both academically and emotionally.

These teachers are also interested in improving their use of technology in the classroom. All of them expressed their desire for additional training, as they had a shared sense of not using the technology to its greatest potential. Being part of the study helped some of them in this learning process, and through their comments, they revealed their own growth, providing examples of ontological authenticity, one of the criteria for evaluating nonpositivistic research. For Mark, the study challenged his preconceptions. Network capabilities had been a barrier in the past, but his experience with his lesson made him reconsider what he might be able to do with his students in the future. The
study gave Wanda a chance to consider doing something new, and despite her exhaustion at the end of the day, she was prepared to at least think about doing another digital video project with her students in the future.

For Carol, the study led to some specific action as well as recognition of opportunities to share with other teachers, demonstrating both catalytic and tactical authenticity, two additional criteria for evaluating nonpositivistic research. During the final interview, she reported that she had requested to have the Internet content filter turned off for the teachers in the fifth grade. During previous interviews, she had complained about how the filter was a barrier to locating resources. She commented, “It [the study] gave me the initiative to contact...the computer guy and say, “Listen, I can’t do my job until you’ve unlocked, taken all these things off my computer.” And they actually did that. Which helped me a lot.” By removing this barrier to access, Carol was able to use the Web to collaborate, which led to a change in the way she thought about that collaboration. She described that change, saying:

It’s made me aware of what I can do and what it has to help me. That I don’t have to start from scratch every time because there is so much collaboration out there with other teachers from all over the state. And I really didn’t look at it that way because I thought I’m taking somebody else’s idea but then I thought, that’s why it’s out there.

Carol had also begun sharing Web-based resources with other teachers in the school.

Here, then are examples of teachers reflecting on their practice; something that I believe should be built into any instructional design model or professional development
effort. Teachers possess, as we have seen in my small study, a wealth of knowledge, tempered by experience, on which they can build new learning.

One of the goals of my study of teachers was to develop a more detailed picture of teacher planning practices, especially as they relate to planning for the use of technology. The close-in view of teacher planning presented in the previous chapter provides details of the kind of complexity with which teachers grapple as they plan for classroom instruction. As we move from that narrow focus to a wider-angle view in this chapter, three conclusions can be drawn that reinforce much of what we already know about how teachers make decisions and link that decision-making process to current scholarship related to how best to organize professional development to support teachers as they learn to integrate technology. The conclusions are stated tentatively and related strictly to the teachers in my study. However, I believe they point to larger conclusions that may emerge as researchers continue to make connections between teacher planning practices and instructional design tools that will aid teachers in expanding their practices. These conclusions, which will be discussed in this final chapter, are as follows:

1. The teachers in my study generally followed Shulman’s (1987a) Model of Pedagogical Reasoning and Action as they planned for and implemented lessons in their classrooms. A renewed focus on this model, which is closely connected to PCK, the foundation of TPACK, might provide a way to bridge the gap between teachers and instructional designers.

2. The teachers in my study are incorporating technology into their existing practices and routines, and all their uses can be related to activity types, or what Harris (2008) calls “flexible design scaffolds” (p. 256). Like the reasoning model, these
activity types provide a connection between instructional design and teacher practice in ways that can help support and strengthen teachers’ planning and decision-making.

3. The teachers in my study were beginning to develop routines related to the use of that technology, sometimes to the point of transparency where they seemed to “forget” that they once considered interactive whiteboards and digital videos to be technology. These routines were all related to activity types and were able to be developed primarily when teachers had unrestricted access to technology.

These conclusions lead us from the past to the present and provide a view towards the future of how best to prepare teachers to use technology in effective ways in their classrooms. We begin with how best to model teachers’ practices, and for that we look to past research.

*Model of Pedagogical Reasoning and Action*

While I focused my study primarily on how teachers planned for instruction, I followed them through the entire process with one technology-enhanced lesson, as they moved from planning to instruction to evaluation. For all of them, the process followed that originally outlined by Shulman (1987a) in the Model of Pedagogical Reasoning and Action. The teachers began with their own understanding of the content, informed, as shown, by the ways the content had been interpreted by the state in which they worked. They moved into the transformation phase, engaging in all four of the subprocesses identified by Shulman, including preparation, representation, selection and adaptation, and tailoring to student characteristics. They applied these subprocesses to both nondigital and digital resources and tools. For example, during preparation, each
resource, whether it was the textbook or a Web site, was critically evaluated for its alignment with the curriculum. As they considered how to represent the content, they took advantage of the World Wide Web to locate different representations including digital images, videos, and simulations. Their selection of instructional activities increasingly included technological choices from the interactive whiteboard and document camera to computer labs and carts of laptops. Finally, all their choices—of materials, representations and activities—were grounded in their knowledge and understanding of their students’ needs, as a whole group but also as individuals.

The teachers also followed Shulman’s model as they implemented their plans in the classroom. The model describes four phases: instruction, evaluation, reflection, and new comprehensions. While formal planning ended once instruction began, the teachers continued to tweak their lessons based on their evaluation of student understanding and engagement. Sometimes activities that looked good during the planning phase did not have the effects that they thought they would. If possible, the teachers would make changes immediately. Otherwise, they would make notes for themselves as reminders for the following year. These notes provided the basis for the ongoing reflection in which all these teachers engaged. The goal of that reflection, simply put, was to become better teachers. Marion, for example, said, “And if I used something during the year, I either think on ways to improve it or make it more purposeful or change the way I'm using it if I notice that something didn't work quite well.”

In their updated pedagogical reasoning model, Feng and Hew (2005) added choosing technology tools as a separate process in the model. However, while my teachers did face special considerations when it came to using shared resources such as
computer labs, their approaches to determining when and how to use technology were similar to the approaches the teachers used with other resources.

Additionally, the ways the teachers incorporated technology supported their existing pedagogies, a practice that has already been identified in the literature (e.g., Olson & Eaton, 1987). Like the teachers in the Olson and Eaton study, my teachers were not resistant to using technology. These uses of technology supported their existing practices, while offering some additional advantages. So the teachers who were using interactive whiteboards often used them the same way they would use their regular whiteboard, but also took advantage of the interactivity to more completely engage students in the learning. Many of these interactive uses involved playing Web-based games; again, not a new practice but one that was enhanced through the interactive nature of the technology. Those teachers who discussed integrating digital video had all used regular videos in the past but found the ability to pick and choose from very focused video clips to be of great advantage as they collected resources to use with any particular unit or topic. Digital videos also offered easy storage and retrieval. Student research and publishing projects were all part of the regular classroom practice for most of the teachers; they incorporated technology primarily because of their perceptions that their students needed to know how to use these tools if they were to succeed in the future.

They did, however, as indicated earlier, exhibit what Feng and Hew (2005) call "caution" when using technology; their awareness of its unpredictability led to additional backup planning. However, they also connected that unpredictability to the practice of
teaching as a whole. Bonnie commented:

Like I've said before, the best-laid plans can sometimes change or don't even work. So you have to, as I've found after 17 years, you have to be flexible...you have to try to always be prepared and ready to adjust or change something around. Make sure that the children understand it. It's meeting the needs of what you are trying to teach. It's meeting the needs of the children. So, I think that's just a part of planning that you learn as a teacher. You keep rolling and going, and you don't let the little things hold you up...It's one of those lessons that you learn.

While Shulman's model was developed prior to the proliferation of digital technologies, it still offers a way to think about teacher practices and its descriptive nature allows for the idiosyncratic, recursive nature of both the planning and teaching process. He wrote:

Although the processes in this model are presented in sequence, they are not meant to represent a set of fixed stages, phases, or steps. Many of the processes can occur in different order. Some may not occur at all during some acts of teaching. Some may be truncated, others elaborated.

Shulman introduced the model at the same time as his notion of PCK. While the latter garnered interest among researchers and scholars, the model itself did not (Carlsen, 2002).

The model has been used as the foundation for other models such as the one proposed by Feng and Hew (2005) that incorporated educational technology. In addition, some evidence for the processes has been found (Bennett & Carré, 1993). In her study of pre-service teachers, Rusznyak (2008) found links between her participants' ideas about
teaching and Shulman's model of the process. Zeegers (2003) also found evidence for the model in her study of 3 science teachers.

Wilkes (1994) suggested that an understanding of PCK was not complete without recognizing its relationship to the reasoning process, a relationship for which he found evidence in the literature. Pointing to the interaction of the knowledge and the model, he wrote, "The view of the dynamics of pedagogy is found in Shulman's model and is particularly evident in the emphasis on processes involved in teaching and in the inclusion of action as well as pedagogical reasoning" (p. 2).

A similar process may underlie the concept of TPACK. Mishra and Koehler (2006), in words evocative of Wilkes, refer to the dynamic nature of TPACK. Robertson (2008) points to a process that underlies the TPACK framework. He writes, "While Content, Pedagogy, and Technology are each important and sustainable educational fields, they are not dealt with by educators equally or simultaneously" (p. 2218). The process he describes, which begins with content and then moves to pedagogical considerations, resonates with the planning phases of Shulman's model.

As we saw, one of the ways the teachers in my study differed in their TPACK was the decision-making processes in which they engaged as they planned. Perhaps now is the time to revisit Shulman's model as a way to consider the relationship between PCK and the processes that teachers use to transform subject matter for teaching. In addition, the model might help bridge the divide between instructional designers and teachers. It seems to meet Calderhead's (1987, 2003) requirements for a "realistic" (1987, p. 4) model that focuses on designing, implementing, and maintaining learning activities.
Teachers' Use of Activity Types

Another possible way to bridge the gap between teachers and instructional designers might be through the use of activity types, which as described in Chapter Two, are a more "teacher-friendly" version of activity structures (Harris, et al., 2007). These structures can be used to characterize interactions in the classroom. Harris and Hofer (2009a) link activity types to instructional design tools, describing them as "conceptual planning tools for teachers" (p. 101). They have developed taxonomies of "content-specific activity types that incorporate appropriate uses of the full range of digital technologies for each predominant curriculum area" (p. 101). The teachers in my study did not have access to these taxonomies as they created their technology-enhanced lessons. It is, however, possible to classify each lesson using these taxonomies, which organize specific activities into more general categories.
### Table 4:

#### Teachers' Use of Activity Types in Planned Lesson Activities

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Planned Lesson Activities</th>
<th>Curriculum Area: Activity Type Category/Activity Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carol</td>
<td>Used a digital game to review for a grammar test</td>
<td>K-6 Literacy: Writing Conventions/Grammar (Schmidt, Harris, &amp; Hofer, 2009)</td>
</tr>
<tr>
<td>Michelle</td>
<td>Used a digital game to review for a quiz on prefixes</td>
<td>K-6 Literacy: Vocabulary/Vocabulary Awareness (Schmidt, et al., 2009)</td>
</tr>
<tr>
<td>Kelly</td>
<td>Used the interactive whiteboard to review a grammar activity</td>
<td>K-6 Literacy: Writing Conventions/Grammar (Schmidt, et al., 2009)</td>
</tr>
<tr>
<td>Mark</td>
<td>Students researched an important person related to the Industrial Revolution and created a newspaper article in Word</td>
<td>Social Studies: Knowledge Building Activity Types/Research Product-Oriented Divergent Knowledge Expression Activity Types/Create a Newspaper/News Magazine (Harris &amp; Hofer, 2009a)</td>
</tr>
<tr>
<td>Bonnie</td>
<td>Students published a brochure about voting</td>
<td>Social Studies: Product-Oriented Divergent Knowledge Expression Activity Types/Design an Exhibit (Harris &amp; Hofer, 2009a)</td>
</tr>
<tr>
<td>Amy</td>
<td>Used a digital game to review for a test on the 13 colonies</td>
<td>Social Studies: Convergent Knowledge Expression Activity Types/Complete a Review Activity (Harris &amp; Hofer, 2009a)</td>
</tr>
<tr>
<td>Deirdre</td>
<td>Students used blogging software to write and solve word problems</td>
<td>Mathematics: The “Produce” Activity Types/Develop a Problem (Grandgenett, Harris, &amp; Hofer, 2009)</td>
</tr>
<tr>
<td>Beverly</td>
<td>Used an online review program to assess student knowledge of seventh grade math problems</td>
<td>Mathematics: The “Apply” Activity Types/Take a Test (Grandgenett, et al., 2009)</td>
</tr>
<tr>
<td>Marion</td>
<td>Students used Web sites to answer research questions related to the oceans</td>
<td>Science: Knowledge Expression Activity Types/Answer Questions (Blanchard, Harris, &amp; Hofer, 2009)</td>
</tr>
<tr>
<td>Samantha</td>
<td>Students completed an online simulation to classify organisms</td>
<td>Science: Conceptual Knowledge Building Activity Types/Do a Simulation (Blanchard, et al., 2009)</td>
</tr>
<tr>
<td>Susan</td>
<td>Used a digital video to review fossils</td>
<td>Science: Conceptual Knowledge Building Activity Types/View Images/Objects (Blanchard, et al., 2009)</td>
</tr>
<tr>
<td>Wanda</td>
<td>Students created a digital video to illustrate a food chain found in the ocean</td>
<td>Science: Knowledge Expression Activity Types/Do a Presentation or Demonstration (Blanchard, et al., 2009)</td>
</tr>
</tbody>
</table>
As can be seen in Table 4, each teacher used at least one of the identified learning activity types to structure the technology-enhanced lessons used in the study. These identified uses of activity types within my study supports Harris’s (2008) contention that structuring professional development around activity types can draw from teachers’ existing PK while “simultaneously encouraging open-minded consideration of new instructional methods, tools, and resources” (p. 267). Because this approach is based in the ways teachers already plan, beginning with content, then moving to pedagogical and technological concerns—a process reminiscent of Shulman’s (1987a) pedagogical reasoning model—it offers teachers a way to think about their practices that will be familiar, even if they are being introduced to new methods. Harris and Hofer (2009a) describe the process as follows:

In the activity types approach, educational technology selections are not made until curriculum-based learning goals and activity designs are finalized. By selecting the technologies that best serve learning goals and activities last, both students’ learning and maximally appropriate educational technology uses are assured, with the emphasis remaining upon the former. By focusing first and primarily upon the content and nature of students’ curriculum-based learning activities, teachers’ TPACK is developed authentically, rather than technocentrically (Papert 1987), as an integral aspect of instructional planning and implementation (p. 101).

Harris and Hofer (2009b) make this connection in their own study of teacher planning. They write, “The results of this study suggest that a content-based, activity types approach to technologically inclusive instructional planning is compatible with existing approaches to teaching” (p. 22).
Using activity types to structure professional development and support teacher planning also helps address the issue of time—something my teachers worried about and never seemed to have enough of for either planning or instruction. Harris (2008) writes:

In this way, teachers can function as designers in time-efficient ways that accommodate the nature of their daily schedules, which unfortunately, don’t allow sufficient opportunities for as much in-depth, design-based planning as teachers may wish to do, or as teacher educators may recommend (p. 263).

Finally, because activity types are grounded in content, they also address the demands placed on teachers by the state curriculum standards.

Professional development structured around teacher practices takes into consideration the individual ways that teachers implement instruction in their classrooms as well as the resources they have available to them. It does not privilege one type of practice over another, but offers teachers a flexible way to think about their practice. As Harris (2008) points out, it will probably not lead to transformational change, since it is likely that teachers will be attracted to practices that are similar to their own. Many of these uses would probably not pass muster with some educational technology writers who often link technology use to pedagogical transformation (Harris). Yet, if the goal of technology-related professional development is to encourage technology use rather than pedagogical transformation, curriculum-based activity types provide a sensible approach.
to that work. Harris writes:

To accomplish a goal of better or more extensive technology integration does not necessarily require a philosophically transformative agenda for professional development. Instead, the primary goal of such professional learning and reflection could be to develop and act upon TPCK in and to whichever forms and extents experienced teacher practitioners choose (p. 268).

This is professional development that would treat teachers as professionals, recognizing and building on their knowledge of content, pedagogy, and technology even as it introduces them to a wider range of activity types.

From Activity Types to Routines

For most of the teachers in my study, the use of technology in support of both planning and instruction had become part of their routines. As discussed in Chapter Four, all of the teachers in the study had developed routines related to their teaching similar to those described by Yinger (1980). These routines revolved around planning, instruction, and classroom management. Important to this study is the way that teachers were beginning to incorporate technology into those routines. The teachers had begun to develop routines around the use of the technology itself, including how to manage student access to it and instruct students in its use. For Wanda, this meant using “cheat sheets” that guided students as they worked independently on the computer. Samantha and Bonnie did not use written directions, preferring instead to demonstrate the technology to the full group before letting students go to work. When Marion’s routine of taking students to the computer lab or using the laptop cart to do research was disrupted, she found herself apprehensive about adopting the use of cycles. The computer lab and cart
were her "security blanket," and despite her willingness to try new things, she was fearful of making this particular change.

Deirdre’s and Wanda’s exhausting experiences with managing fifth graders on computers provide some insight into how these routines develop. As they reflected on the lessons they taught, both of them were brainstorming new ways of organizing for and managing student use of computers. Deirdre, who took charge of distributing and collecting laptops, was considering ways to involve students more in the process. Wanda, who worried about the time wasted shuffling students to and from the computer, was thinking about how she could make better use of the laptop cart available to her. As described earlier, this brainstorming showed that both Deirdre and Wanda were developing their TPK in the area of managing student use. This process may eventually result in the creation of routines that can be reused in future activities.

The teachers in my study were also beginning to develop instructional routines that included technology. A link between activity structures and routines has already been made tenuously in the literature (Chapman, 1993). As noted in Chapter Two, there are both similarities and differences between teacher routines and activity structures/types. The first is essentially a way to think about teacher planning while the latter is envisioned as a professional development tool (Harris, 2008). Routines, as described by Yinger (1980), are not related to content, while activity types incorporate content.

Some of the technological pedagogical routines used by the teachers in my study were content-specific, however, and thus help make the link between routines and activity types. One prevalent routine use of technology in instruction was using technology to provide students with different representations of content. The math,
science, and social studies teachers all described their reliance on technology for easy access to multiple representations including images, multimedia presentations, and video. The activity types (Hofer, et al., 2009) for these three content areas each include an activity related to viewing images or presentations. In social studies, viewing presentations and both still and moving images are classified as knowledge building activity types (Harris & Hofer, 2009a). Science, similarly, includes viewing presentations and both still and moving images, which are classified as conceptual knowledge building activity types (Blanchard, et al., 2009). For math, the “attend to a demonstration” activity type is part of the “consider” activity type category (Grandgenett, et al., 2009). The teachers used laptops, digital projectors, and interactive whiteboards to present these different types of media.

The other prevalent routine use, mentioned by all the teachers in the study and demonstrated in four of the teachers’ planned lessons, was to integrate technology into review and assessment activities, an activity type found in all four content-area taxonomies. This integration took two forms. The teachers all mentioned using digital games—either premade or teacher-made—for quiz and test review, either in whole group or individualized instruction. In addition, they discussed using Web-based assessment tools to administer tests using either computers labs or carts.

Developing instructional routines related to technology use was easier for teachers who had access to technologies within their classroom. Several were beginning to incorporate presentation technologies such as digital projectors, document cameras, and interactive whiteboards to the point of transparency, meaning that they did not really think about them as technology any more because they had become such an integral part
of their teaching. Beverly, for instance, had structured all her daily lessons around the interactive whiteboard, using the software that came with it to organize and present those lessons. Susan and Deirdre suggested that they did not plan specifically for using their document cameras. They used them almost every day in ways that made sense to their instruction. Samantha, in particular, found it difficult to discuss how she planned for the use of her interactive whiteboard. When first asked about her technology use, in fact, she failed to mention the board. She commented, “I didn’t even think about it because you just use it. It’s there. You use it.” Once she had created her activities using the software, she could use them from year to year, tweaking as necessary.

The transparency of these technologies was also evident in comments that the teachers made about their ability to use technology on the spur of the moment. Mark described pulling up Web-based images “on the fly” to illustrate the content. He commented:

I'll pull up new images and Google something and I'm sure I'm going to find a couple of appropriate pictures. Pop it up, turn on the projector and say, “Here you go, chung, chung, this is what I'm talking about.” Or a document. This is what I'm talking about. If you want to check it out, it's here.

Wanda admitted that because she could be assured of almost always finding an appropriate video in the online database, she did not always locate or plan for videos in advance, but if she found herself with a few minutes at the end of class, would do a quick search for a video to share with her students.

That assurance—that both hardware and software resources would be available when they were needed without advance planning—contributed to the routinization of the
use of these digital technologies. In rhetorical terms, the teachers had begun to look through the technologies, incorporating them somewhat seamlessly into instruction. That qualifier—"somewhat"—must be included, however, as all the teachers reported issues with technologies such as interactive whiteboards and digital videos that sometimes rendered them completely opaque. On days when the network was down, Beverly, who was unable to access her files, found herself wondering how she used to teach the upcoming lesson. Teachers like Deirdre and Susan, who despite the fact that they used their document cameras and digital projectors almost every day, worried about losing the hardware since it was not officially theirs. If someone else wished to use it, they would have to give it up, and Deirdre commented that she would cry if that happened. Mark, who did have full-time access to a laptop and projector, expressed frustration that an increasingly restrictive filter was making it difficult to locate images and videos on the spur of the moment. He said:

My understanding is this should enhance instruction, instead of hinder it. If it's going to enhance instruction, you need to be able to grab something quickly and use it when it comes in. You're not always going to plan ahead, oh I need this stuff. I need this picture. I mean it's great when you do and usually when I take kids to the lab I want to make sure they are going to be able to do something with it. But if you think of something in class and you've got the laptop and the projector there you should be able to go screening through a couple of things real quickly and then put them up on the board for them. But we're not there yet. We're working on it.
Ultimately, these issues related to access kept the digital technologies from becoming completely transparent. Having to plan ahead to schedule labs, worrying about losing classroom technologies such as digital projectors, and grappling with interactive whiteboard glitches forces the teachers to look at the technology, and that gaze sometimes leads them to choose not to use technology even when they feel it is a better way to support pedagogy and content. Because they cannot rely on it, they hesitate to make it integral to their instruction (Zhao & Frank, 2003). We know that we cannot ensure use simply by providing access. Robust, reliable access, however, can help reduce unpredictability and allow teachers to more confidently plan for technology use (Cuban, 1999; Zhao, Pugh, Sheldon, & Byers, 2002).

With robust access in place, professional development designed to develop teachers' TPACK through the use of activity types can further build confidence in the curriculum-based use of educational technology. The teachers in my study were not resistant to using technology. They were planning for and using technology to support teaching and learning, but they were doing so in ways that supported their existing pedagogies. In some cases, they had adopted these technologies nearly to the point of transparency. But they also knew there was much more for them to learn. Activity types can contribute to their learning by increasing their awareness of the many possible ways that technology can support content-based classroom activities (Harris & Hofer, 2009a).

**Conclusion**

Why is it important to understand teachers' experiences related to how they plan for the use of educational technology in their classrooms? Despite the widespread availability of digital technologies in the schools, teachers continue to feel uncomfortable
with using them as part of instruction (Thompson, 2005). The goal of this study was to take a close-up view of what the rhetorical act of teaching encompasses, particularly in terms of the planning process. What happened as teachers moved from learning about technology to using it to support teaching and learning? How did they demonstrate their knowledge as they planned? The study attempted to yield a rich picture of contemporary teacher practices related to educational technology.

Readers of the report, however, will co-construct the results, so communicating the sense that I make of the participants’ experiences of the phenomenon of technology integration is a fundamental goal (Stake, 1995), since it is my report of the study’s results that they will use to construct their own interpretations and generalizations. Stake suggests that, while it is impossible to know who will ultimately read the results and what their reactions might be, it is possible to anticipate a reader and her reactions. In the case of this study, possible readers might include educational technology researchers and scholars as well as personnel in school districts responsible for technology-related professional development. For the researchers and scholars, the findings will provide an understanding of the teacher planning process that can be used to develop new research designs. Such future research might focus on studying particular interventions in the technology integration process, including the impact of different types of professional development such as curriculum-based activity types, work already begun by Harris and Hofer (2009b). Likewise, I would anticipate that the findings would help school-level technology personnel as they consider how best to help teachers become more comfortable using technology in the classroom.
In the end, however, I return to my fundamental concern with providing rich
description of the complexity of the rhetorical act of teaching, especially as it relates to
planning for the use of technology in the classroom. Authentic research such as this will
help to undermine the unfair generalizations that paint teachers as technological Luddites
living in a digital world.
Appendix 1: Researcher as Instrument Journal

I delivered my first educational technology workshop nearly 20 years ago when I taught my colleagues in my high school English department how to copy and paste questions from a test database into a word processing document. I was the youngest member of the department and had had experiences with computers as part of the three years that I spent in the private sector prior to becoming a teacher. I had something of a predilection for technology that only increased when I married my husband, a computer professional. Over the course of the past two decades, I have played an active role in educational technology, first as a classroom teacher, and now as an educational technology consultant who has worked with a variety of educators in a variety of settings with a variety of technologies and is beginning her first research related to teachers and technology. I have watched technology move into both the classroom and the culture in sometimes unbelievable, but always-awesome ways. In examining my perceptions, beliefs and values related to technology, both of these realms—classroom and culture—are important.

While Mackey (2002) suggests that the camera metaphor is rather "shopworn" (p. 198), I think, like she does about her own work, that it is an appropriate metaphor to use for this statement. A fundamental personal concern is with providing a richer picture of teachers and their use of technology for teaching and learning. Through this statement, I will provide a similarly rich picture of my own experiences with and understandings of technology and education. Mackey describes the action of the camera when she writes, "If we think of a camera focused in close-up on an activity and then gradually panning backwards, it becomes relatively straightforward to picture a complex encounter" (p.
198). For the purposes of this statement, the camera close up will be on my individual, ongoing experience with educational technology that has informed my perceptions, beliefs, and values. But my individual experience has taken place in an historical moment, one that many seem to feel is a time of unprecedented technological change seems to be changing the way we think about everything (see Friedman, T., 2005; Jenkins, H., 2006). In fact, were it not for technology, I might still be teaching high school English! I am going to begin this statement then by panning backwards just briefly to show how my individual experience is situated in the larger cultural changes, since my relationship to those changes informs my beliefs and values as they relate to technology.

I was born in 1962, the year that Marshall McLuhan published *The Gutenberg Galaxy*. McLuhan’s overarching theme was the experience of living at the edge of two cultures: print and electronic. Recently, Henry Jenkins’ new book, *Convergence Culture: When Old and New Media Collide*, arrived on my door step—I had, of course, ordered it online—and on the cover was a quote from Howard Rheingold, “Henry Jenkins is the 21st century McLuhan.” I have lived long enough, it seems, to witness two technological revolutions, and, as the camera begins to pull in for a more individual focus, the picture emerges of the way my own life reflects what it is like to live in that maelstrom, pulled between two cultures.

For example:

- I am a bibliophile whose walls are lined with printed texts. Given my “druthers,” I am more comfortable reading printed text. But, I keep my reading list and card catalog on the World Wide Web, using a collaborative “Web 2.0” tool called Library Thing. It allows me to track and share my reading with others all over the
world. I order all my books from online booksellers who, like good librarians, always have great recommendations when I stop by. Last year, I did purchase an electronic reading device and have found that its size, display and search and annotation abilities appealing. I have read several books on it and I use it to hold several newspaper and magazine subscriptions.

- When I first began using a computer, I saw it almost strictly as a writing tool that, as you will see, mostly supported the publishing phase of the writing process. But now, 20 years later, computer technology supports almost every thing I do from listening to music, watching television and organizing my calendar and to-do list. It’s a writing, learning and communications tool.

- My father worked for same company for 46 years, his entire career. I’m about 20 years into my working life and am on my 7th or 8th job. For my father, working meant going to a central location where everyone worked for a certain number of hours each day. I, meanwhile, can—and do, it seems—work from anywhere. As I type these words, I am sitting in a public library, taking advantage of their wireless network to get some work done in between meetings.

- Finally, while my family was one of the first on the block to own an Atari computer game and I spent lots of time batting that little white ball with the little white paddles, I never joined the gaming generation the way my nephew, who is exactly 26 years younger than I am, did. Even now, I have two computer games—Flight Simulator and World Civilization—still sitting in their boxes on the shelf. I am interested in the literature on gaming but never got hooked myself.
When I do play computer games, they are really just virtual versions of real-world games like crossword or jigsaw puzzles.

If we focus the camera in just a bit further, we discover that I have watched the technological explosion through the lens of an educator. So, we trade wide angle for telephoto lens, and focus all the way in, on a classroom view. That’s me, two decades ago, in my first classroom where I was teaching high school English. I’m standing in front of an honest-to-goodness chalkboard, reading from a hardbound literature textbook, students following along, taking pencil-and-paper notes. I started my education career as a pretty traditional English teacher in a pretty typical urban high school that, pretty typically for 1988, had only a few computers available to teachers and students. By the time I left the public school classroom 13 years later, I was teaching in a computer lab where every student used a personal computer to do all manner of learning and creating. Understanding that transformation is key to understanding my perceptions, beliefs and values related to educational technology and its use by teachers in students.

While we did not have many computers in those early days, we did have access to lots of other technologies including transparencies, filmstrips, reel-to-reel movies, videotapes, television programs, records, and cassette tapes. Over the course of my four years, I ended up using most of these technologies as part of my classroom teaching in hopes of engaging my students and enhancing their learning. I don’t think I was aware of Howard Gardner’s work in multiple intelligences, and “differentiating instruction” had not yet entered the popular vocabulary. I was using technology mostly as a way to appeal to my students, who I perceived as generally being bored by the traditional English curriculum to which they were being subjected. While I usually used the technology for
whole-group presentations, I did experiment with student video production. As part of a contest, my students wrote and produced 30-second public service advertisements, which we videotaped and edited using the school's cumbersome analog video camera.

By then, I had had my own personal computer for nearly 3 years and had been using computers since my junior year in college when a computer science major showed me how to type papers using the mainframe computer on campus. He had convinced me to abandon my state-of-the-art Selectric typewriter on the kitchen table to head to one of the terminals on campus, extolling the virtues of something called word processing software that, he assured me, would make White Out a thing of the past. I was hooked from the minute I typed my first word and have never really looked back.

Except when I do look back now, I realize that, while I embraced the technology, I did so in a typewriter-like way. I still continued to do most of my drafting using paper and pencil. I would write at home then head to campus to type. I did do some editing as I entered the text into the word processor; however, major revisions were made on a printed copy of the draft. Part of this process was because of the limited access to the computers. But, part of the process was also due to my own writing practices that had been developed in a time when computers were not available. My high school research paper and all my college papers up to that moment had been written and edited in long-hand and then typed on that Selectric. (I had taught myself to touch type using my mother's typing textbook so I was pretty proficient and even managed to make some money of the side by typing papers for others, a job that I just realized probably no longer exists on college campuses. It has, to use Tom Friedman's (2005) idea, been outsourced to the past.)
It was only after I bought my own computer—which I did after I got one on my desk at work and began tinkering with it—that I began to really make any significant changes to my writing process, sometimes beginning drafts of papers on the computer rather than the legal pad. Now, my writing process is much more electronic. I still like to start with paper-and-pencil notes and find some daily long-hand writing to be helpful to my thinking, but I also use concept mapping software to brainstorm and outline, speech recognition software to enter words, and collaborative software to write with other people. Rather than simply supporting the publication phase, technology is now integral to the entire process. But, it was a process that I grew into over the course of many years; it was also a process that was aided by access to technology.

That fact—that, in order to use technology effectively, teachers must have access to it on a regular basis both for themselves and their students, forms a core belief for me. When I started my first job out of college in 1984, I worked in a public relations office. Within six months of starting the job, I, along with everyone else in the office from the boss to the mail clerk, got a computer on our desktop. There was no question that we each had to have our own if we were going to make use of it. I look back now and try to remember how long it took before, as a teacher, someone decided that I needed my own computer. It was many years, it seems, and when I did get it, it was only because I needed it to take attendance. If I chose to use it for other stuff, then that was good, too. I think teachers have often been short-changed when it comes to access, and that if they were provided with the same kind of technology that is expected in business, they would begin to use it in ways that we haven’t even thought of yet!
Access, however, doesn’t show that whole picture. I believe that individuals do have certain dispositions towards technology, and the evolution of my writing process is important because it uncovers my own evolving relationship with technology. I am considered a “techie” by my colleagues and friends, and it is easy to think that I was always that way or pigeon hole me in terms of technology. But, like most people, my adoption took some time. And, in some areas, such as cell phones and computer gaming, I am way behind the technology curve and could even be considered a non-user. I suspect this somewhat complex pattern of adoption is true for others, and I believe that a better understanding of how teachers plan for the use of technology will help fill in this pattern.

So, how do all these experiences shape my perspective as a researcher, especially a researcher whose plan is to investigate the planning practices in which teachers engage, especially related to the use of technology? I want to develop a rich picture of those relationships and practices, lengthen the depth of field so the complexity comes into focus. I am hoping to find another way to approach to understanding Technological Pedagogical and Content Knowledge (TPACK). My ultimate goal is to come into the world of my participants, particularly the teachers, without judgment or pre-conceived stereotypes. This approach, which I believe honors the individuality and diversity of teacher practice, is unusual, it seems to me.

Many of my colleagues in the field of educational technology present a black and white picture of the classroom. In fact, Seymour Papert in *The Children's Machine* uses photography to compare classrooms from the 50s and the present day. Each photo displays a “typical” classroom with wooden desks in rows, facing the front. In my opinion, Papert’s comparison is more important because of the lesson it teaches us about
the power of the visual. A quick Google search on "classrooms" revealed a variety of configurations, some which even included laptop computers for each student. I believe that the contemporary classroom is much more diverse and complex than Papert's photos would lead us to believe.

To listen to the persistent voices in my own field of educational technology, however, nothing has changed, with the classroom remaining a technological wasteland where traditional notions of literacy reign. I just don't think that's true. I have, in the past 20 years, had the chance to work with lots and lots of teachers who were excited about the possibilities of technology for both them and their students and spent many hours of their own time learning what they could and working to overcome technical barriers so they could get technology in their classrooms. The picture presented by many educational technology writers is simply too black and white. Those photographs that Papert shows us include gray areas. And we need to see the grays if we want to come to an understanding of the complex relationship of students, teachers, classrooms, and technology. One fundamental value that underlies my research is the desire to uncover those gray areas and bring the views of my participants into focus.

I am particularly interested in presenting the voices of teachers. Frankly, I think teachers get a bad rap, and I am really hoping that, by getting at individual cases, I can show the diversity that I believe exists. I believe we each engage with technology in different ways, and that's what I'm hoping will be revealed. I have a particular interest in planning because it seems to be something of a "black box" in terms of teacher practice. As a professional developer, I work with teachers before they do any detailed planning. While they may be required to create a written lesson plan, it is often rather artificial and
may not get implemented. I do not have the opportunity to see them planning in action, and I wonder what happens during that process that might make the difference between a teacher who chooses to use technology and one who does not. What happens when a teacher sits down in the afternoon and thinks about what she plans to do the next day or the next week? When and how does she consider technology? And, if she does think about technology, what leads her to choose or not choose to use it?

However, I recognize that my research could reveal that teachers are really anti-technology, that they do resist technology use and denigrate student culture. I can live with that. It would be important information for professional developers who need to understand the context of the teachers with whom they work. If teachers are not planning for the use of technology, what needs to be done to change their planning practices? Generalization is not my primary goal; I hope that reduces the temptation to make sweeping statements about teachers and technology.

What I hope to accomplish with my research is to prompt other educators to examine their relationships to technology and understand that it is a living relationship, one that changes over time. I’ll close with one final picture from my own life that tells of the moment recently when I realized how my own planning practices were changing in response to my new own developing knowledge.

There I am, standing in front of a group of students, just a few days ago. I am teaching a technology class to a group of undergraduate students who are aspiring to be elementary and secondary teachers. It is a course I have taught previously. And, it is a course that has changed pretty radically over the years. Its early iterations were very skill-oriented, concerned with teaching the students how to use tools. This semester, learning skills are
subsumed in a larger theme of linking technology use directly to both content and pedagogy. My planning for the course has been influenced by my own developing TPACK. I wish to discover how other teachers experience the planning process, especially as it relates to technology.
Appendix 2: Verbatim Transcript Examples

Initial Interview with Amy, 6th Grade Social Studies, September 16, 2009

K: Tell me about your history as a teacher. How long you've been teaching. What you teach.
A: This is, oh goodness, I don't know if it's my 8th or 9th year at this point. It's my 8th or 9th year teaching. I started in another school district with sixth grade language arts and science. And then science is not really my strong suit per se so the next year actually I was looking for younger students. They moved me down to fifth grade. And I taught fifth grade science and social studies. And then after that I kind of switched to just social studies. So it was kind of a progression to social studies. And after being in fifth grade for about five years I decided I wanted to try even younger. I tried second grade and decided no I maybe should move back and middle school is actually my niche. So last year I came here to teach sixth grade and it was just social studies last year. Then this year they are kind of revamping the schedule or trying to get more time in math classes across the board so we've now had to take on two subjects. So I'm back to science again. So I'm science and social studies again this year.
K: And how many sections of each do you teach?
A: I teach two sections of science and four of social studies. And it works out kind of nice. In the morning I have the same group of kids for first and second period so I teach them social studies and science and then I switch groups and do the same thing with another group and teach them social studies and science. And then afternoon is just social studies.
K: My primary interest is in educational technology so how, if at all, do you use technology in your classroom?
A: I try to use it as often as I can. And I try, resources seem to be limited, so there's always, are you using the lcd today or that kind of thing? I had used it on Tuesday. We were talking about primary and secondary sources so I pulled up some primary and secondary sources online and was showing them through the lcd projector. I've taken kids to the computer lab to work on that or to review for a unit. After we've completed a unit, we go in and work with a review websites. There's lots of fun games and stuff for them to review the information that way. One of the teachers here is trying to get us all to use the smartboard more often so she's trying to come up with some lessons to pull the SMART Board in. I've done powerpoint presentations, that kind of thing, with them too. I had a project they did last year with native americans where the groups could decide what visual representation they wanted to use. Some of them decided to create models but some of them did do powerpoint presentations too so they were creating their own. I try to pull from the things that I can, when I can.
K: So when you say resources are limited, you mentioned the lcd projector. Talk a little bit more about that.
A: We basically have one lcd projector per grade level. And then I think a few other teachers they have one. I think another teacher in seventh grade has an lcd projector and SMART Board in her room. So, we know we always have one per grade level but there are others and I think we may have lcd projectors in the library that you can check out. But again it's not...you kind of have to plan ahead of time so you can say I need it for this day. You're not going in that day and saying I need this and someone's already checked it out.
K: How many teachers share the one in your grade level.
A: There's five of us.
K: And how do you all divvy it up or plan to get that projector?
A: Well, with all of us teaching two subjects now there is always at least one other person teaching the same subject so we have team planning times on Thursdays. Certain subjects plan on Fridays. Other subjects plan so we can talk then. OK, what day do you want to use it? What day do you want to use it? So we're kind of sharing resources in that sense. I may not have an idea of how I'm using technology when we meet but one of the other science teachers may say I have a lesson that uses this and we kind of rotate stuff around.
K: And is somebody else teaching social studies?
A: Yes another teacher is also teaching social studies. One section of it.
K: So while we are on the subject of resources. The SMART Board? How many of those are available to you?
A: We have one in the computer lab so we can always rotate that through. I don't know if there is another one in the library or not.
K: So if you wanted to use a SMART Board, you'd take your kids into the lab?
A: Yes.
K: And how many computers are in the computer lab?
A: I don't know. And not all of them are in there working. So I think probably around 18 working computers. Usually you can get a class in there and have a computer for everybody. Every once in awhile you may have to double up if you have a larger class or the computers don't want to cooperate that day. Usually you can have each student with their own computer.
K: And same procedure for getting the lab as for getting the projector.
A: Yes. We do have in the workroom, we have a calendar up there and if you want to use the computer lab for a day you just sign up for that day on the calendar.
K: Do you ever have trouble getting it when you need it?
A: Not usually. I mean I really don't remember a time when I wanted to us it and someone was in there. And it's usually pretty adjustable. If they are using it this day, you can adjust your plans by a day or two so it's usually not a problem to get in there.
K: And you said you do online review? Can you say a little bit more about that?
A: It's a website. You do have to have a subscription to it. My district does. It has a lot of fun activities that are standard correlated. There's who wants to be a millionaire games and hang man and drag and drop activities. Things that kids really get excited about. So, it's fun for them to do and it's also reviewing the standard information at the same time. Matching type things. Fill in the blank. There's crossword puzzles. Stuff like that. But they are actually doing it online so they have fun with it.
K: And other things you said you did? The native american project? Did you use the lab for that?
A: We did use the lab for that. We took several days. Now for a couple of my class periods, I only had one or two groups that were choosing to do a powerpoint so we stayed in here and they just used the computers in the classroom. But one of my classes I think every group opted to do the powerpoint so we were in the lab for that. It just depended on how the dynamics of the class were dealt. A lot of them chose to actually make models so they were actually painting and stuff like that so they were on the computers. So they had the option. And some did a combination. They were using the computers to find pictures and information to then use in their models. So some used a combination.
K: In your classroom, I'm looking around. Tell me what technology you have.
A: My laptop. And then the two computers.
K: And if we used a wider definition you have an overhead projector and a television too.
A: They are going to start doing the announcements through the tv. We're auditioning today for the cast members.
K: So, any other things you do with technology. We talked about using websites for review. We talked about you making powerpoints.
A: There are other website occasionally that I'll use. There's a website on Jamestown that I'll use. I had a girl who was labeled MR last year and she was put into my social studies class just for socialization. She wasn't graded. And we used the Jamestown website with her. She could really do things on the computer. A lot of times when my kids were testing and she wasn't taking the test, I'd have her working on a website on the computer. Like I said there are different websites. I can't think of them offhand but there are certain websites I've found that are good. I did the primary and secondary sources unit off the library of congress website. Then there's another link to primary sources: gilderman collection. something like that. For primary sources. And throughout the year if I find a website that will be helpful. United Streaming videos, I also use because they are pretty good.
K: And the two computers in the back. You mentioned them for the native american project. Anything else you do with them?
A: They are used for taking AR tests. Accelerated Reader. Different things. Sometimes if a group finishes an assignment, I let them use the computers. I also do a current events assignment every week in social studies and they have to find a newspaper article and then there's a little sheet I have them write up the main idea of the story and other facts or details. The when, the where, all the important information. And I also gave them a list of websites that were good that they could use for that also. So they can use the computers in home room sometimes to do their current events.
K: So thinking about how you use it, what's been your experience with using educational technology?
A: Overall good. I think sometimes we don't have as much training as we might need to on certain things. Or we'll have a training but by the time you actually get to use it, you've forgotten a lot of the hows. I think
that would be my only, other than limited resources, is having enough training or refresher courses on how to use it.

K: do you have a specific example?

A: Like the SMART Board. Since I don't use it on a regular basis, when I do go to use it I'm kind of like ok how do I do this again? That kind of things. I can usually ask another teacher who I know has used it to get me through the initial set up. I know that the principal is purchasing Exam View for tests.

K: What's exam view?

A: There's a database of questions that are standard correlated so that we can pull from. And we can also input our own questions. And you can set it up so the kids can go and actually take the test in the computer lab so it will score it for you and give you a percentage that missed a certain question. That kind of thing. He also purchased one of the things where you can actually use it as a classroom, I don't know the word, it's got the remotes and you can have them actually punch in things as you go and then you can talk about it as you go. They are going to be rotating that through the building also. As a teacher uses it and learns how to use it, they are going to train the next person on it on how to use it.

K: Have you ever used one before?

A: No. And we did have some training on the exam view but it was kind of like, they are showing it to you but until I actually play with it, it wasn't going to mean as much to me.

K: Say a little bit more about what you mean when you say you had some training?

A: For exam view we had an afternoon training. It was like 1 to 3:30 and the other problem with that is that it was when we were trying to get ready for the beginning of school and so we hadn't had much time in our classrooms yet. So we're worried about getting our classrooms ready to go and getting ready for the first couple days of the kids being here so I was just like tell me the basics and let me go play with it on my own so I can figure it out.

K: So besides training, any other good or bad experiences with educational technology.

A: Overall when I have used it I have had good experiences with it. I am just constantly trying to get myself to find ways to incorporate it more in the classroom. I think sometimes we get kind of stuck and we do things a certain way. How can I bring this in and you have to constantly remind yourself to try to do that.

K: Define good experience. Can you talk a little more about that.

A: When I was doing the lesson with primary and secondary sources and actually getting to show them online the pictures of primary resources that are out there and available for them to use. I think it did register with the kids and they did really well on the quiz on primary and secondary sources. I think that overall lesson went pretty well. Giving them that visual helped.

K: Had you done that lesson before?

A: Yes. I had done the library of congress but I hadn't had the other website, the gilderman website. So I used the library of congress and they had some examples but then I was able to pull some other examples that went really well with the kinds of things we'll be talking about this year. And it was things that were interesting to the kids. I think having that website helped boost the other one as well. So they kind of work well together.

K: and how did you find out about that website?

A: My husband. He sent me an email saying this looks like a pretty good website for primary sources. Let me know what you think. He came across it and forwarded it to me.

K: And the library of congress website?

A: I actually went into google and typed lessons on primary and secondary sources and that one came up and it was a good one.

K: anything else about your use of educational technology or your experiences with educational technology.

A: Not that I can think of.

K: Now think about your students. How, if at all, do you think your students use technology either in or out of school?

A: I think some of them know more about technology than I do. They seem to come. It blew my mind when I was doing my student teaching and I did six weeks in kindergarten and these kids can type their name but they can't write it. It was phenomenal. But a lot of them do use the website for their current events. So I would say that they are using technology on that. I find it definitely. Most of them are relating everything to video games. If you can find video games for them, you've definitely got their attention. I think that you
have some who know so much about it and then who some who don't have access to a computer or very limited. You've got the whole gamut.

K: do you have any sense of percentages of who has and who doesn't?

A: Not yet. It's way too early yet to know. I'm just really getting to know them at this point.

K: Anything else about ways they might use technology out of school? video games you mentioned?

A: I'm sure they are doing a lot but I'm drawing a blank right now.

K: So we'll switch gears just a little bit. And talk about your planning and how you plan. This study really has two pieces: educational technology but how you plan when you're going to use it in your classroom. so for today i'm just interested in sort of general planning ideas. First, do you have any planning requirements for the school?

A: New teachers are required to turn in lesson plans but I'm not required to turn in lesson plans. He has asked us to set a time to plan with the other teacher that is teaching our subject area each week. So that's why we have come up with a schedule on Thursdays and Fridays so that we can do planning with the other team mate or team mates that are teaching the same subject area. We do have that requirement.

K: And how much planning time do you have during the day.

A: We get a personal planning period which is about 40 minutes. A team planning period which is about 40 minutes and like I said two of those days are actually spent planning for your subject. Two 40 minute periods for your subject matter.

K: The other three days?

A: The other three days are in team meetings dealing with are there any students who aren't turning in homework consistently that we need to call to the meeting to talk about. We want to bring parents in and we try to conference at that time also. And just day by day things. What's working. What's not. We've been having a lot of problems with bathroom issues lately. They want to go to the bathroom during class so trying to work around, how can we fix that?

K: But you get a 40 minute personal planning every day.

A: Every day.

K: What kind of stuff do you do during that planning period?

A: Sometimes it's grading papers. Sometimes it's copying things for the next day. Sometimes it's just getting stuff ready for the next day. Sometimes it's making phone calls to parents. All kinds of different things. Sometimes it's hanging things up in the room. Depending on what you need to do for the rest of that day or the next day.

K: When does your planning fall during the day?

A: At the end of the day. We get our personal planning 7th and then team planning 8th and then we get them back just basically to get them on the bus.

K: Do you ever have meetings during planning time?

A: During team planning. They try to leave our personal planning alone. Which is nice. In Essex I never had personal planning time. You only had personal planning time so there was no such thing as team planning. If you wanted to do team you met one day a week during the personal planning and it seemed like it was always getting taken with conferences or we need to develop this or that. So it's nice that they try to leave our personal planning alone.

K: So now probably the toughest question, how do you plan? Describe your planning process?

A: Well this year it's talking to the other teachers in your subject area and kind of brainstorming ideas, what can we do for this. Seeing what resources each of us have and combining resources. That type of thing. And then going back and looking at what you have, what the other teachers have given you, and then basically going in to see what's going to fit in a 43 minute block of time for each day and how things flow together. I kind of like having, I don't like having two subjects, I like having one subject better. At the same time I like having the other people to bounce ideas off of. That way when I go home here Friday my lesson plans are pretty much done except for some tweaking here and there. So I don't have as much planning to do over the weekend. It used to be that Sunday was my planning day so it kind of cuts back on that. I may have a little bit to do but not a lot. I do like having the other teachers to plan together with. It helps a bit.

K: So you plan for a whole week at a time?

A: Yes, a week at a time. Obviously you are constantly changing that as you go. You may not get through as much as you had thought some weeks. Some weeks you get through more. It's just constantly scribbling and crossed over and written over but this one group may get it and fly through it and another group may take more time with it. It just depends on a lot of different factors. I plan for a week at a time.

K: I know you said you do current events. Do you do that at a specific time each week?
A: I give them the form on Monday and they are due back to me on Thursday. So they have three nights to do it.

K: And do they present?
A: No they just hand it in. I wish I had time to let them present but in the day of standards I don't have that luxury. But every once in a while if I have one who does a super job on one or it's a really interesting story, I'll have them get up.

K: And do you have any other things like that you do on a weekly basis.
A: No that's basically the only recurring assignment we have.

K: Your daily lessons. Like I noticed when I observed the kids came in and there was a warm up. Do you have a sort of standard kind of this is how my day works.
A: Yes. When they come in they should be copying down homework if there's a homework assignment on the board and then doing their warm up. So that's how they should start class. And then we talk about the warm up and we go right into the lesson. That's pretty much how. It helps get them focused as soon as they come in. It cuts back on a lot of issues if they are waiting for something to happen. Last year I would have a paragraph on the board about something that happened that day in history. Then there was a sentence underneath it relating to that paragraph that had some kinds of mistakes in it, things were spelled wrong, punctuation was wrong, or something to that effect and they had to correct the sentence. My social studies scores weren't what I wanted them to be last year so I went more geared toward the standard related question with them rather than language. I was trying to help out the writing teacher last year but you know.

K: Where were your scores?
A: They were not great. They were, I don't have the official percentage back, but my count when I looked, they were probably somewhere in the 60s which blew my mind. We finished our standards and had a month of review. So I mean I was hitting that stuff constantly. It was frustrating. Well the test wasn't very good.

K: Why?
A: Looking at some of the questions. Out of 400 years of material, that's what you are choosing to ask. Some of the questions were just so convoluted so even I was looking at them and thinking what do they want? It was almost like they were trying to trick them. And like I said when you are covering 400 years worth of material, don't try to trick them. They know it or they don't. When I see some of my gifted kids struggling, I was very frustrated by last year. But I learned a lot from the process. It was the first year, it wasn't the first year that I taught that curriculum, but it was the first year that it was tested at the end of that year. In Essex, they did the cumulative test at the end of 8th grade so I never saw the break out test for just US History I. So it gave me a good idea of how they are going to ask questions. And that's the other problem. In social studies they weren't releasing test items for a long time. We didn't have that skill box. Last year was the first time they released some test questions and it was only one test. So I used those in class and we went over those. Like I said, now I have a better understanding of how they are going to ask questions so I'm more prepared for the test.

K: It sounds like one thing that influenced your planning this year was your test scores in terms of how you did your warm up. Did they have any other influence on the kind of planning that you are doing?
A: Absolutely. I will definitely change my test. There are a lot more pictures on the test and a lot more interpretive data and things on the test. Giving them a graph, giving them what's missing from the graph. It will influence how I make up my tests.

K: So your old tests didn't have as many pictures? What kind of questions did they have?
A: There were a lot of pictures and a lot of maps. And we did a lot of maps in social studies but it was more where. I mean they just gave a blank map and they didn't necessarily have to know the name of that region. They just had to be able to identify. For example, there might be a map of the United States and the Louisiana Purchase wouldn't be labeled. It would just be labeled A, B, C, D, E, F and then it would be which territory did Lewis and Clark explore. And they wouldn't say the Louisiana Purchase. They had to be able to identify it by what's region F. So to where my test they had to know it was the Louisiana Purchase. So I know I've got to do more of both, the name and being able to locate it on a map. I learned a lot.

K: And has that also changed your instructional strategies changing?
A: To some extent. Like I said, we've always done a lot of maps in social studies but where the focus is will be slightly different. The actual activity may not be that much different but the focus of it will be different.

K: Any other influence from the test scores?
A: It's really tough, again, like I said with 400 years worth of material, with some of the things that they've picked for them to know. And I think that's where I made mistake my very first year teaching social studies. I was trying to give them the background. I'm still trying to give them the background information that they need to understand but I spent too much time my first year with a lot of that. Whereas now it's here is the stuff you need to know. I still want to give them some background information so they can actually understand it and they are actually changing curriculum this year. And the American Revolution is a big chunk of that. And then you've got to gauge how...you never know where they are going to pull, which question they are going to pull. You know they are not pull as many questions from native americans as they are from the American revolution so obviously you are going to spend more time with the American revolution but you got to make sure you've covered everything that they want you to know under native americans because they could pull any one of those questions from that section. So, it's a guessing game really.

K: so when you say you try to provide background information, what does that mean?
A: Well if I just went through the American revolution and said OK here's the important people you need to know, here's the events you need to know, they are going to think well why did this lead, how did this lead to this. So I try to give them some of that and I do want to tell it as a story because it is a story. The kids are interested in that. They want to see that story. They want to see the progression. But I don't focus quite as much on that and there's none of that in their notes. Their notes are the required knowledge. And I've been doing that for several years but it's a hard game to play. They are switching the curriculum so this year the fifth graders are starting with US History I also so they are going to have two years of US History I before they have to take the test so we will have time to really get them to understand the whole concept instead of just this bullet, this bullet, this bullet, which I think is going to help them. It may be my opinion but it sounded good when I told the school board that and they agreed to go with that.

K: With planning how if at all do you use the textbook?
A: Not very much. I very rarely use the textbook only because it has...there again, in some units it has a lot of great information and some units it's just not good at all. But also with the textbook there is so much more information in the textbook than they really need to know for that test. So we very rarely use the social studies book. I might use it a few days here or there to read the information and even then I'm pulling, OK we're going to read this page and then we're going to jump to this page and then we're going to jump to this page to keep it more aligned with curriculum. We definitely do not go through the book cover to cover. It's more of a resource. It's more of a take a look at the picture on this page. I'm pulling from so many other sources that it's good for what it is.

K: What other sources are you pulling from?
A: Internet sources. Lots of different activity books. That kind of thing. We're using interactive notebooks this year. Those resources. Videos. I have a DVD set on the American Revolution. I have a coloring book on the American Revolution. Crossword puzzles. Teacher created materials. Different actual trade books. That type of thing. So they come from all different places.

K: What's an interactive notebook?
A: OK, the interactive notebook, they get the note page and then we bought these paragraphs. They circle key words, maybe put the word in their own words. Use a synonym so that they can understand it. And then after they've done that, I have an example here, they will draw pictures of something. Like this side of the notebook will be the notepage with their box and circles and highlights and this side of the notebook will have a picture, maybe for each paragraph or sometimes it may be you are splitting the notebook page into four sections. You want a picture in each section for whatever the four main topics are. So you are having them draw a representation of whatever it is over here that you need them to know. It is making it real for them. Because they have to come up with their own example. For example in science we were talking about observation. And how some observations are qualitative and some are quantitative. So I had them.... here was there note page and we highlighted important terms and definitions, that kind of thing. And then I had them write observations. They had to draw pictures to show me what observations were. So most of them were drawing pictures that had something to do with their five senses. Then the next one: show me an example of a qualitative observation. So, I drew, I gave them an example and I said you can't use mine. You have to come up with your own picture. So I drew two cherries and I said the cherries are red. And then a quantitative, draw four cherries and there are four cherries. Just something for them to make sense of it to them. And sometimes they will do their pictures in class. Sometimes that will be their homework to draw the pictures.

K: Is this something you purchased, the school purchased?
A: Yes. It gives you basically, it comes with the note pages. And examples of the boxing and circling. They
did provide us an inservice on interactive notebooks and they came in and she went through the skills of
circling words that they may not be familiar with and having them come up with synonyms and the whole
process.

K: So how does this figure into your planning?
A: This is the first year I've done this. I'm hoping this will also make a difference in the scores but I'm also,
I guess everyone also is kind of different in their take on it. I'm definitely going to give them the reading
note page and this basically becomes their textbook in all honesty. But then because some kids will learn
better in this format but some kids learn better with a different representation, I'm still going to give them a
page that looks more like notes on this with maybe bulleted information. Sometimes it will be a chart,
sometimes a graph. Sometimes it will be an outline so they will have both representations of it. So when
they go to make their pictures they have a better understanding of what I'm asking for. And they can, if they
see it better this way, they can have this. If they see it better in the chart, they'll have the chart also.
K: And the chart comes from you.
A: Right. The chart I've created using the required knowledge. Interactive notebooks are apparently the
newest trend.

K: So we have a sense that you plan in a weekly basis. At the beginning of the year, do you outline units.
do you have any sort of yearly process?
A: I have made a pacing guide for social studies. This is my pacing guide.
K: At some point I'd love to get a copy of this. So you've created this yourself.
A: I borrowed from another school district. Another school district had a very similar one and I just kind of
tweaked dates. I knew that I don't take as long to cover native americans as they had on there so I kind of
shortened that up and extended American revolution. So I used another school district's as a guide and went
from there and plugging in our dates for parent teacher conferences.
K: So this is what you started the year with. And then what kind of state resources might be available that
inform your planning.
A: The enhanced scope and sequence.
K: Can you describe those a little.
A: It gives you some sample lesson plans Things like that. This is my bible. This is the required knowledge,
the curriculum framework. The required knowledge is basically my notes. In some cases, I put it into a chart
form or that kind of thing. That information is in different representations. This is what I look at when I
plan a lesson, what do they need to know on this particular topic. When I'm planning a unit, this is my
notebook.
K: So when you say required knowledge, defined by the state.
A: Exactly.
K: And you mentioned that they haven't released tests.
A: They did last year. They released a full test last year in social studies. Which was the first time they've
done so. I'm hoping they do this year too. Then I'll have 80 questions instead of just 40. Because I think that
has, I think the test last year was even harder than the released test.
K: So anything else about your planning that I didn't ask or just your general planning process. So now
throw technology in the mix. How, when, if at all do you figure out if you're going to use technology?
A: Again I look at the required knowledge and where can I plug it in. Where does it fit? My knowledge of
what's out there and googling on the internet and finding resources and that kind of thing. What kind of
resources do we have in the library. Our librarian is really good about is she sees something she puts it in
my box. I thought you would be interested in this. She's pretty good about things like that and knowing
what's out there. She has good magazines and resources.
K: Kind of, what did you have to do to make that primary source lesson come together in terms of using the
technology in particular. What process did you have to go through?
A: When I originally started thinking about the lesson, the section on it where they can actually go in and
look at some of the primary resources online and analyze them. But as I was gauging my class, I decided
that I didn't think they were really ready for that step. So we were just going to show them the different
primary resources online through the lcd projector. So I guess it's a process of knowing your students as
well as what technology resources you have available. It's kind of a balancing act.
K: How far in advance did you have to reserve the projector?
A: Just a couple days. It wasn't really a problem.
K: And is that every a barrier? Have you ever had to abandon plans because you couldn't get access.
A: No, maybe changing a day you are going to do it. But it's never been I'm not going to do it at all.
K: Anything else?
A: No.

Post-Lesson Interview with Beverly, 7th grade math and pre-algebra, February 19, 2009
K: What worked with your lesson?
B: It was an eye opener for some extent. It got me looking at specifics on what I haven't covered with them as far as um concepts that really are not part of their curriculum. OK. Each student as you know took the study island test. We can get on study island and we did that day, we looked at their final scores and they looked at them as well. And for example it breaks it up into the different categories and the grading key advanced, proficient or did not pass.
K: and you said that was the levels?
B: Yes. Now depending on which screen they were on when they printed, and I didn't even catch this. A different screen gives you a slightly different grading system. Instead of advanced it's called excellent. But still they are comparable. Below average is what I needed to tune into or needs improvement. OK. So basically I looked for things that did not look good enough as far as a passing rate. And I
K: In your mind, what's good enough?
B: They're competent and they're going to be fine on that standard test. What I focused on were anything that showed up as needs improvement, below average, or did not pass. So, I made a spreadsheet with the six different categories. The fractions, decimals, percents...they're fine. This little boy down here, he's bless his heart, he's in pre-algebra but he's a scatterbrain. He can't focus and he didn't do terrific. so I need to if I'm going to do it right, I'm going to pay a little bit more attention to him and make sure he's fine. Scientific notation, that was a red flag for me. Particularly this group up here. They tend to be more capable than this group. We do group them and pretty much these are the academic kids and these are bright kids who can handle the pre-algebra concepts but they struggle a little bit more. So when I saw this you know there are a lot of below average or did not pass. Now what could it have been was they didn't answer those questions. That could be it.

K: You were concerned they wouldn't get done.
B: We had selected 25 questions and I remember we were approaching the end of the period and some said I'm only on 21. Don't worry. don't worry. So that could have been that issue. But still I need to address it as though they don't know it. Order of operations, I'm pretty OK with that. I'm comfortable with that. Real world problems is a red flag. And compute solutions showed up as a red flag for me. So then the next thing I do is I get on a particular student say this child here who has a low average for scientific notation so I go and pull up exactly what he did. I'm not going to find his right now I'm sure. And if I get on his I can click on, I think it's there, no, let's see, what am I looking at, scientific notation, OK, yeah, right, I can click on right there well anyway, I can get to it and I found this isn't his sheet, but I'm looking at the question and I'm thinking that is an easy question. And he should have done better. So again I am going to review especially before the standard test. We're going to go over a lot of this stuff just to keep it fresh in their minds. Little bit harder question, alright, these were the typical scientific notation questions. Really though not tricky if they know to look for exponents and then putting the numbers in a given order. They shouldn't have missed the scientific notation. So that did bother me a little bit. Alright then I got on somebody's order of operations and you can see that that bothered me a little bit for that group. But then look at the question. Without a calculator, I'm not going to worry about it. You know that's not going to be asked of them on the state test. that's a humdinger. It really is. You know to do four to the third power and then times it by 8 and then times it by 10 and then do your exponent here. That's just too much. This, yes, they do need to know this without a calculator with your fraction work. But this did not really bother me too much if they missed this type of question. So I felt after looking at the questions, I felt a little bit better that that doesn't bother me as much other than I do need to focus on fractions a little bit more with them.
K: You really had two goals. One was just generally the math seven stuff but then that no calculator bit too.
B: Exactly. So
K: Do you think if they had had calculators they would have done better?
B: Yes. Exactly. And so just to double check too I got on two different students order of operations and I found the same kind of things. He missed a killer question and something he shouldn't have missed. So I do need to go back now in my planning and allow some time to go over the operations with fractions. K: So that's my area of interest. Now you have this information, so what do you do?
B: It tells me what needs to be focused on before they are faced with their test. Our school system in preparation for the standard tests, we are required to give four practice tests throughout the year. And our third one is coming up in February. We have to have it done in February. Well I'm going to be off a few days because next Friday is the last school day in February. They are taking their chapter seven test. I'm not going to stop the flow of chapter seven just to get in a practice test. So the next couple days after will be our practice test. Well, what I will do is I will share with them the overall results and I'll say look guys you're going to see this on your practice test today. This is a grade. This is a grade. And we have to make sure we know how to add, multiply, whatever, our fractions. It showed up that we don't know what we are doing. And we'll do two problems ahead of time. It showed up scientific notation was an issue. Remember how to do scientific notation? And I'm really asking them to probably pull from their memory in sixth grade. Things like that. And so then when we take the practice standard test in two weeks hopefully my little review will be enough to say, oh OK I know what I'm doing. I just forgot that day. And if it shows up again, then we need to just stop and that's really when my review gets concentrated would be the weeks right up until the standard test. It's a concentrated, just about every day, I pick five questions, we have a quiz, we talk about it. You know let's remember how to do everything. Remember the whole year, just concentrated effort, concentrated review. But I thought that this was a good thing to do because it showed me problem areas. The real world pretty much the thing that came up over and over and over, was the interest. And I think you probably heard them in the library that day. They saw a simple interest problem and they just Deer in the headlights look. I don't know what to do. Well, we haven't done that. We have talked about that zero. So that didn't surprise me. So after chapter seven is done next week before we take that little review standard test. I'm going to cover simple interest. And that will take three examples for them It's very easy to calculate simple interest and if they put it in their notes and talk about it, they will know it.
K: It's content that you perceive that they learned last year so you aren't teaching them something new?
B: Right. I am pulling it up from their memories. So for the most part I was very pleased. I think that they are doing fine.
K: And stepping away from the content and what you learned, how did the technology seem to work or not?
B: It worked. I like study island. As I told you, I think it's very comparable to what the seventh grade content it. Their choice of questions. If anything, maybe they are a little bit tougher. You know some of those order of operations. Without a calculator, they are pretty tough. K: In study island, could you designate sample no calculator questions?
B: I don't think so.
K: So they were just throwing out order of operations questions.
B: Yes. And you know to be honest, the standard people who designed that test, you know, I tell my students, they can ask us an easy order of operations question, medium, fair, or a killer. And you know we have to get ready for all of them. I hope they don't give us the killer questions. I don't think that's fair. But they could. And so it's good for them to be exposed to those kinds of things. And they did work hard. And that's another thing I needed to see. There was one child that I think I pointed out to you. A little attitude situation and you know he's so bright. So bright. So even with his little attitude, he pulled out some pretty good answers. There was one and that might have been those killer order of operations problems where he didn't do so well. But they worked hard. And that's what, you know if you work hard at something, you'll get there.
K: That was one of the things you were concerned about was if it was a grade or not whether they would work or not. So you are happy that they gave it their best shot.
B: And there was one boy that I noticed, I had given them paper to work things out and he sat there and he did it mentally. Problem after problem after problem and that just worries me because on test day, I don't want them to sit there and do the standard test mentally. And again he did pretty well except look at this. You have to work out real world problems. You have to write down, because I'm sure they were multi step. And you have to work things out so that's something else I'm going to mention as a result of this. But that's something else I can share with them you know the day we were in study island I told you work things out and some of you didn't. And I noticed that. You have to. You have to.
K: So have they seen their individual results?
B: Yes. And maybe that's a wake up call for some of them. those who care. If they don't want the did not pass or the below average. Especially when they share, what did you get? What did you get? Oh I got a below average. You did! They're competitive in a good way. So I think it's a nice program. It's a valuable tool.
K: Something you would consider using again next year?
B: Yes. And I think in the same capacity.
K: Would you make any changes?
B: I don't think so. I think I would probably do it at the same time of year. It's not something that I would do too early. Because I think you have to give it a chance of covering and then again we don't really cover this. Maybe this would be a good thing to use at the beginning of the year as this is what we should have talked about in sixth grade. Did you? Do you understand these? And maybe that would be my guiding point. Well, we need to cover certain things because they did not do it in sixth grade.
K: When's the last time they took a math standard test?
B: Sixth grade.
K: Oh, they do take a math test in sixth grade?
B: Yes.
K: And then again in seventh grade.
B: Starting in third grade. Every year they do a math test.
K: But the content is similar but more difficult?
B: Exactly. Math progresses.
K: And no dispensation if you are taking a more advanced math class.
B: Not at this level. The, All seventh graders no matter what level they are in take the math seven standard test. Eighth grade is where it starts to break apart. If you are an algebra one student you used to take two math standard tests, the algebra one and the math 8 which our eighth grade math teacher loved because that helped her math 8 score go way up. Because you have these extremely bright students taking a math 8 test. This is the first year, I believe I'm right, where the algebra one students will just take the algebra one test and the algebra one part one and the math eight pre-algebra will take the math eight test. We have less population taking the math eight test which doesn't help her scores.
K: You noticed the students worked hard, anything else you noticed about your students as they worked on study island?
B: No, they worked well. They worked hard. They were stressed when they knew they weren't going to finish. That's going to affect my score and that might, as I say that's why some of these showed up as did not pass. I really have a feeling it's because they didn't get to those questions.
K: So what did this look like? You had shared with me and you had given me one of your weekly agendas I think that you turn in. So what did this look like in terms of, so let me back up, you gave me the agenda and behind the agenda were your SMART Board lessons. That's how your lessons are really laid out. But this wasn't a SMART Board lesson so what did this look like in terms of lesson planning.
B: I think I was very vague. I think I put library/computer lab. And administration doesn't really require specifics.
K: And you don't keep a lesson plan book?
B: I do but see this, well sort of. I keep the folders.
K: The folders. But you don't have a green like I'm thinking of the old school green book. So your weekly agenda is your outline and if there isn't a SMART Board lesson behind it, it just is what it is on the outline?
B: Right. And for that week, I will have all the SMART Board lessons or this kind of thing would go in there. So I can refresh my memory, what did we do in the library that day. Oh that's the day we did study island.
K: So, you'll keep all of this for next year.
B: Probably this. I probably won't keep individual students stuff but something like that.
K: But your study island activity is there in perpetuity now, right? When you log in...
B: As long as we have the finances to continue our subscription.
K: But you could use those 25 questions again?
B: Right. I would just have to update it with the current class.
K: They get entered in somewhere along the line.
B: I think we have to do that ourselves.
K: What kind of realizations, if any, did you generate from your participation in the study?
B: Are you asking me to look at taking an examination of the technology I do use?
K: Did you have any realizations as we talked about planning or as we talked about this particular lesson?
B: I don't know how to answer that. Well I guess any time you use the technology, it has to be ahead of time. You have to plan and it has to be prepared. The lessons I can't create just off the top of my head. They're prepared in advance. The Geometer's Sketchpad which I often do with the students in the computer lab, that's an activity that has to be prepared in advance. Just the technology that I use I have to I guess do it in advance. run a test run of it. Make sure it works. Make sure it's what I want to do and make sure it covers the content that I want. I don't know if I'm answering the question.
K: You're fine.
B: this was something I had to prepare in advance because I had to select particular areas. There is available just an overall test. But that wouldn't really have concentrated on what I wanted. So I can't use like the prefabricated test. I had to make it specific for my goal.

K: You've had your SMART Board for three years. How, if at all, do you think about it? Do you think about it as technology anymore?
B: No. True. Because first of all, I'm very dependent on it. I don't even, I use my white board as a message board or where I can post my magnetic games for tutoring sessions or something. But when our network goes down, I think oh my gosh how do I teach this lesson? Because it's how I teach now. It is a white board. It's how I write. How the student show their work. But you also, it's so valuable. Because you have manipulatives right there. And it does so much. It really does.
K: do you have a sense of when you got over it being technology? Was there a time when it was sort of this glaring thing?
B: It was intimidating at first. Just because I didn't know how all the tools worked and I guess there's always a fear what happens if I hit the wrong thing and it goes away? Oh know, where is it. It's easy to get back. The kids come up and they erase something that another student has done and you didn't want it erased, it's not the end of the world. You pull it back. It's not scary anymore. It's frustrating as technology is. Often. There are glitches. We just updated our smart notebook software. I don't know what version it was before, never paid attention, but now it's version ten I think. It has glitches. I'm not happy. So I spoke with the sixth grade math teacher and I said are you having trouble also. And we described each other's problems. Yes. So we've contacted our tech person at the central office and said, I don't want it. Well, he tweaked. He said I think I know what the problem is. And so he tweaked. It's better but we're not there. So I said I'll try it but I need the technology to work. It interrupts the flow of the class when it doesn't. So I want it a little bit better. And you would think when something's upgraded, it's better. But there are glitches. And I'd rather go down a level, go back to the old version, because it worked better.
K: Plus once you open your lessons in the ten, it may not...
B: I thought about that and I didn't want to upgrade because of that. Because when it first came out, it saved every file as xbk. X book or something. And sure enough when we upgraded into smart notebook or something, yeah, I had to rename every lesson. That's a pain. It takes five seconds, but it's a five second pain. And so I thought if I upgrade again, am I going to have to do all that again? Resave it and then delete the old one. It doesn't require you to do that. I was surprised at that.
K: How, if at all, have you and/or your planning practices changed over the course of the study?
B: I'll be honest. I did some of this when I analyzed the results of their study island that day when I was printing out their scores and I asked them to print out specific, what did you miss. And I was looking at it. So I had an idea where some of the problems were. I had an idea that I'm not worried about the order of operations because the equation was this long and they're not going to do that to them on the test. Not a problem. But I really didn't get thorough into this break down until today. Because I knew you were coming. So I would have done this. When I would have done this, I'm not sure. When I have time. When do you have time? And sometimes when you have good intentions and no time, sometimes things don't get completed. So this could have been one of those things that never really got done. But since you were coming today, it got done. I mean I try to follow through with most things but and with this four times a year practice, the principals ask us, please look at the data. Look at it and see, just like this kind of thing. And I try to do that. But sometimes it gets done, sometimes maybe not. The April one definitely gets done and the February one, too, because we are approaching that test. November I might not really be too concerned. September, I don't think I look at the data at all. It's a benchmark. It's a starting point. Oh, you don't know how to do this? Well I'm sure you don't. We haven't taught it yet.
K: Is it different with your math seven classes? do you concentrate more on their tests because you are teaching them for the test?
B: Yeah. And I assume that these people are very capable and I'm really not going to worry greatly about their state test score. Whereas math seven, I'm really going to do a break down of the different categories and who did what and who's not passing it. We offer tutoring on Wednesdays and that's where I start sending letters home. Dear parent, your child is not passing. On the last test she scored. She needs to be in tutoring. Well how do I get that? I really need to have a break down.

K: Anything else you can think about?
B: It is a lot of planning. You can't just come in on Monday morning and say here's what I want to do. It is a lot of planning. You can't just come in on Monday morning and say here's what I want to do. It took an hour or half an hour. So there is some time. But I think it's worth it.

K: Can you kids access it from home?
B: Yes they can.

K: So if you had some motivated ones, they could go home and play with it.
B: And I think the 8th grade history teacher offers that as extra credit. I think I've heard her talk about that. Get on study island, practice, it's extra credit. I don't know if I'd have time to check.

K: But you could see if they did.
B: Yes. Our ag/technology teacher, the 5th six weeks, he does a concentrated review of it used to be math and english standards. This year it's going to be math, english and history standards for seventh grade only. Because he's a seventh grade technology teacher. And we just share with him some areas that we would like him to focus on. He has used study island for me in the past. As an assessment. You know, let's practice this. OK you're going to take a test on it. It prints it out. He doesn't have to grade it. It takes him a little bit of time and it's good questions. And then he'll share that with me. I hope we keep it. I hope we can afford to keep it. Without it, I'll probably, I don't know, unless I have to hand write a ten question, which I do, a ten question quiz Monday, another ten question quiz Wednesday, another one Friday, boom, boom, boom. Review, review, review. That kind of thing.

K: Are you going to use the Renaissance receivers for your practice test.
B: Yes. Because for two reasons, you know a child has to realize just because you work it out right on paper, you have to choose the right answer. So you have to be coordinated. You are sitting on a computer on test day. And I got 83% for my answer and c says 83%. I have to choose C. So I can't just be half minded on this. You've really got to be in the zone. So I will do that and use those. And plus it saves time on grading. It grades it for you and prints it out and you can see what they got and you can see what they missed. How did I miss that? Well let's talk about it.

K: Think back to when you didn't have that. Did you have a way to share that kind of data with the students?
B: Unless I would have taken the time and when you have 100 students are you really going to take the time how many people missed number 1, tally marks. This really is valuable. As far as collecting data, sharing the data.

K: Anything else?
B: No. I hope I was helpful.

Planning Process Interview with Carol, 5th Grade Writing, April 22, 2008

K: This is our second interview with Carol and two questions, the first one is just a general question about your school district, what kind of requirements they have for planning.
C: We have a planning period every day where you sit down and you plan for the next week. Actually, the middle school has a week at a glance form that we fill out. We fill it out on a Thursday. It's due on Friday which covers everything we are doing for the following week. Now, I like doing that personally because I
can keep myself on track. Some of the other teachers thing it's a waste of time because normally it does
change. You're thinking it might take you one day to go over and review something and then it takes you
three days. But anyway, it keeps me on track and I'm a very organized person where I want things, this,
this, this, before you do this type thing. One thing about the planning period though is that many times
our planning period is taken away. We don't have a planning period simply because a parent wants to me or
we have a meeting with the administration or we meet with a group of kids that are having problems with
some situation. So, we don't always have our planning period. But the school here requires you to turn in a
week at a glance. The other schools I think more or less you're on your own. Last year, we did start doing--
it's on the tip of my tongue--oh, you take your year and your write everything down.
K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
called? It's your guideline for the year.
K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
called? It's your guideline for the year.
K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
called? It's your guideline for the year.
K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
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K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
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K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
called? It's your guideline for the year.
K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
called? It's your guideline for the year.
K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
called? It's your guideline for the year.
K: Like a unit plan?
C: It's like a unit plan, it's called--you have your benchmark assessments, that type of thing on it, what is it
called? It's your guideline for the year.
K: Like a unit plan?
That night, the night before I knew I wanted to continue with subjects, predicate, root words so I googled to find out what they do and then once they are finished with that if they are having problems on one specific topic once in reading so I'm just reiterating what they've already been taught. And I try to make it fun. Like the day before or two days before?

K: So back a little to your planning process. So I'm picturing you coming in... so the lesson that I observed where you were using Quia. You had found that probably in the summer? How did you plan that lesson? Like the day before or two days before?

C: Usually, like with what we are doing now, and I am doing math and social studies and all that and reading, what I do is I'll say OK, today we worked on probability. So if I know that we're going to work on probability tomorrow, I'll go home tonight and google probability, and see what I can find with probability. That night, the night before I knew I wanted to continue with subjects, predicate, root words so I googled to see what type of games were there for that to make it fun and interesting because they've already hit that topic once in reading so I'm just reiterating what they've already been taught. And I try to make it fun. Like this one today, I thought was fun because it dealt with playing cards and tic tac toe but they didn't enjoy it, so. It was still too much work.

K: And you talked a little in our last interview about using the computer lab. How does that figure into your planning process.

C: Not often. We have two computer labs that 34 teachers use so and we have one in particular teacher in 8th grade that goes in the beginning of the year and signs up for every Friday. So you know that you cannot get it on Friday. It's difficult to get the computer lab in, it really is, especially like I said again when I have all that to cover and I only have until March. When it comes time to review and you're like a week before the test, I will take them into the computer lab and we will go over my released test test and I'll take a grade from what they do and then once they are finished with that if they are having problems on one specific area then they go to that game or whatever and hit that specific area. But to be completely honest there's enough one and not enough time there never is.

K: And then things like again, back to your first interview, you talked about sharing the led projector. So how does that factor into planning?

C: Well we had set it up last year where I would use it on Mondays, Miss Bice would use it on Tuesdays, and so on and so on and so forth. Then there came a problem where one person said I've got to have it on this day and the other person said well I've got to have it on that day too but it's so and sos day and then you're at the situation, well who gets it? Who is most important, blah blah blah. Which is difficult. But then they always tell you to focus on math and reading or math and english so if it's math and social studies needs it, math gets it. If it's reading and science needs it, reading gets it.

K: So you have abandoned the days of the week schedule?

C: Yes.

K: You said you only just got an elmo. The white board, do you ever have the opportunity to use that?

C: The whiteboard, we only have one and it's in the computer lab. No, we only have one and it's kept in the computer lab so that he can show keyboarding or whatever. But you know it's wonderful to have the
whiteboard but then you also have to have the overhead projector and then you also have to have the
computer. This school system is just not up to par with where it should be with technology. I mean we don't
have the equipment that we need and even if we did have the equipment we would need, you saw how I
had to set it up. There's this one going here and this wire going here. The kids are tripping over it. This
school is really behind with technology.
K: So when you sit down to plan what technology and using the wide definition what technology do you
have sort of under your control.
C: The overhead. And the TV and the VCR. The overhead we use everyday for daily oral language which
is sentence structure and that kind of thing. And then I have my laptop and then this printer is shared by
everybody in the 5th grade, the 5th grade teachers are all networked to one. And then of course we've got
one copier for 34 teachers that is past a million copies and is about to break down. And the office is very
good at letting us use theirs but then when that one is broken and the one in the library is broken then you
have to run down to the school board to hope they will let you use theirs which they normally do. It's not a
problem. But too many people and not enough equipment.
K: So anything else about your planning process? I'll just reiterate: it sounds like you do the bulk of your
planning in the summer and then week to week fill out your weekly planner. I'd like to get a sample of one
of those if I could just to see what it looks like. And then on a nightly basis you are home maybe finding
resources to use. Anything else I missed?
C: No.
K: Do you fill out a plan book.
C: I don't because my plan book is that. (Indicates the year plan).
K: OK.
C: My plan book is that. And then each week I mark down what we have finished, what we haven't finished
and what we still need to do. But this will tell you that a benchmark here and then we will have a major
benchmark here and a final unit test. How ever many units that we have and then I sort of do like a midterm
in January that covers everything we have learned since the first day of school. It is usually a released test
from the state.
K: And then how do they influence your planning? You give a midterm test and discover something?
C: Yes, if I give a midterm and I discover they are missing one or two questions that deal with the same
thing, I may say OK I've got to go back and reteach plurals and possessives because they have a hard time
with apostrophe, not an apostrophe, so once I get that test, I analyze it because we have the Pearson scanner
and it will run through and let me know 20% are missing this one question. And then I'll know, if it's that
big a percentage, I need to reteach that. So, then I'll go back and reteach that and what I'll do is normally,
I've already done everything for that subject here so I'll go back online and see if I can find a worksheet or
another powerpoint or a movie upstairs that they have on tape that covers plural and possessives in a
different way than I did.
K: And are there grammar videos.
C: Yes, there are grammar videos in the library.
K: And are there any other resources like that that I might not know about, things that online you
mentioned and videos.
C: Well there are some things on Channel One, the educational channel. Unfortunately, 5th grade at this
end, we don't have a TV hooked up to the cable. 6th, 7th, and 8th do so if they have something on channel
one they need to view or watch or whatever they'll show it on TV. Like let's say that they are going over
something like politics, then Terri who is in 7th grade can have it automatically sent to her TV every hour
so each class can watch it.
K: But you do not have that capability?
C: No, we don't have that in the 5th grade.
K: Anything else about planning, your planning process.
C: No. Hopefully it will get better because like I say, even sometimes when I go home and I find a
powerpoint or a show or whatever then I come to school and I try to load it and the network's down. But
from what I understand on the 30th of this month if I'm correct, the network connection is supposed to
bump to 6 meg or something. I think right now it's 2. So but like I say, it doesn't matter if people bump it up
to 6 meg if you can't get to the information because they have that blocker on. And it is very very
frustrating. I had a meltdown Friday and went over to talk to the network person and said listen it doesn't do
us any good if we can't get to it. And his thing was that the state has certain requirements and we can't let
you into this, this, this, this, and this. And I said arts and entertainment have to do with school, shopping.
When we start at the end of the year ordering supplies, we've got to get into the shopping part. And he said, well I can't open it up to everybody because then everybody will be on there at QVC or whatever and I'm like, I don't know who you are talking to but I don't have enough time to go on QVC when I have a room full of kids. So something's going to have to get fixed.

K: Will they unblock sites?

C: They will if you print them which I do and take them over there but then he has to manually go in and say it's OK for P1054 to see this site.

K: So he opens it just for you?

C: Yes. But he's... but see that's going to when it gets to the end of the year and we get into looking to purchase orders and order our supplies and things like that, he's going to be overwhelmed, because everybody's going to be. He's going to be bombarded and I don't know how anybody will be able to keep up. I usually have one or two a day that I have to send over there that I can't get to.

K: And these are things you found at home.

C: These are things...I can get on at home...when I came here to get on to it it says watchdog has blocked this because it's shopping or arts and entertainment. I'm like you've got to have arts and entertainment for school. What I don't understand is why can't he release it for teachers and not for kids but he says that teachers are going to get on and I'm like I don't know how in the world anybody would have time, I don't have time to do that.

K: So what was your meltdown about? A particular website?

C: I had went in the day before, found a perfect website that would have been perfect for something we were doing with the civil war. Came here, plugged it in and it wouldn't come up. OK. Then I went in to order samples of buckle down books. They send us triumph learning or something and I go to triumph learning, shopping, can't get into it. And then it was and buckle down says can't get into it, shopping. I was just like Whoah and I went upstairs and we like Mrs. Teague we've got to. She's like go over and talk to him. So I went over there and he's like, I hate that we have to do it but we can't view blah, blah, blah, blah, meltdown big time. I can't get into anything.

K: How, if at all, does the filter influence your planning?

C: Because you sit down to plan and you go into these things and you can't get into these sites and then you go into another one and it is so much fun but you can't get into that site. And then you do this and you can't actually do what it wants you to do because you can't get the overhead. Or you need the whiteboard or you're going in and finding something that would be wonderful to help the kids and you don't have the money to buy it. I was talking to Dr. Holm the other day and I sent her a note and said I asked to have dictionaries. Those dictionaries were copyrighted in 1961. Half the pages are torn. Some words are not in there. So I wrote her a letter and said is there any way we could order dictionaries for next year. I'll go online to see if I can find a grant but we've got to have dictionaries. And she came to me and she said, paper dictionary, why in today's society would you want a paper dictionary. I was like, we don't have any computers. We have to have them because we don't have computers. Some of the kids, well they don't have computers at home, so you show them how to use it and anyway so you know I have this one laptop. Like if I wanted some of the kids that finished, and I would love to do this, when they kids finish early with a test or whatever, I'd love to have a little area set up where they can actually go onto my portaportal and play some of the games. Go online and find a resource for whatever paper they are doing. But we don't have the resources, we just don't have them. I don't understand it. But then you go next door to the computer man and he's got 8 brand new computers in there. I'm sure they are running something but anyway. He's got 8. We haven't got any. But, it just gets aggravating when there are so many things out there that you could use but you don't have the resources to use them. Or it takes so long to set it up and to get it to work that you only have 15 minutes of class left.

K: But you persevere. The lesson I observed randomly you were using it. Why? Why do you?

C: Because the kids enjoy it. And my feeling is if the kids enjoy what they are doing they are going to get more out of it and hopefully learn a little bit other than me sitting here lecturing all the time which gets boring even for me. But you know the kids, especially with English, (she mimics the kids) English is so boring, I hate parts of speech. I don't like to write and duh duh duh. It's hard to come up with things to make it fun. To make it interesting. To make them want to get excited about it. And then you try to find things online that will make it that way but then you can't get it to work or you don't have the equipment to get it to work. So, that's about it.

K: Anything else?
C: No.
Appendix 3: Observation Notes Examples

Initial Observation: Bonnie, 7th grade Civics and Economics, April 10, 2008

There is one whiteboard in the front. The walls are lined with brightly painted open shelves and cupboards. One shelf holds a pile of video tapes. There are books. The bins for the student fact cards are on one shelf and students remove their plastic bags and take them to their seats. Everything in the room seems to be red, white, and blue: an American themed quilt, several flags, two wind socks. There's a computer and printer. She also has an overhead on a cart and a tape deck/radio player.

There are 14 students with 5 boys and 9 girls and no apparent minorities. The room has tables and chairs. The bags are filled with 3X5 cards and the students copy the questions and answers on the board onto them. They are related to both history and economics. She reminds them that they will be using the cards in two weeks as part of an "around the world" game and there will be a contest amongst the different classes for who remembers the most information. There is a sense of urgency in the room as she has started talking even before the bell rings. She reminds them that they are doing two a day because they will be doing benchmark assessments and will miss some time. Students return their bags to the bins as part of the routine of the classroom. One asks if they are going to the computer lab and she says yes and will explain the assignment.

Bonnie talks about going to the computer lab and what they will be doing. She reviews a three-page handout that gives specific step-by-step directions on one page, statements to be used in the diagram on the second, and then a sample on the third. She stresses creatively and encourages them to make it their own. She reminds them that she has scheduled another day in the lab to finish. She reads the handout and reminds them that they will be using SmartDraw 8. She reviews both content and technical skills and emphasizes the steps. Putting the graphics in first is important because the graphics can mess up the arrows. She also reviews the different statements and goes through an example of where those statements might fit. She seems to be constantly asking questions, testing their knowledge.

The students leave their stuff in the room and walk to the lab. The lab has about 21 dell pcs. The walls are lined with chalkboards and they are scribbled with different websites including quia and portal. The regular clock doesn't work so someone has added a small kitchen-type clock. Bonnie keeps track of the time with her watch that she glances out now and then. There is a large white board with the month's schedule and different teachers have signed up for the lab. Bonnie's name is on it at least twice. They fill in at the computers and she uses the presentation computer which is hooked up to a large tv on a cart to show them how to open the software and use it. I can't tell if the students have used it before or not. She takes them through the first two steps (the title and finding the graphics) and then moves around as they work independently. Students raise their hands if they have problems. They are using (sort of surprisingly) Google images to find pictures to represent home, government and business. She shows them how to enter and edit text. She is clearly comfortable with the program. The students watch carefully as she creates her title then minimizes her chart to go on the internet to find pictures to copy and paste. By now, some students have already started. Their keyboarding skills vary with one girl doing a one-finger hunt and peck and another boy who has some skills. She circulates and continues to offer support, positive reinforcement and both technical and content help. The students are engaged and working. Some need help once they get to the statements and where they belong.

Finally, she glances at her watch one last time and stops them. She forces them to look at her and shows them how to save their work, reminding them that if they save under My Documents, their work will be erased when the computer is shut down. She directs them to the correct space and gives them directions for naming the file. She ends with positive feedback, telling them how amazing they look.

Lesson Observation, Beverly, 7th grade Pre-Algebra, February 11, 2009

Fourteen students: 5 boys, 9 girls, 3 possible minorities?
The class meets in the library and spends the first few minutes exchanging books. Before they head to the lab she talks to them about why they are doing the lesson and describes the activity: 25 questions in six sections. She tells them to work to the best of their ability and tells them that it will be a good indication for her concerning what they know. She also tells them about the no calculator section on the state test. She tells them that there is a grade involved.
Then they head to the lab, which is connected to the library. The students sit at individual computers that are on tables in rows. The lab has bulletin boards. It also has a cart of laptop computers and a presenter station with a laptop and projector.

The students are able to login and get started. She tells them to look at their own screens. She reminds them that they can use the paper she gave them. They should not use mental math. She encourages them by telling them that they can get a 100 percent and that they are capable students. She tells them she will take the paper at the end of the class.

The students work quietly as she and the librarian circulate. She talks to one student who she doesn’t think is taking it seriously. She reviews the score with another student. As they begin to finish, she shows them what to print and then looks at the print outs with them. She consults with them and has them go back to the ones they missed.

Those who are done go back to the library. She tells a few of them not to worry about simple interest. Just try to figure it out she tells them.

The class is called for lunch so she tells them to finish and not to worry about not getting done.

**Initial Observation: Mark, 6th grade United States History, April 9, 2008**

This is definitely a social studies classroom. There is a painted mural of the mountains on the back wall. There are history posters above the board. There are bookshelves and cupboards in the back, two file cabinets on the side. The students sit in chairs at desks. There’s an AC which he turns on during class.

There is a computer and printer on his desk. There is a laptop and projector on a cart next to an overhead projector on a cart. There is an small overhead television in the front corner with a screen leaning up against the wall beneath it near the door then a larger television and a vhs player on a cart on the left hand side of the room. (NOTE: He uses this larger tv.) There’s a Steeler's poster. He has discipline steps posted on the back of a file cabinet but none of the kids can see them. There are two white boards. The one in front is filled with information about the civil rights movement and he refers to it during his review. The one on the right has some percentages written down. It also has his and another person's phone number written down. Interesting note: there's a whole shelf of disinfectant. His desk is covered with papers and an open notebook. The rest of the room is generally neat.

The class includes 15 students, 9 boys and 6 girls with 4 apparent minorities. He begins talking as the bell rings. Starts with a quiz on the reading. 5 questions and a bonus quiz. Many of the answers are on the board and he tells the students they are fair game. But he also points out that he will be taking all that down for the tests. The quiz questions are about the civil rights movement. (What's it called when people are separated, The law that led to separate but equal, the law that got rid of separate but equal, whose actions started the bus boycott, etc.). The bonus question is the hardest: who started the NAACP and the answer was WE Dubois. Some students got it correct. He engages with the students while they take the quiz and seems easy going. The students are comfortable, raising their hands to ask questions or sometimes making comments without being recognized. He does admonish them at one point to "shh." The students check their own papers. He sits on a desk at the front of the room and reminds them that they are honorable people. He's going to count this as a class grade. One kid points out how easy it was and that there were lots of clues and he repeats the comment that it will all be gone because the room wouldn't be in compliance for the tests. They discuss how to score that quiz and he collects them. It will be a class grade rather than a quiz grade. Now he is going to try to put this all together in a coherent story. He uses the notes on the white board to review the constitutional amendments related to civil rights. while he talks, one student gets up and uses a disinfectant wipe on the cart to clean her hands. She returns to get one for another student. Most students are listening and participating when he asks questions. He does make one kids sit up. He tells the story and the kids fill in information. The heat is on in the room and it's a sunny warm day so he turns on the AC.

My note: This really does look pretty traditional, with all the kids in rows and the teacher standing up.
He brings up the movie Remember the Titans. He talks about one of the Little Rock 9 who came to speak at the nearby college. One of the students asks about segregation in their own community and he reminds them where the "colored" high school is and talks about how the town is trying to restore it. He discusses the word "colored." Then a student asks a question I can't hear and he says he doesn't know but they can find out the answer. He tries to explain why it was so hard for people to change and tries to relate it to their own lives, particularly moving to a new place. While he is talking, he rolls the television cart to the front of the room. He turns off the lights, grabs the remote, and prepares them for the video. He has already told them it will be about Little Rock. He also spends a minute talking about the power of television because it broadcast these images to everyone. All the students are watching these pretty powerful images of the military escorting students to Central High School in Little Rock. At the end, he fast forwards to the march on Washington and reminds the students of their field trip to DC on June 6.

He picks up handouts and keeps reviewing. He gives them to the first student in the row who then hands them back. They talk about the difficulty of practicing non violence. Students have good questions and are engaged. He reviews the handout they have for homework and how much time it should take. He won't be there the next day so he reviews what "best behavior" means.
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Appendix 4: Document Examples
**Samantha’s Lesson Plan**

Science 6 Lesson Plans
Feb. 9 – 13

**Mon. Feb. 9**

Objectives: The student will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include major conservation, health, and safety issues associated with watersheds.

Materials: Video entitled “Common Ground” (27 minutes) and worksheet with same title Handout on “Oyster Harvest by Season,” and “Oystering Events of the Past”

Procedure:
1. View the video “Common Ground.” Have students follow worksheet to take notes on video
2. Discuss the importance of what oyster do for the watershed. List on overhead.
3. Pass out handouts on oyster harvesting and events of the past. Have students find reasons for the decline in the oyster population. List on overhead.
4. Review the different types of landing places for oysters (both suitable and unsuitable). (Suitable includes old oyster shells, other shells, rocks, clay, and other hard, elevated substrates.) (Unsuitable includes muddy bottom, sandy bottom, silty bottom, mud, and muck.)
5. Conclusion: Help restore oysters.

Homework: Vocabulary worksheets, due on Wednesday!

**Tues. Feb. 10**

Objectives: The student will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include major conservation, health, and safety issues associated with watersheds.

Materials: Handout on “Oyster Harvest by Season,” and “Oystering Events of the Past.” Graphic organizer on “Oysters.”

Procedure:
2. Discuss the importance of what oysters do for the watershed. List on overhead.
3. Pass out handouts on oyster harvesting and events of the past. Have students find reasons for the decline in the oyster population. List on overhead.
4. Review the different types of landing places for oysters (both suitable and unsuitable). (Suitable includes old oyster shells, other shells, rocks, clay, and other hard, elevated substrates.) (Unsuitable includes muddy bottom, sandy bottom, silt bottom, mud, and muck.)
5. Conclusion: Help restore oysters.
6. Review SAVs (Underwater Grasses) by listing the benefits of having SAVs. List the causes of the decline of SAVs.

Homework: Vocabulary worksheets are due on tomorrow!

**Wed. Feb. 11**

Objectives: A classification system is developed based on multiple attributes.
To investigate and understand the health of ecosystems and the abiotic factors of a watershed.

Materials: Picture Cards of Insects, worksheets entitled “Insect Graphic Organizer” and “Insect Identification Key,” digital projector & laptop

Procedure:
1. Give each student a set of Insect pictures. Ask students how they could classify these organisms into two groups. Accept all reasonable answers. Have students sort insects by wings and no wings.
2. Next, ask how students could sort the group of insects with wings into two groups. Accept all reasonable answers. Have students sort insects by one pair of wings and two pairs of wings.
3. Next ask students how they could sort the insects with one pair of wings. Suggest looking at the insects mouths. Sort into piercing mouth parts and sucking mouth parts.
4. Explain that scientists sort and categorize all different types of plants and animals this way. Sometimes scientists create an identification key so that others can sort and classify.

5. Have students classify the same insects using the “Insect Identification Key.”

6. Explain that scientists have classified macroinvertebrates the same way as we just did the insects. What is a Macroinvertebrate? Freshwater macroinvertebrates are organisms that have no backbone (invertebrate), are large enough to be seen without a microscope (macro), and live underwater in streams, rivers, ponds, and lakes (freshwater). Many are insect larvae that only live part of their life underwater others, like crayfish, water mites, snails, clams, worms, leeches, and mussels live underwater their entire life!

Homework: Quiz next Wednesday on Voc. Words!

Thurs. Feb. 12
Objectives: A classification system is developed based on multiple attributes.
To investigate and understand the health of ecosystems and the abiotic factors of a watershed.
Materials: Worksheets on “Sample Stream 1” and “Sample Stream Macroinvertebrate Tally”, digital projector & laptop
Procedure:
1. Demonstrate with students how to access the internet browser, how to get onto the www.portaportal.com website, and how to access the “Study Stream” under the Science heading in portaportal.
2. On the “Study Stream” site (http://people.virginia.edu/~sos-iwla/Stream-Study/StreamStudyHomePage/StreamStudy.HTML), demonstrate how to get to the “Identification Key” and from there to the first page of the key.
3. Next, pass out “Sample Stream 1” and using the “Study Stream” website, use the identification key to label the macroinvertebrates. Continue to identify and label the organisms in “Sample Stream 1.” Have students select which category to choose each time. Making mistakes is GOOD! It teaches students how to go back and try again which also teaches tolerance towards failure (mistakes) and how to correct the mistakes.
4. Using the “Macroinvertebrate Fact Sheet” label each organism as to its sensitivity to pollution.
5. Explain to students that you can tell how polluted or fresh the water in a river or stream is by collecting, counting, and returning macroinvertebrates to the river or stream.

Homework: Quiz next Wednesday on Voc. Words!

Fri. Feb. 13
Objectives: A classification system is developed based on multiple attributes.
To investigate and understand the health of ecosystems and the abiotic factors of a watershed.
Materials: Worksheets on “Sample Stream 2, 3, 4, 5 & 6” and “Macroinvertebrate Fact Sheet”, computers in computer lab
Procedure:
1. What is a Macroinvertebrate? Freshwater macroinvertebrates are organisms that have no backbone (invertebrate), are large enough to be seen without a microscope (macro), and live underwater in streams, rivers, ponds, and lakes (freshwater). Many are insect larvae that only live part of their life underwater others, like crayfish, water mites, snails, clams, worms, leeches, and mussels live underwater their entire life! Why do we classify these macroinvertebrates? (To determine the fresh water from polluted water.)
2. Pass out "Sample Stream 2" and using the identification key online, have students label the macroinvertebrate and its sensitivity to pollution. Continue to identify and label the organisms in "Sample Stream 2."

3. Continue identifying and labeling organisms for "Sample Streams 3, 4, 5 and 6." Label the macroinvertebrates sensitivity to pollution.

4. If time, tally up levels of pollution for each stream. If not enough time, this can be completed in the regular classroom. (No more computer access necessary.)

Homework: Quiz next Wednesday on Voc. Words!

Wanda's Lesson Plan

Ocean Animal Food Chain
Part 2

Please follow the attached directions to use "Movie Maker" to make a movie about the ocean food chain you put together last week.

For full credit, your movie must have:
1. An appropriate title with your name as creator (1st frame)
2. A full picture depiction of an ocean food chain, in the correct order (sun, producer, and consumers must be represented)
3. Music (bonus points for music!)
4. Must be saved on your "H" drive as below:

   • your name period #

   Your file name should look something like this:

   JohnSmith3

   This is very important so I can find and grade all your projects at a later date!
Appendix 5: Open Codes Examples

Screenshot of Open Coded Transcript

<table>
<thead>
<tr>
<th>Open Codes</th>
<th>Verbatim Transcript</th>
</tr>
</thead>
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<tr>
<td>Use of smartboard to look at documents</td>
<td>ME: Talk a little about—I jotted down a note to myself—have you used the discussion group thing in the echalk site at all?</td>
</tr>
<tr>
<td>Use of smartboard to pinpoint vocabulary or terminology</td>
<td>BW: I have used it with the teachers and I set it up once for the students. However, the passwords that they have to be assigned didn’t work completely so they cut it out for 5th, 6th and 7th grade and only 8th graders are allowed to use it. But I would use it if it were available and they are hoping they can get the passwords set up. Each child in order to use it has to have a password and so that was more of a technology issue not because I didn’t want to use it. Which happens. So the password obviously they weren’t allowed to assign it to more than one group and they had tried to do that and it didn’t. They had to pick one class and grade so they decided to do it with 8th grade and next year the 8th grade. I should say—I didn’t even mention this—online testing. We use the interactive achievement and different online tests. That’s one technology tool we use as well.</td>
</tr>
<tr>
<td>Use of technology for online testing</td>
<td></td>
</tr>
</tbody>
</table>

Table of Open Codes Assigned to Text

Open Code: planning requirements
Source Material:
I am required to submit a week at a glance which is basically like your weekly lesson plans.

Open Code: keep detailed notes
Source Material:
It is a general overview of what I plan to do for the week and then of course I keep slightly more detailed notes for myself.

Open Code: planning requirements
Source Material:
It is a general overview of what I plan to do for the week and then of course I keep slightly more detailed notes for myself.
It is a general overview of what I plan to do for the week and then of course I keep slightly more detailed notes for myself.

But generally the week at a glance is the roadmap that the administration uses to kind of know where we are going, where we've been, what we're doing and so forth.

And the other thing is last year and the year before there was a big press to do pacing guides. I went ahead and did that the first year and got that together.

That's pretty much a basic skeleton that we are expected to follow once we create it and then help tweak it as time goes along so it fits whatever situation might come up. That's basically it.

The other that thing we do is we are to post periodically post things on the webpages and as we've talked about before those are sometimes pretty quick to do and other times it takes awhile.

Our high speed line is supposed to be in any time now but it was not up and ready to go on the date that it was.
Source Material:
That's still kind of a slow process some days but it's not regularly maintained by a lot of people.

Source Material:
That's still kind of a slow process some days but it's not regularly maintained by a lot of people.

Source Material:
That's still kind of a slow process some days but it's not regularly maintained by a lot of people.

Source Material:
Weekly would be optimal but at least every couple of weeks.

Source Material:
The school is posting the homework pages and the assignment pages on the main website and that's where parents can keep in touch.

Source Material:
And parents can also link emails through the echalk site directly to teachers so there's plenty of ways to get access.

Source Material:
It's just a matter of usability at this point.

Source Material:
Basically, what standardss you are covering,

Source Material:
what are your activities that you're going to do in class, what resources are you going to use, what days are you going to various activities.

Source Material:
It also has a place at the bottom, you run it by your special education inclusion professional and they will make suggestions and make comments and then work together with that person to make modifications that are necessary for that week.

Open Code: week at a glance
Source Material:
It also has a place at the bottom, you run it by your special education inclusion professional and they will make suggestions and make comments and then work together with that person to make modifications that are necessary for that week.

Open Code: week at a glance
Source Material:
There's a place at the bottom of it for that. Some people give a paper copy and some people give, send an email.

Open Code: week at a glance
Source Material:
I usually send mine by email to the administrators and to the special ed professionals that are using, or that need to have that information for their instruction basically.

Open Code: week at a glance submitted via email
Source Material:
I usually send mine by email to the administrators and to the special ed professionals that are using, or that need to have that information for their instruction basically.

Open Code: plan by feel
Source Material:
Generally, I, it may sound kind of silly but some of it's kind of feel.

Open Code: plan in the car
Source Material:
I do some of it in the vehicle because a lot of times running errands or contacting parents or doing other things during planning time.

Open Code: planning not protected
Source Material:
I do some of it in the vehicle because a lot of times running errands or contacting parents or doing other things during planning time.

Open Code: planning used for meetings
Source Material:
I do some of it in the vehicle because a lot of times running errands or contacting parents or doing other things during planning time.

Open Code: planning time used for grading
Source Material: Grading papers or trying to catch up.

plan in the car
Source Material: Often times it's done, it's tweaked in the vehicle.

Open Code: plan using resources for various texts
Source Material: I put together concepts at home on Sundays and I use resources from various texts.

Open Code: planning done on Sundays
Source Material: I put together concepts at home on Sundays and I use resources from various texts.

Open Code: plan using internet to find resources
Source Material: Sometimes I'll look up ahead of time, I'll use the Internet connection to look up sites ahead of time if we're going to do a scavenger hunt or look up a particular time period and make suggestions to kids on places where to start and where to go.

Open Code: plans for technology use
Source Material: Sometimes I'll look up ahead of time, I'll use the Internet connection to look up sites ahead of time if we're going to do a scavenger hunt or look up a particular time period and make suggestions to kids on places where to start and where to go.

Open Code: no solid planning process
Source Material: So there's really not a good solid answer for that.

Open Code: plan on the run
Source Material: I guess generally I do it a lot on the run.

Open Code: planning done with the pacing guide
Source Material:
I have, I read ahead in what the text has and I follow what I, I did a lot of research for the pacing guide.

Open Code: planning with textbook
Source Material:
I have, I read ahead in what the text has and I follow what I, I did a lot of research for the pacing guide.

Open Code: planning starts with pacing guide
Source Material:
So often I will refer to that and use it to check on some resources and then I add resources from libraries where appropriate.

use pacing guide to locate resources
Source Material:
So often I will refer to that and use it to check on some resources and then I add resources from libraries where appropriate.

Open Code: library resources
Source Material:
Also our own library has so I'll pre-screen those to make sure they fit in with where we are in the pacing guide.

Open Code: use pacing guide to locate resources
Source Material:
Also our own library has so I'll pre-screen those to make sure they fit in with where we are in the pacing guide.

Open Code: planning hodge podge
Source Material:
Generally, it's a hodge podge.

Open Code: plan ahead for the following week
Source Material:
I usually try to set a good plan ahead of time before I get a pretty good idea of the week before we're going to do it.

Open Code: week at a glance
Source Material:
I know where we are going and then I will try to put together the week at a glance before the weekend.
Open Code: week at a glance completed before weekend
Source Material:
I know where we are going and then I will try to put together the week at a glance before the weekend.

Open Code: week at a glance changes
Source Material:
But usually it ends up getting modified or tweaked over the weekend as I think about it and look at it.

Open Code: week at a glance changes
Source Material:
And then as the week goes on if I see the class is not progressing at the pace that I would like to go, it is often modified again during the week.

Open Code: plan on the run
Source Material:
I try to plan as much as I can at school but often times it happens on the run.

Open Code: pacing guide covers the whole year
Source Material:
But following, I'm following the basic time frames that I have laid out in the pacing guide and that's for the whole year.

Open Code: pacing guides
Source Material:
But following, I'm following the basic time frames that I have laid out in the pacing guide and that's for the whole year.

Open Code: general idea of how long concepts take
Source Material:
So I generally know about how long it should take to cover certain concepts.
Appendix 6: Memo Examples

10 February 2009 @ 10:26 am
Memo: Susan's Quote

I'm in the midst of coding Susan's second interview, prior to her lesson. It's the prescient part of the interview because she's discussing the problems she had before getting a website and a video to work on her laptop. She had to rush to get software installed. (I was reminded of Amy's story of the projector not working the morning she came in.) She is also discussing how she is nervous about my visit. She is discussing her feelings as she struggles to get a website to work on her laptop:

At the time when it wouldn't come up I was like OK this is why I don't use websites in the classroom. And, of course, I mean and I thought I had planned ahead of time well enough. I had looked at the website. I had checked it all out. All the stuff they tell you you should do and then I didn't expect for it to not work on that computer. But anyway, it all worked out in the end.

She felt like she had adequately prepared and I'm sure she overprepared for my visit. But it just didn't occur to her that computers are different and the projector also makes a difference in terms of displaying files. I remember writing in my observation notes when she struggled with the video, "Is it too much to ask that this stuff works reliably?" Technology adds to an already complex process.

06 February 2009 @ 02:35 pm
Memo: Wanda's Quote

Here's her quote:
"I would have to say that one of my realizations is of how hard it is for me personally to actually plan technology in. For me, it just happens. Like, I'm fortunate enough to have the SMART Board in there, the computer, the projector, everything I need and it just happens that when it came time to actually stop and make a plan, it's like my brain went whoa. It was hard to stop and think about it. It just seems to happen without putting a whole lot of thought in it. It is as natural to me to turn to the internet and turn to the computer as it is to some to open a book or something. So that was a bit of a surprise for me."

She probably did the most ambitious project in terms of having the kids make something. She enlisted the help of the computer teacher to get some of those "maintenance" skills (see Deirdre) out of the way like logging in and accessing the h drive. Like Deirdre, she was surprised at how poor their skills are. Deirdre and Wanda both teach fifth grade and this didn't seem to be as much as a problem with the older grades. In fact, Mark was pleasantly surprised and felt their skills were getting better. And I don't remember Bonnie talking about it...she teaches them how to use a particular program but she didn't seem concerned about their skills. They all felt it was important for students to learn how to use software programs to create things.

Other Notes:

Both Wanda and Deirdre commented about how tired they were. They were considering other ways to do the lesson so that every student wasn't on a computer at the same time as the students were so needy. Wanda was thinking about doing stations but she commented that the other stations, besides the computers, would have to be pretty fun so the kids didn't complain about fairness. Deirdre was also concerned about that...having only some students on the computers. So she thought she could handle doing one class on computers one day and another class the next day.

30 September 2008 @ 10:59 am
Memo: All the Planning in the World (Michelle)

As I coded her the planning process section of her interview, this was the quote that leapt out at me: "I can do all the planning in the world it seems like, spend hours and then I'm going to change it when I walk in
the room." She says it drives her crazy but she seems unable to change it. Her perspective changes or she thinks about something else to do. And there is just a general sense of not always being in control. She doesn't know how much she is going to get done day to day.

Of course, for Michelle part of the problem is that she changed her curriculum this semester, especially with her advanced students, so she has a sense of having the big picture, but not knowing the path. That may contribute to her sense of chaos that she feels.

This reminds me of Kelly who says that trying to plan for a whole week is too hard...she gets behind on the very first day. And it's a general theme, it seems, that you can do all the planning you want, but you don't control everything that goes on in terms of student discussion or questions or comprehension. Amy, who identified herself as a weekly planner, said that even though she plans for the whole week, she has to tweak as she goes along, scribbling notes or crossing things out.

And, then there's Wanda, who emailed me that when an activity didn't take as long as she thought it was, she was able to find an enrichment activity on the internet and bring that into her classroom. Time is very fluid, it seems.

29 September 2008 @ 08:45 am
Memo: Balancing the Teaching of History

As I listened to Amy describing her difficulties with teaching history, specifically balancing between the facts they needed to know for the test and the background they needed to know to make sense of it all, I remembered my interview with Mark, who said almost the same thing. Amy was despairing over her test scores from the previous year but still determined to find a balance between the facts and the story. She said, "I'm still trying to give them the background information that they need to understand but I spent too much time my first year with a lot of that. Whereas now it's here is the stuff you need to know." Later, she said, "Well if I just went through the American revolution and said OK here's the important people you need to know, here's the events you need to know, they are going to think well why did this lead, how did this lead to this. So I try to give them some of that and I do want to tell it as a story because it is a story. The kids are interested in that. They want to see that story. They want to see the progression." So, in her planning, she very much moves between the two sides but what goes in their notes and what is emphasized is the required knowledge that is determined by the state. That is, as she called it, her "bible" and one of the reasons she doesn't use the textbook very much is because it has too much information and is not clearly focused on that required knowledge.

Mark is also concerned about helping students see the trends. To the question as to whether the state materials or released tests had changed the way he plans for and teaches history, he said,

"No, not at all because I'm preparing kids more strongly than I think what the minimums require. I'm trying to look at them as that these are minimums. I want my kids to know more than just a list of facts. I want them to understand more about the time period and be able to use the lessons from that time period to help them make judgments in the future. That's the whole purpose. In doing so, when it comes time for them to go through the information, the standards, my hope is that they have enough reasoning ability that if there is an item that comes up that they are not familiar with that they are going to be able to think well let's think of the trends here. I'm trying to show them the trends. And that's not explicitly pronounced when you look at the standards."

And, in discussing his use of a pacing guide, he commented that he spends more time on some things than the outline would suggest because he wants the kids to see the connections: "Generally, I spend more time than what the pacing guide would suggest what you might need to because I feel like there are a lot of connections that aren't made in the standards themselves." He also refers to wanting the kids to understand the story: "Generally, I spend more time than what the pacing guide would suggest what you might need to because I feel like there are a lot of connections that aren't made in the standards themselves."
Appendix 7: Code Map Examples

Screenshot of the Code Map for “Time”

<table>
<thead>
<tr>
<th>Time</th>
<th>Theme</th>
<th>Memo</th>
</tr>
</thead>
<tbody>
<tr>
<td>wish I had more time</td>
<td>Feeling of wasting time if it doesn’t work</td>
<td></td>
</tr>
<tr>
<td>Pressure of getting through the curriculum</td>
<td>These teachers are constantly thinking about time and how they can use every second. Most had a classroom routine that included some kind of warm up to get the kids started immediately. There was no waiting around for the teacher to start. And they thought about buying every minute…both Wanda and Deirdre figured out they could save time on the interactive notebooks and then thought about what they could do to fill that time. Sure you’re not crowded here.</td>
<td></td>
</tr>
<tr>
<td>students guide planning but also pacing guides</td>
<td>using planning time to find resources</td>
<td></td>
</tr>
<tr>
<td>spend more time than pacing guide</td>
<td>TIME ACCESS OVERLAP</td>
<td></td>
</tr>
<tr>
<td>only so much time for trial and error</td>
<td>using websites requires time</td>
<td></td>
</tr>
<tr>
<td>afraid of losing time</td>
<td>there’s not enough time to take them to the computer</td>
<td></td>
</tr>
<tr>
<td>afraid of not getting everything done</td>
<td>Technology offers options for extra time</td>
<td></td>
</tr>
<tr>
<td>concerned about wasting time</td>
<td>Add to planning time with time it will take to create brochure in</td>
<td></td>
</tr>
<tr>
<td>planning depends on time</td>
<td>research takes a lot of time</td>
<td></td>
</tr>
<tr>
<td>concerned about pacing</td>
<td>save time by dropping a test</td>
<td></td>
</tr>
<tr>
<td>teachers created pacing guide</td>
<td>the wars are good place to make up time</td>
<td></td>
</tr>
<tr>
<td>spending more time on each SOL</td>
<td>pacing guide is a skeleton</td>
<td></td>
</tr>
<tr>
<td>talking to other teachers about pacing and ordering</td>
<td>use saved time to pull in videos wants the video to be worth the time</td>
<td></td>
</tr>
<tr>
<td>teach a certain amount of things in a certain amount of time</td>
<td>time consuming takes time to get used to it</td>
<td></td>
</tr>
<tr>
<td>pacing guide covers the whole year</td>
<td>smartboard makes planning more time consuming</td>
<td></td>
</tr>
<tr>
<td>pacing guide is padded a bit</td>
<td>use the time you have</td>
<td></td>
</tr>
<tr>
<td>a little behind pacing guide</td>
<td>Susan, I think somewhat this because we are. I mean it’s not the ideal situation by any means because we are close to winter break so they are excited about that. We are going on a field trip tomorrow afternoon. That will be kind of hectic anyway. So it’s not necessarily ideal conditions but I think with any lesson you never really have ideal ideal conditions so you just have to kind of go with it the best you can. And use the time you have and try to get out of what you can. Susan</td>
<td></td>
</tr>
<tr>
<td>pacing guide will change with new SOL</td>
<td>behind on pacing guide</td>
<td></td>
</tr>
<tr>
<td>try to spend time based on blueprints</td>
<td>behind on pacing guide</td>
<td></td>
</tr>
<tr>
<td>hate to be narrowed into pacing guide</td>
<td>technology increases planning time</td>
<td></td>
</tr>
<tr>
<td>try to spend time based on number of questions</td>
<td>use the time you have</td>
<td></td>
</tr>
<tr>
<td>try to spend time based on amount and challenge of information</td>
<td>use the time you have</td>
<td></td>
</tr>
<tr>
<td>doesn’t quite have the pacing yet</td>
<td>school doesn’t have a pacing guide</td>
<td></td>
</tr>
<tr>
<td>modified another school’s pacing guide</td>
<td>planning starts with pacing guide</td>
<td></td>
</tr>
</tbody>
</table>

Open Codes

Participant Quote

Susan, I think somewhat this because we are. I mean it’s not the ideal situation by any means because we are close to winter break so they are excited about that. We are going on a field trip tomorrow afternoon. That will be kind of hectic anyway. So it’s not necessarily ideal conditions but I think with any lesson you never really have ideal ideal conditions so you just have to kind of go with it the best you can. And use the time you have and try to get out of what you can. Susan
Screenshot of the Code Map for "Student Engagement"

**Main Question:** How to engage the kids

- Judge kids learning by their reactions to things
- kids learn more when they are engaged
- kids who are engaged don't get in trouble
- Try to motivate kids with promise of fun
- students will remember the lesson in the future

**Wanted to Get Kids Excited**

- Excited by student response to word problem
- Teacher Engagement: Several of the teachers indicated that they were excited about using technology themselves.

**Tech**

- Traditional class is boring to kids
- English content is not exciting
- Kids find English boring
- It's good to see the kids excited about math
- Kids enjoy tech
- Kids love computers
- Kids love playing games
- Kids loved playing Jeopardy
- Kids enjoy games
- Kids like brain pop
- Kids respond well to videos
- Kids like playing with graphics
- Kids were excited about making a

**Engagement**

- Teachers engage kids
- using pedagogy to engage kids
- Using technology to engage kids
- pictures of kids engage them in content
- kids examples are fun
- Kids were excited about making a
- Kids learn more with games
- Kids enjoy games
- Impress by student engagement with blogging
- Kids were excited and anxious to share
- Kids want to write on board
- Just reading the textbook would get boring

**Excited by Possibilities of Smart Board**

- Kids excited when smart board shows up
- Writing on the board is interactive
- Smart board engages kids
- Writing on board engages them
- Writing on board makes them active
- Elmo keeps the piece in front of them

**Tech**

- Excited about smartboard
- Excited by smartboard
- Elmo keeps kids more engaged than just talking
- Kids enjoyed smartboard prefix activity
- Kids loved smart board
- Kids were excited by smart board

**Interactive Whiteboards & Elmo Increases Engagement**

- Thinks smart board is cool
- Thinks kids will enjoy smartboard
- Kids were excited when smart board shows up

**Technology Engages Students**

- As excited about tech as the kids
- As excited about tech as the kids
- Students were engaged
- Writing on board engages them
- Writing on board makes them active
- Elmo keeps the piece in front of them
Appendix 8: Coded Observation Examples

Screenshot of Coded Observation, Initial Observation of Samantha, January 29, 2009

<table>
<thead>
<tr>
<th>Axial Codes</th>
<th>Observation Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>obs classroom description</td>
<td>The school appears to be old. Tall windows with old blinds and tall ceilings. The desks are in rows with a table in the middle covered with stuff. There are lockers lining the walls that she is using for storage. There are posters on the wall. There are four desktop computers in the back of the room. There is a desktop computer on her desk. There's a laptop and projector on a cart and a mounted interactive whiteboard. The students come in with their bookbags. She is writing a pass for a student to go somewhere. She reminds them that they are going to the library later on during the class for the art fair.</td>
</tr>
<tr>
<td>obs available technology</td>
<td></td>
</tr>
<tr>
<td>obs students</td>
<td>They start with a review of yesterday: environmental scientists. They are blurt out answers and she chides them. They continue to review and she asks them questions about the previous day's lesson. She asks the class: 8 boys and 7 girls with maybe 6 minorities? She asks also one boy several times.</td>
</tr>
<tr>
<td>obs student activities and reactions</td>
<td>The students want to talk about storm sewers. She answers some questions. She brings up a slide on the board and she tells the kids they are going to come up. She wonders out loud if it is going to work. The kids come up and write. Suddenly, everything disappears on the board. She doesn't know how to fix it. She says that she can't magically bring it back. They continue the review and write on the next slide. The words disappear again but this time she gets them back. Then the board shows an error message. She says she wishes she hadn't turned it on. She tries to focus them on the lesson and not the board. She tells a story about her family reunion but only after waiting for them to settle down.</td>
</tr>
<tr>
<td>obs beginning of class</td>
<td></td>
</tr>
<tr>
<td>obs manage students</td>
<td></td>
</tr>
<tr>
<td>obs students</td>
<td></td>
</tr>
<tr>
<td>obs student activities and reactions</td>
<td></td>
</tr>
<tr>
<td>obs using interactive whiteboard</td>
<td></td>
</tr>
<tr>
<td>obs using interactive whiteboard</td>
<td></td>
</tr>
<tr>
<td>obs glitches with interactive whiteboard</td>
<td></td>
</tr>
<tr>
<td>obs instructing students</td>
<td></td>
</tr>
<tr>
<td>obs manage students</td>
<td></td>
</tr>
<tr>
<td>obs dealing with glitches</td>
<td></td>
</tr>
</tbody>
</table>
Lesson Observation, Wanda, November 10, 2008

She and the students are just getting back from lunch. She shares with me that the day has been rather stressful. There are 21 kids: 9 girls and 12 boys. 5 appear minority. Wanda is busy handing things out and talking to them about what they will be doing in the lab. She reminds them about saving to their H drives. She doesn't have enough copies of the handout because students took them in previous classes.

She starts up the projector and a student turns off the light. The kids come to the front of the room. She shows them how to open Movie Maker. She has printed directions. She reminds them about the H drive again. She talks about dragging and dropping and adding a title. She compares the transitions to Powerpoint. She talks to them about downloading pictures.

She shows them a movie she made about her dog.

Then she tells them to line up and the kids run to the door. They walk to the lab and the kids go right to the computers and login. There are 19 working computers around the four walls of the room and facing into the wall. She sent several students to the special ed teacher to work. She tells me they couldn't get the laptops to work earlier in the day so they don't have any extra computers available.

The students are all at different places. Some are working on the movies while others are finishing the research handout from the week before. There are lots of hands and she is trying to be everywhere. She has one student who wasn't there the previous week so she has to get her started. The students do appear to be following the directions she provided. Some students are having trouble finding their pictures.

She encourages them to start saving as the period comes to an end. Some students have finished the project. They save and log out. She waits for all the students and they go back to the classroom.
Mark’s Lesson Plan: Week at a Glance

This Week at a Glance

TEACHER

WEEK’S DATE October 6-10, 2008

To be covered:
- Transportation advances spur Industry.
- Reasons for the growth of big business.
- Technology improved all aspects of American life.

Resources to be used:
Teacher Made Reading Guide, notes, Quiz
Video, Dry Erase Board, Computer Lab.

Classroom Activities:
Guided reading and reading guide, note taking, review worksheet, oral review. Quiz.
Video on Industrial Development in the late 1800s.

Monday:
Begin Project research in computer lab on famous people of the Industrial Age for a newspaper style article. *Work on project, due Wednesday.

Tuesday:
Complete practice Quiz and check in class. Begin reading Section 3 on p. 584 silently while others finish practice. *Study for Quiz

Wednesday:
Finish Projects in a computer lab. Begin reading an taking notes on important people from p. 584-587. Note Alexander Graham Bell, Thomas Edison, Cyrus Fields, George Westinghouse, 3 other useful household/industrial inventions.

Thursday:
Complete notes for sections 1 and 2. Practice worksheet for Friday’s Quiz. *Study for Friday’s Quiz. Present projects Today or Monday.

Friday:
Take Quiz on Chapter 20 Sections 1 and 2. Finish reading an taking notes on important people from p. 584-587. Note Alexander Graham Bell, Thomas Edison, Cyrus Fields, George Westinghouse, 3 other useful household/industrial inventions. Watch video on Industrial Revolution.
Mark's Lesson Plan: Handout

The Rise of Industrial America

Throughout the next 2-3 days students in each U.S. History class will research one of the following topics and compose a ½ to 1 page newspaper style article with a headline using the computer. These articles will then be displayed and possibly compiled to form a book on events and people that stand out in the Industrial Revolution. One student form each class may be asked to design a cover if we decide to create a book.

Topics for research include the following:

- John D. Rockefeller
- Andrew Carnegie
- Levi Strauss
- Sears and Roebuck
- Aaron Montgomery Ward
- E. L. Drake
- Alexander Graham Bell
- Henry Bessemer
- Ellis Island
- Jane Addams
- J. P. Morgan
- Samuel Gompers and the American Federation of Labor

Each student will be required to paste at least one illustration with his or her article. The article must also have an attention grabbing title to entice readers to want to read it. Proper sentence and paragraph structure is required and students will need to cite their resources.

Grading

- Attention Grabbing Headline and Newspaper Title (20 points)
- Informative Body (30 points)
- Illustration/Picture (20 points)
- Bibliography (10 points)
- On Time and Complete (20 points)
Marion's Lesson

5th grade Science

Investigating Characteristics of the Ocean Environment
Three Lesson Stations

Purpose: The purpose of this lesson is to help students understand concepts of oceanography as they investigate physical and geological characteristics of oceans.

Objectives:

- TSWBAT...
  - Conduct an investigation (simulations) related to physical characteristics of the ocean environment (depth, salinity, formation of waves, and currents, such as the Gulf Stream).
  - Explain the formation of ocean currents.
  - Interpret a model of the ocean floor, label and describe each of the major ocean features (including the continental shelf, slope, rise, the abyssal plain, and ocean trenches)
  - Research and describe the variation in depths associated with ocean features (including the continental shelf, slope, rise, the abyssal plain, and ocean trenches)
  - Interpret graphical data related to physical characteristics of the ocean.

Procedure:

Computer Station – Ocean Web Explorer Activity:

1. Vocabulary
2. Physical characteristics of the ocean environment
3. Biological characteristics of the ocean environment/ecological relationships

Desk Station – Concept Development Activity:

1. Ocean floor features
2. Physical characteristics of the ocean environment
3. Biologic characteristics of the ocean environment/ecological relationships

Lab Station – Hands-on Activity:

1. Experiment and model about ocean currents
2. Creating graphs/analyzing graphs comparing data about the oceans

Resources:

- McGraw-Hill Science 5: Unit C, Lesson 7
- Teacher Created and Edited Supplementary Materials
- Teacher References:
  1. ScienceSaurus, Houghton Mifflin
**Pre-Algebra Agenda**  
**Feb. 9 - 13**

<table>
<thead>
<tr>
<th>Day</th>
<th>Activity</th>
</tr>
</thead>
</table>
| Mon., Feb. 9 | Review chapter 6 – Prepare for the chapter 6 TEST  
  **HW: STUDY!!** |
| Tues., Feb. 10 | **CHAPTER 6 TEST TODAY!**  
  **HW: none** |
| Wed., Feb. 11   | Library Today – Study Island –  
  **HW: none** |
| Thur., Feb. 12  | Progress Reports  
  Solving 2-step equations – p. 348  
  **HW: WB p. 114 #1-18 calc. Ok – SYW, get progress report signed** |
  **HW: WB p. 116 #1-15 odd** |
Appendix 10: Recoded Data Examples

Screenshot of Recoded Data

Table Showing Selective Codes Assigned to Data

<table>
<thead>
<tr>
<th>CONTENT KNOWLEDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Material:</td>
</tr>
</tbody>
</table>

D: Not any time soon. Maybe by the time we get to that Civil War unit that we are going to work on with another teacher. That they are very comfortable and a lot more independent with it then maybe. Maybe. But not for a while. I don't want them to lose site of you know like she kept reminding them today, yes it's about blogging and yes, it's about having fun, but this is math class and we've got to remember that our main objective is to get that math problem written.

K: You're sure about that.

D: Again I will tell you that I am excited because they were very excited. And just for them to have a laptop computer was just a tremendous deal, I mean such a big deal. It's going to get I mean maybe my expectations may be too high for the next time. But I know it's going to better. It's going to run smoother. I know that.

K: So did you come with a plan B today?

D: Plan B we would have given the graph back and we're starting stem and leaf next and I already have their notes copied, hole punched. We were going to put it in our binder under our notes and we were going to collect their favorite number from 11 to 99 and we were going to write it on the board and we were going to put it in a stem and leaf. So we did have a backup this time.

K: Anything else that you learned?

D: And I will tell you. I also pass it around and I know another teacher found the same problem. Have something to do because you never know when that computer is just going to go completely. And you can have high expectations and have this wonderful plan and if the technology doesn't work so yeah that I shared with everyone.

K: Anything else like that that you learned?

D: Just grasped them that it's very difficult to do everybody.
So I try to give them some of that and I do want to tell it as a story because it is a story.

CONTENT KNOWLEDGE
Source Material:
We were talking about primary and secondary sources so I pulled up some primary and secondary sources online and was showing them through the LCD projector.

UNPREDICTABILITY
Source Material:
For the most part, yeah. I mean and sometimes you don't and sometimes unexpected things happen and you can't, there's no way to control that. And you just change it up. You maybe take something out that you were going to do or push it back and it depends on a lot of different things. We had a situation last week where the kids had a day off school because they were having problems with the water. So I was going to give a quiz on the southern colonies that day so I just decided to scrap the quiz because I didn't want to do it the next day and take away from what we were doing the next day because that would push us back for the test. So I just decided to scrap the quiz.

CONTEXT
Source Material:
For the most part, yeah. I mean and sometimes you don't and sometimes unexpected things happen and you can't, there's no way to control that. And you just change it up. You maybe take something out that you were going to do or push it back and it depends on a lot of different things. We had a situation last week where the kids had a day off school because they were having problems with the water. So I was going to give a quiz on the southern colonies that day so I just decided to scrap the quiz because I didn't want to do it the next day and take away from what we were doing the next day because that would push us back for the test. So I just decided to scrap the quiz.

TWEAK
Source Material:
They are always changing. Because certain classes respond differently to certain things so I may have a store of things to use but I'm constantly tweaking them as I go and I'll say I can change this. I can make this better by doing this or adding this. So they are constantly changing. It's a work in progress. And even for different classes. Like first period might respond to something and third period doesn't so I've got to switch it up and do something different with them. It is just being reflective and constantly mixing things up so you can reach a group of kids.

VISUALIZATION
Source Material:
A: It was right before Thanksgiving and we were talking about the different colonies and I was looking for something where I was kind of sick of doing the same kind of routine and I wanted them to see how difficult it was in the colonies. I don't think they get that picture just hearing me talk about it or seeing even just the pictures in the book. And the video does a good job of showing the hardships and that it wasn't easy to be a colonist in either Jamestown or Plymouth. And so I guess I wanted them to actually see what it took to survive in the colonies.

THE VALUE ADDED
Source Material:
It's so that kids see it in a fun way. It gives them a fun way to review the information.

CONTEXT
Source Material:
I try to use it as often as I can. And I try, resources seem to be limited, so there's always, are you using the led today or that kind of thing?

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
After we've completed a unit, we go in and work with a review website. There's lots of fun games and stuff for them to review the information that way.

CONTEXT
Source Material:
We basically have one lcd projector per grade level. And then I think a few other teachers they have one. I think Mary Jones in seventh grade has an lcd projector and SMART Board in her room. So, we know we always have one per grade level but there are others and I think we may have led projectors in the library that you can check out. But again it's not...you kind of have to plan ahead of time so you can say I need it for this day. You're not going in that day and saying I need this and someone's already checked it out.

TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE CAPS
Source Material:
A: It's a website. You do have to have a subscription to it. My district does. It has a lot of fun activities that are standard correlated. There's who wants to be a millionaire games and hang man and drag and drop activities. Things that kids really get excited about. So, it's fun for them to do and it's also reviewing the standard information at the same time. Matching type things. Fill in the blank. There's crossword puzzles. Stuff like that. But they are actually doing it online so they have fun with it.
I also do a current events assignment every week in social studies and they have to find a newspaper article and then there's a little sheet I have them write up the main idea of the story and other facts or details. The when, the where, all the important information. And I also gave them a list of websites that were good that they could use for that also. So they can use the computers in home room sometimes to do their current events.

TECHNOLOGY KNOWLEDGE
Source Material:
I think sometimes we don't have as much training as we might need to on certain things. Or we'll have a training but by the time you actually get to use it, you've forgotten a lot of the hows. I think that would be my only, other than limited resources, is having enough training or refresher courses on how to use it.

TECHNOLOGY KNOWLEDGE
Source Material:
Like the SMART Board. Since I don't use it on a regular basis, when I do go to use it I'm kind of like ok how do I do this again? That kind of things. I can usually ask another teacher who I know has used it to get me through the initial set up.

TECHNOLOGY KNOWLEDGE
Source Material:
As a teacher uses it and learns how to use it, they are going to train the next person on it on how to use it.

TECHNOLOGY KNOWLEDGE
Source Material:
No. And we did have some training on the exam view but it was kind of like, they are showing it to you but until I actually play with it, it wasn't going to mean as much to me.

K: Say a little bit more about what you mean when you say you had some training?

A: For exam view we had an afternoon training. It was like 1 to 3:30 and the other problem with that is that it was when we were trying to get ready for the beginning of school and so we hadn't had much time in our classrooms yet. So we're worried about getting our classrooms ready to go and getting ready for the first couple days of the kids being here so I was just like tell me the basics and let me go play with it on my own so I can figure it out.

THE VALUE ADDED
Source Material:
A: When I was doing the lesson with primary and secondary sources and actually getting to show them online the pictures of primary resources that are out there and available for them to use. I think it did register with the kids and they did really well on the quiz on primary and secondary sources. I think that overall lesson went pretty well. Giving them that visual helped.

THE VALUE ADDED
Source Material:
I think sometimes we get kind of stuck and we do things a certain way. How can I bring this in and you have to constantly remind yourself to try to do that.

TECHNOLOGICAL CONTENT KNOWLEDGE
Source Material:
A: Yes. I had done the library of congress but I hadn't had the other website, the gilderman website. So I used the library of congress and they had some examples but then I was able to pull some other examples that went really well with the kinds of things we'll be talking about this year. And it was things that were interesting to the kids. I think having that website helped boost the other one as well. So they kind of work well together.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
A: Yes. I had done the library of congress but I hadn't had the other website, the gilderman website. So I used the library of congress and they had some examples but then I was able to pull some other examples that went really well with the kinds of things we'll be talking about this year. And it was things that were interesting to the kids. I think having that website helped boost the other one as well. So they kind of work well together.

TWEAK
Source Material:
Obviously you are constantly changing that as you go. You may not get through as much as you had thought some weeks. Some weeks you get through more. It's just constantly scribbling and crossed over and written over but this one group may get it and fly through it and another group may take more time with it. It just depends on a lot of different factors. I plan for a week at a time.

TIME
Source Material:
A: No they just hand it in. I wish I had time to let them present but in the day of tests I don't have that luxury. But every once in a while if I have one who does a super job on one or it's a really interesting story, I'll have them get up.
A: Yes. When they come in they should be copying down homework if there's a homework assignment on the board and then doing their warm up. So that's how they should start class. And then we talk about the warm up and we go right into the lesson. That's pretty much how. It helps get them focused as soon as they come in. It cuts back on a lot of issues if they are waiting for something to happen. Last year I would have a paragraph on the board about something that happened that day in history. Then there was a sentence underneath it relating to that paragraph that had some kinds of mistakes in it, things were spelled wrong, punctuation was wrong, or something to that effect and they had to correct the sentence. My social studies scores weren't what I wanted them to be last year so I went more geared toward the standard related question with them rather than language. I was trying to help out the writing teacher last year but you know.

CONTENT KNOWLEDGE
Source Material:
A: Looking at some of the questions. Out of 400 years of material, that's what you are choosing to ask. Some of the questions were just so convoluted so even I was looking at them and thinking what do they want? It was almost like they were trying to trick them. And like I said when you are covering 400 years worth of material, don't try to trick them. They know it or they don't. When I see some of my gifted kids struggling, I was very frustrated by last year. But I learned a lot from the process. It was the first year, it wasn't the first year that I taught that curriculum, but it was the first year that it was tested at the end of that year. In Essex, they did the cumulative test at the end of 8th grade so I never saw the break out test for just US History I. So it gave me a good idea of how they are going to ask questions. And that's the other problem. In social studies they weren't releasing test items for a long time. We didn't have that skill box. Last year was the first time they released some test questions and it was only one test. So I used those in class and we went over those. Like I said, now I have a better understanding of how they are going to ask questions so I'm more prepared for the test.

PEDAGOGICAL CONTENT KNOWLEDGE
Source Material:
A: Absolutely. I will definitely change my test. There are a lot more pictures on the test and a lot more interpretive data and things on the test. Giving them a graph, giving them what's missing from the graph. It will influence how I make up my tests.

PEDAGOGICAL CONTENT KNOWLEDGE
Source Material:
A: There were a lot of pictures and a lot of maps. And we did a lot of maps in social studies but it was more where. I mean they just gave a blank map and they didn't necessarily have to know the name of that region. They just had to be able to identify. For example, there might be a map of the United States and the Louisiana Purchase wouldn't be labeled. It would just be labeled A, B, C, D, E, F and then it would be which territory did Lewis and Clark explore. And they wouldn't say the Louisiana Purchase. They had to be able to identify it by what's region F. So to where my test they had to know it was the Louisiana Purchase. So I know I've got to do more of both, the name and being able to locate it on a map. I learned a lot.
PEDAGOGICAL CONTENT KNOWLEDGE
Source Material:
A: To some extent. Like I said, we've always done a lot of maps in social studies but where the focus is will be slightly different. The actual activity may not be that much different but the focus of it will be different.

PEDAGOGICAL KNOWLEDGE
Source Material:
A: To some extent. Like I said, we've always done a lot of maps in social studies but where the focus is will be slightly different. The actual activity may not be that much different but the focus of it will be different.

PEDAGOGICAL CONTENT KNOWLEDGE
Source Material:
I'm not a teacher to teach this is what you do, do it. I want them to see it. So we'll talk about stories, we'll talk about what's a good strategy. How do you do this? And hopefully somebody in the room will come up with something logical. And I always tell the kids, there's more than one way to skin a cat. There's more than one approach to so much of what we do. I don't want to give them all three or all four different approaches because that would blow some of their minds. And you have to keep it simple and to the point. So, if I want them to use a proportion to solve this problem, then I might have some kids say in the room, well this is how I did it. Well, tell me. And he might give me something really logical but I want them to do the proportion because I know number one that's what the standards say. You got these proportions to solve these problems. So I do want them to know because they are going to see it on their test. And yes your way does work, very logical, good thinking. What did somebody else try? And I'm going to try to gear it towards who can come up with make a proportion? And let's work through the proportion. Who would like to show us at the overhead, or at the smartboard. I'd rather get them up to the smartboard rather than me. I want them to see it, hopefully they will pay attention to each other more than pay attention to me. I try to keep it very simplistic. Let's make a proportion. Let's. I have them label proportions according to what the words are in the story so that they can get numbers to go in the right place. If they put a number in the wrong place, they are shot. So I try to make it meaningful. And not just this is how you do it. I just don't like math teachers that take that approach. I want them to understand.

PEDAGOGICAL CONTENT KNOWLEDGE
Source Material:
You can show me the right answer but the working out is wrong, I don't want that. You show me how you do that correctly. Because I can do your working out and I don't get that right answer. So what did you do now. How did you know to come up with that? I want to see the strategy. I want the strategy to be there. More so than coming up with the right answer.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
We use the smartboard every day. The lessons, the practice, the homework, going over a quiz or test after they receive it back. All my lessons are made ahead of time and they are on the smartboard. That way I can print them off for kids who are absent. I can print them for kids who are in in-school suspension. I can print them off for the special ed students. And those are the notes. I can use those same lessons all day long. Because you just don't save what the students have written on. Here's this problem. Jamal, come up, can you work it out for us. Jamal works it out. He sits down. Go on to the next screen. Work through the whole class. Exit without saving. I am ready for my next class. So I really like using the smartboard for that.

TECHNOLOGY KNOWLEDGE
Source Material:
This is my third. I got it half way through one of my years so I've either had it for three years now. Because I was so scared of it the first year. I used to use an overhead. And my hand was blue from all the ink. And it's intimidating at first. It takes awhile to get used to it.

TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE CAPS
Source Material:
But it's wonderful. The manipulatives that you can get. Incredible. I love doing probability on there because you can get dice that roll. Spinners that spin. The kids love it. Quarters that flip. So probability is fun to do instead of what I used to do. We would all have dice and we would all roll them and they'd be all over the class. Kids would be cheating, flipping the coin, they'd be cheating and there'd be quarters all over the class. This is more controllable, kids still have fun with it. They are still flipping coins and everybody takes their turn and all that. So I like it.

TECHNOLOGICAL CONTENT KNOWLEDGE
Source Material:
My only problem sometimes when we are doing geometry, if I have to measure with the protractor, it's hard. It really is. There is a protractor on the smartboard. It's just hard to manipulate it, to move it to exactly fit your angle to measure. Some things are still hard.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
B: Right. When we have homework in our workbook, I'll scan the workbook page. Insert that into the smart notebook so that kids can see exactly what your homework is going to look like. The next day, the day after homework, we trade and we grade each other's homework and the answers are right there in front of them. Trade back and discuss, that kind of thing. We do the same with quizzes and tests. I'll scan the quiz, the test, so that I can project it up th
I would love to find a graphic calculator that's like a virtual online. I think there would be but I can't find it. So because then the overhead is sort of nicer because we have the setup to put your graphing calculator up on the screen to project it. Now I don't have that set up so that's a little hard to teach. What's everyone's calculator say, does it look like this? You know and I'm holding up mine and that's not ideal. I want to project it.

TECHNOLOGY KNOWLEDGE
Source Material:
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TECHNOCAL CONTENT KNOWLEDGE
Source Material:
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Table Showing Data Related to One Selective Code (Including Source)

TECHNOCAL PEDAGOGICAL KNOWLEDGE
Source Material:
Like today. Oh yeah. I was just driving to work and was like oh yeah I can just go in and a colleague had said you just need to enter each one into a separate text box and that way you can scramble them up. So oh yeah I'll do that, I'll try that.

TECHNOCAL PEDAGOGICAL KNOWLEDGE
Source Material:
Oh, the kids love it. They like it. It's pretty fun because they get to actually get up out of their seat and go and manipulate the board. Some of them have a hard time dragging it. You know they try to be so precise and I demonstrated I just went up there and touched that word and drag it over real quick but they are still learning too. They were getting frustrated today and I was like oh, man handle that.

TECHNOCAL PEDAGOGICAL KNOWLEDGE
Source Material:
Now we do our testing with the cows but as far as lessons and bringing that into the room, unless I was doing something that was going to take two or three days, I wouldn't even consider using the cow, just the prep that would go into setting that up.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
Well, anything that I can do obviously on the white board, I can do on the SMART Board and then I can capture the images and print them out which is great for the special ed kids who some of their accommodations is you know providing them a copy of notes. So it kind of cuts out an extra step. And that way it's exactly what we do in class. Sometimes you know how you pre make things, plan ahead of time, you don't do it exactly the way when you get into class and you actually put it into action.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
Just like the one today. Even though it wasn't mine, still it was something. It was better than nothing. It was premade. And I think that the kids enjoy playing games. It puts some fun into it. I think they were kind of excited at first. Even one student said, oh we never play games. I thought, well yeah.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
Yeah. All its features I guess. It has many features that are just embedded in the program that I don't know how to use. And I guess that software has lesson plans on it as well. So just being able to go in and find those.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
I just know so many other teachers who are using computers more than me. I feel really old when I use them. I think of it as a certain aptitude that you have to have. And I obviously don't have that. It doesn't come natural to me.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:
Well it's just a mind set. My mind isn't programmed to use technology.
And of course we have our digital projector. I couldn't live without that and my laptop.

But the first week I thought about it because my students, I have them writing things and the kids they wrote so slow and I kept looking at the clock, looking at my paper, seeing the lesson and thinking oh my gosh this doesn't work. I can't stand the smartboard this is not going to work with me. I had some slides though where they are just tapping things and moving things and they couldn't do. They would drag it and let go before it got there so it flies back and I thought oh this is a nightmare. Sixth graders can't handle it. but after they got used to it, it was fine. So once they got used to using it, and my stress level went down

Yes but only because I have my tv in the way. There was one day I was going to put the smartboard up to take their notes on for something but the tv was in the way. And having them running at the same time, the children can't see both. So I just decided we wouldn't take notes this way. We would do it on pencil and paper. And so that was the only day I would have liked to have been writing up on the smartboard. We were doing pros and cons and the kids could be listing them up there also. And I would have liked to have been running both at the same time. But if I move the TV to either side then they can't view it. They can't see it and they were going to be doing the notes from the tv. That's the only time I can think of where I didn't use it.

Only, I did one day. I don't do this very often but every once in a while you have an extra minute or two in class. And I play hang man with my students. So that day I just quickly put it up and put it to a blank smartboard and just drew my hangman and we started playing hang man because we were doing vocabulary words. I'll start putting their vocabulary words up there. And they always win. I never win. It's still fun and it reviews it because we'll start talking about what does that mean. So yeah I've spontaneously used it for hang man. Very educational. It was. We've also just used the white board for that. It just depends on what we can access, the easiest one.

And the students would log in and they would have to wait because you know they are beaming everything back and forth and it was just a slow process. They worked on that. Things got better and then we had a glitch earlier this year where they were slowing down again and we didn't know why. We had to put a new virus scan on everything and it was bogging down the laptops and there again you got frustrated. I learned if my first period class was using laptops, they would log on during homeroom and then while they did their other homeroom games, everything is booting up and then when they got on everything worked fine but I can't do the same thing for second period. But usually my second period can have the computer lab and not need the laptops. But there are little glitches that just frustrate you and make you hesitant to use the technology. But usually if you keep using it, you get over those. You figure ways around them. And it works out OK in the end.

Yeah, it means entertaining them while they boot up. I haven't used the laptops this year. I've been in the computer lab more.
TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:

So that's me, not anybody else, but me. It's like I don't use it often enough. The math teachers us it constantly because it, see again, my standards are tested in 8th grade so a lot of my questions are written for 8th graders and the 6th graders can't pull out, I can't just pull out their questions. So then I have to wait to have a topic that's just mine. Like weather. Energy actually has 8th grade stuff in it and I'll just tell them, you just guess at those and move on. Let's reason it out though. Let's just now make a wild guess. Let's reason out what we can from what we do know and they do pretty well with that. So I can do energy and I can do weather. And I can do space on Study Island. So it's a good review program.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:

S: Oh yes, whenever you're using technology, you should have a backup plan. Things go wrong. We had a day where we had a power surge. And two of my computers went pop pop pop. And the teacher next door lost some computers also. They were able to fix them. They are all operational again. But still, the students in the back were scared to death. I think you should move closer to us. We were on there at the time. I had the students sitting back there but they were booted up because we had used them earlier in the day. I said to them you need to come our way. We didn't know what was going on other than I called the principal down and he is standing in my room when the other computers went and he said what's going on in that classroom? And I didn't know. It sounded like desks being moved but it was the computer. It just popped and did all kinds of crazy things. So you never know so you should always have a backup plan is the moral of that story.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:

Instead of using the smartboard, oh I'm on my white board now. OK, no big deal.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:

Like the graphing thing, I guess if the computers had been down I guess they could have written their charts our and had it ready to do another day and do their graphing or we could have graphed it by hand which would have been a lot longer process. But we could have done that.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:

You have to allow time for the person that gets it the first day and for the student that after two months of school is just like Oh I said memorize this.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE
Source Material:

S: I think other teachers do all the time. I don't think I do and I don't know why. I just look at things differently. I don't forget to use it but I don't think but oh yeah, I've got to use the SMART Board for this. I don't know how to answer your question again. To me it just makes logical sense. Oh yes here you use your smartboard. This lesson you don't.
TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE

Source Material:
It probably has to do with smartboard to me is a very visual thing. And if you have the students interacting then it might be tactile and that kind of thing. So to me if the lesson needs that kind of interaction that would be oh smartboard works perfectly here.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE

Source Material:
Other lessons I look at them and think oh let me find a lab where they get to mix chemicals and they get to see an explosion. And you know some of it depends on what I'm teaching and some of it depends, if I can do it hands on where they are doing a science laboratory, I'm going to go with that first. Because the smartboard's a step away from hands on learning when it comes to that. So it guess it has to do with how closely I can get it to hands on and what I think will sink it into their brains. So again it's not, I don't know.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE

Source Material:
United Streaming videos to me are more a review. Or maybe we just learned a hard concept and I can tell it's not visual to them. Maybe the United Streaming makes it visual. And they need to see that. Again you can find some real cute video clips that are short and sweet and to the point. And that will keep the students attention. I do have a few presentations where I have more videos that cover a whole sequence of events. Most of the students will follow because I'll stop and talk to them between each one and keep them focused. But if you do that too much, then again the eyes glaze over and it's like you showed a 30 minute video and they just blanked out on you. So again you kind of have to know your students when it comes to that but as far as choosing to me United Streaming is more of, it's either an introduction or a conclusion for me. It's like we've done something in between to jell it all together. You can't just use that for your lesson. It's not enough. We had to do steps that we learned and then we watched the video. Like weather. We might study how the weather patterns and how weather storms and all form and then we might watch a video about, say we just learned about tornadoes, Then we are going to watch a video about tornadoes. the kids love it. Oh look at that man, it's going to hit him. Look he was knocked unconscious and his video camera is still running and we see the tornado. They like it. You have to get it exciting and expose them to the things. That's one of my favorite uses. We watched hurricanes and floods and they love that. And again you don't need very much of it. You just need it to get their interest. And keep their interest. So sometimes we'll just, oh we're going to watch floods and we'll watch it for ten minutes and then we'll go on with our lesson about the floods and talk about well how hurricanes bring in all the flood waters and that might be the introduction then to hurricanes. And then again you get out the video and say let's watch this hurricane and we'll talk about safety because a lot of times a lot of the actions by live people, by true people, real footage, so then you can get the safety aspects. So then you have to be able to go in and out of these videos.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE

Source Material:
I think the first year I had written down all the steps in how to do it and in fact had written it out for the students to follow thinking that would make it easier. They wouldn't or couldn't, I think, they wouldn't read and follow directions. that to them, I guess to the students that was hard. And yet it seemed logical to have it where they could reference it. And that was not good. Um, what else went wrong the first year? I know we had trouble with their images, putting their images on the page and getting the graph on so maybe again we had problems with them formatting the pictures. So I think just me having more experience and seeing how they reacted to it made it so I knew how to make it clearer for them this second year. But again the second year we went through and they all did one together and we demonstrated. I had the visual projector and SMART Board that I used. For one class, I didn't use it for them. I forget what was wrong, something was wrong with it that period and they were able to do without it. So they did really well.
Source Material:
But most of it I think was giving them the directions orally and demonstrating when I could on the SMART Board or digital projector. We weren't actually using the smartboard aspect of it. And again them following and once they could do one, then having them repeat it. By repeating it two more times, they had it down in their mind how to do that. And then you do the same thing for the graphs. They are repeating it again. Again, the hardest thing was formatting the pictures. But then again the peer tutoring helped. I think I got better peer tutoring was part of a lot of the difference, too. Last year I wasn't so good with that with technology. I'm getting better with that. I'm letting go of the control a little bit more. I have control.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE

Source Material:
Having it live in my room is important to me because it's easy accessibility. If you did have to change a plan suddenly, it's right there and you don't have to use it another day to go access it. It used to be the only SMART Board we had was in the computer lab so if any other class was signed up for the computer lab, you couldn't get to the SMART Board if you wanted to. also my thing was that preplanned SMART Board lessons that come with the SMART Board, none of those ever fit my curriculum right. So it was a matter of having some experience with a SMART Board and knowing how to make those things. Now that it's in my classroom, it's easy. I've made my own SMART Board presentations. I can pull them up so if a lesson is going wrong in some way, if that's your backup, it's instant. If you don't have a SMART Board in your room, you have to switch classrooms with another teacher to access it. You can't do that. And you have to be so meticulous in your planning that you have no flexibility at that point. You have to know exactly what day, what time you needed it and if anything went wrong that's it, you don't get to do it. So with it in your room, it's very nice. It's just convenient and just knowing that no one is in your way. That's terrible to say but that's it. People can be in your way. If it's in your room, nobody's in your way.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE

Source Material:
S: I think what makes it work is the fact that we went through it the day before. We did one stream together. We tallied it together. We talked about what it meant. So they had an understanding of what they were doing and why they were doing it.

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE

Source Material:
S: They wouldn't type it in. It would be a nightmare. You would have to do a stream studies search and take it from there. You would never get to a URL typing it in for the kids. another thing that just worked well for me. On Monday, they were on the portaportal site so that helped them remember how to get there and how to login. But I did go over that in class in case they hadn't been to the portaportal or weren't familiar with that. No everything's been really smooth.
Appendix 11: Codebook

Selective Code: Content Knowledge: Teachers' understanding of the content they will be teaching

Axial Code: Content Defined by State Standards: The teachers almost always linked their content to the state standards.

Open Codes:
- Focus on content was primary concern
- Focus on teaching content
- Content drives instruction
- 4th and 5th grade science standards
- need extra time to review 4th grade curriculum outline is bible
- curriculum outline
- standards knowledge
- standards knowledge guides
- planning
- preparing for test
- helps students understand the importance of technology
- switched content because of election
- adjust civics plan to what is going on in the world
- civics and economics are about the future
- civics and economics are constantly changing
- it will run smoother
- standards are changing
- hit upcoming topics at end of year
- building a book using standards knowledge
- standards knowledge guides
- planning

Axial Code: Social Studies and the Standards: Both sixth grade social studies teachers talked about the issues of trying to balance their understanding of history with the standards' approach.

Open Codes:
- don't see history as facts
- need for background in social studies
- sees history as a story
- less focus on story of history
- social studies notes are required knowledge
- hard game to play
- more times for history
- social studies curriculum
- understand whole concept rather than bullets
- can't just do recall and learn history
- standards don't make important connections
- standards are skeletons
- need to make connections
- Theodore Roosevelt and standards
- teach about people who are essential
- kids relate to the wars
- wars are concrete
- prepares kids beyond the minimums
- depression isn't stressed but important
- need to make connections
- industrial revolution
- jp morgan
- make connections beyond the facts

Axial Code: Organizing the Content: While they did not determine the content, the teachers did organize it. They had yearlong plans that may or may not follow the printed standards. Within each standard, they also considered the ordering of the information.

Open Codes:
- Whole broken into parts
- organize standards in a way that is appropriate
- don't just go through the standards
- don't just go through the textbook groups standards to cover information in a particular order
- skip around standards
- groups standards in a way that I think is appropriate
- look for changes to standards
- will have to modify units when standards change
- figure out the flow
- flow helps students make connections to their lives
- help students associate the flow
- natural flow of things
- after unit break down into standard categories and required knowledge
- use materials from Dept of Ed
- what's the basic knowledge they need to know
- each standard is a unit
- do scientific investigation first
- integrate scientific investigations unit with everything else
- created a curriculum guide over the summer
- one story for each six weeks

review during sixth week
- do spelling and grammar every week
- combine grammar and writing
- do vocabulary every week
- do two stories every six weeks with comprehension
- bit off more than we could do
- do one story every two weeks
- do parts of speech in two weeks
- last year took six weeks to do parts of speech
- no parts of speech on standard
- two week schedule covers comprehension grammar writing
- working two weeks at a time
- Figure out order of topics in unit
Figuring out the order of the units
Figuring out what will fit in a class period

Figuring out how to group standards
Figure out where they need to know
Can't start with the house

Break down the writing process
When they start to write you can review
When they start to write you can fix problems

Selective Code: Pedagogical Knowledge: General knowledge of activities and students; managing the classroom
Axial Code: Plan for Students: knowledge of individual students and classes of students
Open Codes:

Takes some classes longer
Students drive planning
plans differently for two
different prealgebra classes
two different prealgebra classes
are different
kids change from year to year
planning for the students
you plan for meeting the needs
of the kids
abandoning cooperative
grouping
6th period didn't interact as well
as other classes
a little worried about third period
adjust based on kids
added journal this year
dealt with classroom issues
delayed by cheating
delayed by classroom drama

centered with motivating last
period
class might be loud
er class gets loud and messy
classes are different
whistle would be too loud
whistle would cause commotion
differences in classes
differences in classes influences
planning
differences in students
differences in students from year
to year
different classes worked at
different rates
different examples for different
classes
differentiating for classes takes
longer
differentiating

Axial Code: Pedagogies: types of activities used by teachers

Wheel of fortune
Does a lot of peer work
Use peer tutors in class and with technology
Do a lot of labs
Do labs and experiments all year long
Don't do a lot of research during the year
Don't give much homework
Does concentrated review before test
Do quick out the door thing to gauge student understanding
Does peer editing
Worksheet

Workbook pages
Workshops pages don't follow text
Workbooks from different sources
hasn't completely decided how to use interactive notebooks
interactive notebook becomes textbook
interactive notebook doesn't follow textbook
interactive notebook is useful for parents
interactive notebook training
interactive noteookbooks
interactive notebooks allow physical interaction

interactive notebooks go faster
later in the year
interactive notebooks let kids highlight
interactive notebooks make it real for students
interactive notebooks not used correctly
interactive notebooks purchased by school
interactive notebooks wasted time
interactive notebooks with remedial kids
usually assigns a review
still use groups but doesn't rearranged desks

Axial Code: Student Engagement: Getting kids involved in learning, keeping kids' attention

Open Codes:
Don’t want to listen to someone talk all the time. The main question is how to engage the kids. Judge kids learning by their reactions to things. I wanted to get kids excited. They learn more when they are engaged. Kids who are engaged don’t get in trouble. Student engagement will lead to learning. Kids will remember the lesson in the future. I try to motivate kids with promise of fun. See student engagement. Liked the engagement. You can tell when they are engaged. Just reading the textbook would get boring. If I’m excited the kids are excited. How to make it easier for my students. Interactive notebooks. Pictures of kids engage them in content. Thinks about how to make it less boring. Traditional class is boring to kids.

English content is not exciting. English is not an exciting class. Try to make English fun. Hard to make English fun. Kids find English boring. Kids examples are fun. Also play a review game before exam. You can see their understanding. Created food web with yarn. Created oceans wall display. Body bingo.

Selective Code: Technology Knowledge: knowledge of how to use technology, knowledge of how to learn about using technology
Axial Code: Library/Librarian: Use of library for computers resources and use of librarian for computer support

Created a quotations. Librarian is more accessible than tech person. Librarian set up laptops. Library computers. Library media specialist has done interesting things.

Axial Code: Technology training resources: available training, issues with training, tech coach
Open Codes:


Axial Code: Informal Learning: teach themselves or learn from other people (including students) either in the school or on the Internet and including the student; creating resources with technology
Open Codes:

Try to use tech as much as possible. Tried to use technology as much as possible. Train other teachers in exam view. Teachers use tech to continue education. Teachers train each other. Teacher confer on tech skills. Forgets how to use Study Island. Get help from other teachers.
needs to play with it
nice to be able to reuse things
Jeopardy template from another teacher
designed own Jeopardy game
found directions for PowerPoint
Jeopardy online
didn't take long to create Jeopardy
didn't know you could do a Jeopardy game in PowerPoint
Jeopardy is bare bones
didn't know Jeopardy would be so easy
created PowerPoints the day before
create PowerPoints as needed
create template with computer person
created movie with pictures from previous year

created PowerPoint on civil war soldiers for tech requirement
created PowerPoint with pictures from previous year
found lesson on Internet
found PowerPoint on the Web have a teacher who uses SMART Board on team
can ask questions of teacher on team
prefix activity came from another teacher
created brochures with previous math teacher
found out about SMART Board through tech coach
kids figured out SMART Board stuff
learning SMART Board is a joint effort
kids may know more than teachers

would need to play around with technology to use it again
kids teach her about SMART Board
learned about SMART Board from cousin
learned about clicker system from web
emails and texts notes to herself
emails Web sites and puts them in her favorites
google can find anything
google probability googled for lesson and found Web site
sharing resources
sharing resources with other teachers
Web site came from husband
Looks online for resources

Axial Code: Continuing Learning: plans for continuing to learn more about technology; plans for future use of technology
Open Codes:
want to add sounds to Jeopardy
currently knows how to add sounds to PowerPoint
will read some more about PowerPoint
wants to know what else is out there
doesn't know everything Think Quest can do
not sure what to do with SMART Board
can't do things he's learned due to reliability
likes to stay up to date
keep changing his own skills
not using it to its potential
there's a lot more I need to learn
need to know how to access lesson plans
have to dig into technology to appreciate it
not sure how to get PowerPoints from home to school
never tried to get PowerPoint from home to school
she is creating her own Web site
have to learn the program first
allow yourself some freedom to do new things
challenges herself each time to do more
would like to get more comfortable
continued development is important
working on Web site
using the SMART Board more than she thinks
use ThinkQuest to teach math vocabulary
Use ThinkQuest for vocabulary

Axial Code: Feeling and reactions: how teachers report their responses to technology
Open Codes:
Bandwagonning
intimidated
takes time to get used to it
now she loves the SMART Board
scared of SMART Board at first
SMART Board isn't scary anymore
apprehensive about using SMART Board
don't know all that is available
loves technology
working on computer before teaching
would like to get back into using computer more
been a long time since she learned something new on computer
likes working on the computer
got away from working on computer
learning to use SMART Board not scared of technology
sticks with familiar stuff
still learning to use SMART Board
SMART Board use is limited to premade activities
puts in for new things
easy to integrate video into PowerPoint
Internet use is scary
technology doesn't come naturally to me
concerned about breaking it
intimidated
transitions between gradebooks was easy
setting up the SMART Board was tough
got a bad taste for it
didn't want kids to think she didn't know what she was doing
stress levels were higher until we learned
overhead is easier than Elmo comfortable with using technology
doesn't use computer lab very much
ed tech experience has been good  
Enjoys learning technology  
Willing to try new things  
I surprised myself  
I accomplished my goal  
I was dreading the cycles  
I'm leaning  
Will use whatever they give me  

Looking forward to technology plan  
Gotten better with technology  
Forces you to bring you're a game  
Forward progress  
Teachers must be comfortable with tech before using it  
Teachers would use more tech if it were in their classrooms  
Tech can become more a part of the classroom  
Tech doesn't scream come use me  
When she saw it she immediately asked for one

<table>
<thead>
<tr>
<th>Selective Code: Technological Pedagogical Knowledge: knowledge of how to use technology to teach, support instructional activities, knowledge of students and technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axial Code: Teachers, Kids and Technology: Technology is engaging to students AND teachers</td>
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<tr>
<td>Open Codes:</td>
</tr>
<tr>
<td>Web sites are exciting because they don’t use them much</td>
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<tr>
<td>Students enjoy technology</td>
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<tr>
<td>Students feel more comfortable with technology</td>
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<tr>
<td>Students go above and beyond with technology</td>
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<tr>
<td>Students have greater knowledge</td>
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<td>Kids enjoy tech</td>
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<td>Kids love computers</td>
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<td>Kids like brainpop</td>
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<td>Kids respond well to videos</td>
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<tr>
<td>Kids pay attention when using technology</td>
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<tr>
<td>Kids enjoy games</td>
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<tr>
<td>Kids learn more with games</td>
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<tr>
<td>Kids love playing games</td>
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<tr>
<td>got good response doing it online</td>
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<tr>
<td>Kids loved playing Jeopardy</td>
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<tr>
<td>Impressed by student engagement with blogging</td>
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<tr>
<td>She is excited about blogging</td>
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<tr>
<td>Use united streaming to excite kids</td>
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<tr>
<td>As excited about tech as the kids</td>
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<tr>
<td>Students were engaged</td>
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<tr>
<td>Kids enjoyed the lesson</td>
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<tr>
<td>Kids were excited about making a movie</td>
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<tr>
<td>It’s good to see the kids excited about math</td>
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<tr>
<td>Excited by student response to word problems</td>
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<tr>
<td>using technology is fun</td>
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<td>SMART Board has helped with last period a little</td>
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<tr>
<td>lose kids because we aren't interactive enough</td>
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<tr>
<td>even big kids like quia</td>
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<tr>
<td>interactivity engages students</td>
</tr>
<tr>
<td>neat to see them get it</td>
</tr>
<tr>
<td>Kids were excited and anxious to share</td>
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<tr>
<td>another new thing will motivate kids</td>
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<tr>
<td>uses technology to keep kids interested</td>
</tr>
<tr>
<td>break from taking notes</td>
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<tr>
<td>it’s exciting when kids are excited</td>
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<tr>
<td>use of movies made her excited</td>
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<tr>
<td>valuable fun lesson for the kids</td>
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</tbody>
</table>

Axial Code: Interactive Whiteboard and Elmo Increase Engagement: allows interactivity and student movement, supports student learning

Open Codes
**Use of Elmo:**
Elmo keeps the piece in front of them
Elmo keeps kids more engaged than just talking
use of Elmo to fill in vocabulary sheet
use of Elmo with bellringer
use of Elmo with worksheets
Elmo is easier to erase than whiteboard
math teacher brings kids up to Elmo
she can't use Elmo the way the math teacher does
Elmo makes more sense with the booklets
Elmo use or overhead depends on what they are doing
use of Elmo
use of Elmo as document camera
use of Elmo like overhead projector
Elmo has more uses
Elmo helps with math
Elmo helps with reading
Elmo helps with standards review
Elmo helps with summarizing and note taking
Elmo helps with writing
Elmo is better than overhead
Elmo is important because it encourages discussion
Elmo is new for the kids
Elmo makes more sense with booklets
Elmo saves you from making transparencies
Elmo would be great for writing

**SMART Board**
Integrating SMART Board and new curriculum
SMART Board allows her to bring in technology
SMART Board and graphing calculator:
Kids love SMART Board
Kids still excited by SMART Board
Kids want to write on board
use of SMART Board for accommodations

**Axial Code:** Plan to use technology to support existing pedagogies; figure out how to include the technology in the activity

**Open Codes**

**Videos:**
Doesn't use vcr anymore
because of united streaming
videos must align with content
conscious not to overuse video
available ocean videos were on too high a level
Adding United Streaming videos this year
Video was enrichment

**SMART Board:**
use of SMART Board in math
use of SMART Board to organize lessons
Thinks SMART Board is cool
Interactivity engages students
Writing on board makes them attentive
Thinks kids will enjoy SMART Board
Excited about SMART Board
Excited by possibilities of SMART Board
Kids excited when SMART Board shows up
Writing on the board is interactive
Writing on the board wakes them up
worried about kids losing interest in SMART Board
do Jeopardy on SMART Board
use of SMART Board for instruction
use of SMART Board to slide in graphic organizer
doesn't use SMART Board every day
doesn't use SMART Board with stories
use of SMART Board for review games
uses SMART Board Web site for charts
use of SMART Board to demonstrate activities to students
use of SMART Board to instruct for technology
use of SMART Board to look at documents
use smartdraw throughout the year
use of quia with SMART Board
SMART Board for grammar study
kids using SMART Board for review
may use SMART Board for warmup
comfortable with what she is doing with the SMART Board
likes being able to demonstrate on SMART Board
created SMART Board prefix activity
use of SMART Board for review games
it worked to have kids write sentences
just sending kids to SMART Board wouldn't have been successful
SMART Board was a reward for finishing
focus on SMART Board was secondary
kids don't come up to SMART Board on first day of topic
use of SMART Board to review tests and quizzes
use of SMART Board with homework typing notes because she can't write on SMART Board
everybody comes up to the SMART Board
not all kids like coming up to the SMART Board
kids have always come to the board
use of SMART Board to teach probability
use of SMART Board with manipulatives
use of SMART Board with interactive notebooks
use of SMART Board for kids to come up and participate
use of SMART Board to pinpoint vocabulary or terminology
use of SMART Board to pull out key words
use of SMART Board to teach root words
use of SMART Board with vocabulary
use of SMART Board with Youth Leadership Initiative
use of premade games with SMART Board
SMART Board in one step away from hands on

**Videos don't seem to have worn off**
Videos reinforce concepts
use united streaming for review plan for using united streaming clip
sometimes she'll just introduce
the concepts to look for in the
video
created guide to united streaming
video
view media as a whole group to
courage discussion
use videos for introduction
uses video database
doesn't use video or ppt for
direct teaching
wants video to be supplementary
has been using a lot of video in
science
video shows the hardships
use united streaming as an
introduction
use united streaming for review
discusses videos with students
doesn't just show videos
feel guilty about using video
sometimes
Concerns about use of video
move in and of videos
discover that kids haven't really
learned anything from a video
would try a new approach if
videos weren't engaging
use of video primary intruction
use of videos review for test or
quiz
used a video to put it all together
use of technology as classroom
media source
grammar movies
united streaming brings concepts
to life
united streaming is so readily
available
assessment plan for ocean
movies
movie was easier than research
paper
movie prepared them better for
the standard
uses video more in science than
social studies
integrate video and PowerPoint
Use of PowerPoint:
Kids create PowerPoints
Powerpoint allows them to
incorporate art
Powerpoint and smart notebook
software
Powerpoint and space
Powerpoint for math content
Powerpoint for review
Powerpoint for writing
Powerpoint is basically it
Powerpoint notes
Powerpoint on energy
Powerpoint on plural possessives
Powerpoint to show different
approach
Powerpoint comes from laptop
Powerpoints for plants
Powerpoints from the web
use of PowerPoint for review
PowerPoint for Native American
unit
desktop computers used for
current events
PowerPoint
students do PowerPoints
don't have time to do three
different PowerPoints
edits PowerPoints between
classes to individualize
used PowerPoint for weathering
and erosion
PowerPoint can help poor
writers
Use of Web sites:
Webquests
Webquests are a work in
progress
Web searches
use of online review Web site
uses Web sites
used Internet site for planets
Web sites used for current events
do quia as a whole class
do quia individually on computer
go to lab week before tests to
review
practice tests
students do web searches
online resources
interactive Web sites with math
Think Quest had potential for
collaboration
kids do interactive lessons
kids do research
pull up Web sites
collecting standards web-based
resources
Review, remediation and
assessment:
Exam view
Exam view is user friendly
Edutest
Interactive achievement
Computer use for testing
do math review near test
no calculator section of test
study island as a guide for her
study island provides immediate
feedback
study island provides results for
students
tech used to assess weaknesses
will probably do this as a review
at end of six weeks
does an assessment at the end of
each six weeks
Computer labs used for review
activities
Clicker system
Clicker system for review and
remediation
remediation tool to get kids to
stop and think
use for review and remediation
use clickers for tests and quizzes
use clickers to get a sense of
students understanding
likes to use technology for
reviews
use of computer lab for review
kids use games to review
would like to do more things like
the Jeopardy
games make it easier for them to
learn
kids loved playing Jeopardy
games used for review
designed own Jeopardy game
online games
easier to use Jeopardy with
social studies than writing
played quia games for test
review
would have used board games in
the past
students do data processing
graphic organizers help kids
organize information
kids create graphic organizers
clicker system for review
clicker system to get at students'
thought processes
use of timer downloaded from
Internet
students type project into word
would have used flash cards in
the past
students create flow charts to
analyze information
use of Kidspiration
use of Kidspiration Venn
diagrams
Use of Kidspiration with
advanced kids
Axial Code: Make decisions based on students: consider student skills and dispositions when determining
technology use; the value added
Open Codes:
- gauging class for determining tech use
- important for kids to be familiar with laptops because of testing
- think Quest was a chance to use the laptops
- using technology with inclusion group
- time for whole group and time for work at own pace
- students will not have the same questions and concerns
- students work at own pace to analyze information
- computer lab work at own pace
- thinks about technology in terms of what would be helpful for students
- make decision based on the class
- think about how tech will facilitate learning
- trying to use more technology
- technology adds value of visual and physical
- autistic child benefited from video
- never know who you are going to reach with a video
- you never know if the kids will like it
- it was great to see the kids excited about coming to class
- use of lab is a change from sitting in classroom
- important for kids to have technology experiences

think about the detriment if he doesn't expose his kids to tech
be able to use it in high school
you can overuse video
video is valuable for some students
when kids graduate technology will be all there is
art students may go above and beyond
be able to use it in high school
help them when they get to high school
help with writing research papers in high school
when they are old they can use it efficiently
technology gives them ideas
technology gives them a competitive edge
technology is where we are heading
technology is important for world we are living in
technology in necessary with modern speed of business and information
technology will benefit them in the long run
set them up for success later
students need tech experience
students need to feel comfortable with tech
make connection with kids through ThinkQuest

Axial Code: General instructional decisions such as how technology can support goals when to use technology during the lesson

Open Codes:
- Technology not a primary instructional tool
- Technology use as supplement
- Teaches first then uses tech for enhancement
- Tech allowed more than typical lecture and not taking
- Tech use must not be a filler
- Tech must serve a need in your class
- Think about what typing adds
- Concern with choosing the right day in the lab
- Use technology when it makes sense
- Use technology when it's beneficial to students
- This is a natural way to do it determine tech use if it has a natural tie in
- won't do something fun and exciting unless has tie in appropriate educational use
- tech use must be tied to learning
tech use must have relevancy
other teachers abused the lab
discovery learning
hands on learning
web resources are more up to date than library books
project worked so well went back to it
Resources Alignment:
- study island questions were too hard
- good videos that correlate with standards
- Feels guilty using premade materials
- premade was better than nothing
- have to tweak predone SMART Board lessons
- hints were wrong in millionair game
- publishing piece is still up in the air
- bring in technology when they don't want to take notes
- look for extra resources for teaching
- choosing smartdraw/ looking for program to do flow charts
- word was too hard for flow charts
- plan more for introductory piece
- introducing a new topic nonlearning way
- a good video that sums it up and draws it all together
uses computers if she can do something easily
determine tech use for review
determine tech use based on outcome
use of technology to expand instruction
use of technology to elaborate on curriculum and instruction
use of tech to go above and beyond what they've learned
tech use depends on assignments
uses smartdraw for brochure because it makes it more professional
uses smartdraw for brochure because it makes feel good kids feel proud of printed brochure
trade off is learning to use technology
would still learn through brochure even without technology
sometimes share them in class sketch out brochure in class
brochure is done and they are creating it in the program problems when classes are at different places
determine PowerPoint when text is wordy
determine PowerPoint use when there's lots of information
Harlem Renaissance 1920s as example of lots of information
use books or pictures with Harlem Renaissance make history real
PowerPoints for tough chapters scavenger hunt for Ellis Island

**Visualization:** United Streaming videos have good graphics
Tech shows things not in text
See things they can't otherwise see
See how it all works
Enhance my presentation
Provide multiple representations for social studies

Comparing video to pictures or models there are field trips I can't take
united streaming makes concepts visual
use of visual helped
visual
uses SMART Board with visual lessons
video shows the hardships
video is good for ocean floor
video better than even a demonstration
chooses video when it is more valuable time than direct teaching
choosing image helps them
video is providing enrichment for her classes
technology makes concepts visible to students
technology offers another resource for presenting material
video of holocaust survivor

**Axial Code: Spur of Moment: May not always plan specifically for using technology**

Open Codes:
technology use may be more spur of the moment
technology use just happens doesn't necessarily weigh the benefits of the Elmo or a video laptop and projector allows quick finds can't always plan ahead

united streaming is a little more impromptu
to enhance must be able to use it on the fly
tech use is often on a whim technology planning is not always purposeful
technology requires planning
can't always plan for technology prepares for spur of the moment by collecting Web sites
use video when there's an extra ten minutes of class
used extra time for review
use saved time to pull in videos

**Axial Code: Transparent Technology: Forget about the technology; use technology naturally without a lot of thought**

Seems natural to turn to the Internet
You just kind of forget it Stop thinking about SMART Board as technology
Stop thinking about technology at some point Didn't really plan for prefix activity on SMART Board
Power school isn't technology anymore

Forgets to list technology in materials
I don't feel like I plan for technology
I forget I use it
I have come to rely on it I would cry if they took it from me
if it's in your room nobody's in your way
important to have SMART Board and projector in her room

Smartboard is how I teach now
Forgets that she is using it using SMART Board more than she thinks
doesn't really plan for Elmo ability to use it everyday when it's in the classroom
sometimes even forgets about the resources she has
doesn't think about SMART Board

**Axial Code: Getting Around Glitches: What to do when it doesn't work the way it was supposed to**

Open Codes:
Will computers connect System has not always been on my side
Network has been working but it bogs down
Nervous about possible technical glitches
Network issues
Network reliability
Don’t know when the server is going to do go down
Issues make you question use of technology
Issues with getting video to play on laptop
Issues with getting Web site to work on laptop
Issues with LCD projector
Issues with network
Is it capable
Issues with printing
Issue with SMART Board text looking like Chinese
Issues with videos
Have abandoned projects
because of network issues
Concerned with getting on the Internet
Concerned with Internet issues
Computers don’t always connect
Would have been more frustrated if it were more important
Would have done something more to get it to work
Would have improvised for one day
Didn’t expect not to be able to get on at all
Would have just played Jeopardy on the board
Would have to use textbook
issues with SMART Board alignment
stressful when projector didn’t work
plan B was to postpone lesson and do worksheets
kids get frustrated with SMART Board use

once kids got used to it it was fine
stress levels were higher until we learned
concerns about being able to see
SMART Board
played hangman on SMART Board
little glitches are frustrating
little technology bugs annoy me
with usage it gets better
glitches with laptops made her reconsider their use
must have a plan B for technology
doesn’t have a plan B
will just use board instead of PowerPoint
if network bogs down we’ll scrap it
worried about the speed of the network
still gun why with technology
issues with SMART Board scrollbar
issues with smarboard working
have to use the SMART Board
SMART Board placement
had a backup plan this time
manipulate SMART Board from computer
technical difficulties are the nature of teaching
not fool proof
technical quirks can throw you off
technology is not always a blessing
SMART Board stall
stalled SMART Board wastes time
when tech fails it puts a roadblock on your process
had to rename lessons when software upgraded

had trouble with a PowerPoint presentation
had to take care of the computers myself
hard to wire an old building we adapt
we make it happen
strategies for planning when the tech doesn’t work
plan C
try it the first day
try some sample searches
check on backup computers
surprised at how well it worked encouraged
planning for the worst
didn’t have a plan B
sometimes you can switch things around to use technology
must have a plan B for technology
strategies for planning when tech doesn’t work
had a backup plan this time
I had done everything they tell you to do
will test out Web sites on laptop just assumed it would work
hadn’t thought about video and projector
will always check the laptop and projector with video
as long as we recognize limitations we’re ok
backup plan was necessary
back to drawing board if it fails
if it fails can’t take another week brainstorming a plan B
does something to your psyche
video did not display through projector
it’s tough to plan something and then have technical glitches

Axial Code: Instructing Students in Using Technology: How to help students use the technology required for the lesson

Open Codes:

Five years ago felt like he was introducing them to computers
No cheat sheet for research
Don’t need cheat sheet to play games
My plan assumes you know nothing
Tech coach will teach first two sessions with Think Quest

Work together on geometer’s sketchpad activity
Encourages kids to use each other
Challenge to help students with tech
we did one stream together
students use a template
create cheat sheets

lab days are just running non stop
really only 40 minutes in the lab
expecting instruction to be harder
this group can’t multitask
how to instruct children on program
can’t assume students know everything about technology
students will have different experience with tech
5th graders minimally versed in PowerPoint
the students needed a lot of individual attention
shocked by the neediness in the past it was harder for them to find stuff
technology teacher was involved technology teacher taught student skills
student background knowledge technology teacher was helpful cheat sheet worked for oceans lesson cheat sheets allow students to move at different rates some students went further with movie preparation worked

advanced group has more computer literacy kids had trouble following printed directions started with whole group demonstration used laptop and projector to demonstrate kids help each other repetition helped students learn unfair to jump into technology students need guidelines for tech need for guidelines and expectations make tech use difficult will learn smartdraw via trial and error will demonstrate smartdraw on the board role will be to answer questions

5th graders minimally versed in PowerPoint
6th graders learn to login and save a few students have learned to use moviemaker use another activity to introduce smartdraw show them how to use smartdraw before going to lab doesn't use printed directions for smartdraw prefers using overhead with calculator but doesn't SMART Board and graphing calculator considering going back to overhead projector does some instruction on how to use calculator

Axial Code: Access: Getting access to the hardware and software resources required for the lesson; issues with access to resources; concerns with filters

Open Codes:

Four computer in classroom School provided laptops Scheduling around other teachers interferes with flow Scheduling around other teachers is hard No computers during testing New wireless network hooked up New wireless network doesn't reach his room No cable for 5th grade Easy to get into lab when first started teaching Once it's down for awhile you stop planning for it Worried about access to projector Harder to get in at the end of the year Hardware availability Would love to have computer in the classroom Computer lab available in wing Computer lab scheduling Computer lab scheduling not a problem Computer lab shared by whole school Computer lab was booked Computer labs and math teachers Clicker system in each grade level trying to figure out how to do oceans unit without lab or cart activity is same but presentation is different borrowed lcd from tech lab important to have the SMART Board and projector in her room couldn't live without projector and laptops classroom availability makes it possible to adjust your plans tasks will have to be broken down has lcd projector from library asked for an Elmo or document camera would rather use lab than classroom computers if cow doesn't get fixed she knows she can do the cycles now choosing lab depends on purpose hard to get computer lab for more than 2 or 3 days scheduled computer lab for two days signed up for lab about a week and a half in advance frustrated by not having computers available when you need them access is not always conducive to when you want to teach it plan weeks in advance because of access do the best you can with access even best laid plans can go awry it's just part of teaching learn to adjust things don't always work smart draw is only in one computer lab have to be flexible and make adjustments it's just part of teaching doesn't use computer lab very much hard to get into computer labs no computer lab on Friday lcs projector shared by six teachers schedule for lcd projector one SMART Board for whole school SMART Board in computer lab couldn't get into lab in timely manner request sites to be unlocked for instructional use keep fingers crossed that no one needs the projector sad that the lab isn't available we adjust Filter: Not planning to ask for sites to be open State filtering requirements Doesn't want to get Web site unblocked just to browse it Filter forces you to plan ahead Filter impacts planning Filter makes it inconvenient to do research
Filter should enhance not hinder instruction

Worried about filter blocking sites

Sound Web site was filtered

Filter slows process

School may unfilter all teachers

Kids will have to learn to deal with filter

Computer blocker

filter prevents many sites from coming through

deep freeze

request sites to be unlocked for instructional use

need permission to get through the filter

get tech people to unblock filter

issues with filter

filter is a deterrent

restrictive filter

dropped project due to reliability

signing up for lab locks you in computer lab availability

generate plans based on content and lab availability

need to work with others and be flexible

technology is strong enough so teachers can experiment more

stagger use of lcd projector

lcd projector shared by six teachers

would have had to give up on video if she couldn't get the projector

limited resources

one SMART Board for the whole school

SMART Board in the computer lab

SMART Board requires lcd projector and computer

school system not up to par

don't have the equipment we need

have to hook it up wires everywhere

access can sway lesson

access is not a problem

access may cause you to jump ahead

access may cause you to put something off

4th and 5th grade need it for whole day

ability to use it every day when it's in the classroom

access to mobile units

access to portable labs

benchmark assessment limit online use

can sign kids up for lab during smart block

can move lab into classroom

could borrow fifth grade cart

Axial Code: Management: Managing kids on computers and kids using technology

Open Codes:

Student deliberately lost everything

Student used tech failure as an excuse

Easier to start with advanced group

Concerned about unstructured time

Assignment for those who finished

manage kids on computers

allowed her to work with individuals

could monitor individual kids

feelings of self conservation

planning for Jeopardy implementation

makes it easy if classes stop at the same place every day

won't send kids to lab with substitute

use of centers requires more planning time to make it fair

divide into teams to use classroom computers

maybe organize students into groups

considering use of centers for laptops

considering use of centers for oceans lesson

use of laptops for oceans lesson

work with four students at a time

laptops save time

4th period got a little crazy

generally students did well on Jeopardy

6th period didn't interact as well as other classes

kids did not get out of hand with Jeopardy

Jeopardy rules for playing

kids avoid some topics in Jeopardy

limited student choices in Jeopardy

won't do whole group again

brainstorming ideas for making laptops easier

maybe do whole group but every other day

it will run smoother

learning management part of mobile unit

might be easier to use computer lab than the laptops

hadn't expected students' low skills

students had trouble following directions

students needed a lot of help

maintenance will get better

hadn't anticipated how exhausting it would be

process for developing word problems

process for answering word problems

wouldn't consider using portable lab for one day

learned from previous year and scheduled two days

thankful to be getting back to regular schedule

activity is more independent

adding a second planning period means classes are bigger

all students had at least three periods

brought information back to classroom

brought research back to classroom

can't leave kids in the computer lab

gives more time if they aren't fooling around

students couldn't remember passwords

Axial Code: Technology And Time: adds to planning time, wastes time, takes lesson time

Open Codes:
Technology increases planning time. Setup takes time. Taking time to make sure it works. Time consuming. Takes time to get used to it. Smartboard makes planning more time consuming. Using planning time to find resources. Using Web sites requires time. Data analysis takes time. Doesn't always have time to do data analysis. Use of technology requires advance planning.

Use of premade materials. Not enough time to get in lab. Wastes time to move to tv. Waste valuable time when lesson doesn't work. Won't use PowerPoint if she can't do it during the day. Creates PowerPoint during planning. Stalled SMART Board wastes time. Concerned about time to fit in SMART Board. There's not enough time to take them to the computer lab. Only so much time for trial and error.

If it crashes will move on. It it fails can't take another week. More a time thing. Lose valuable time when tech fails. Sometimes you can't go back and redo lessons. Lose valuable time when tech fails. Give up another day for typing. Finding time to plan so tech works. Late to team planning finishing up. Led projector requires planning ahead.

Selective Code: Pedagogical Content Knowledge: Teachers' knowledge of how to “teach” content, organize content, combine resources and activities into lessons
Axial Code: Concern for student understanding: pedagogy supports content learning
Open Codes:

make changes when kids aren't getting it. have to monitor for student frustration. kids will remember the lesson in the future. hope they will carry ideas with them as they get older. want them to know something about these people. remember it when they are 30. decide what to do based on student learning and accomplishment. student background knowledge. I want them to understand. this isn't just about how you do it plan for diverse needs. try not to just do remediation or reinforcement. try to use more learning modes been teaching more and making sure they get it the first time changes to test due to test scores learned from testing process activity focus will change concerns with social studies test activate prior knowledge more emotional involvement leads to learning been teaching more and making sure they get it the first time assigns homework to see if they got it depends you how kids are getting it. writing unit was fun for them answering questions makes it easier to get at student thinking can’t assume prealgebra kids know 7th grade stuff. challenging information takes more time. Can’t teach reasoning skills. Concerned with how to get the kids to understand the project. Subjects and predicates is tough to understand. Don’t learn subjects and predicates in earlier grades. More interested in student’s science knowledge. Use relevant example to motivate kids.

Axial Code: Pedagogies: knowledge of different activities and how they support student learning of concepts
Open Codes:

Science and art is a wonderful combination. Science journal. Science journal takes them through the scientific method. Groups create pronoun skits. Students identify pronouns in songs. economic flow is difficult concept. flow chart helps with understanding. flow chart gets at required knowledge. flow chart helps them think about interactions. flow chart generates discussion prepare kids beyond the minimums. letter to FDR. letter writing project didn’t do project because depression isn't stressed. tie in with current events. math teachers have to fill in gaps. math uses more examples use of calculator uses little rhymes. does diagramming sentences uses mnemonics to help kids remember. won’t be able to use examples next year. familiar content makes research easier. try out dif experiments like try on dif shoes kids like experiments. put aside days for notes. do labs or tech after notes. let kids explore first before giving answers.
if kids paid attention to notes
they would know lab answers
do labs before notes this year
use of journals in science
do music day with pronoun unit
do notes after activating prior
knowledge
draw pictures
draw pictures with vocab

Interactive Notebooks:
interactive notebook doesn’t
cover all standards
interactive notebook a little
harder in math
interactive notebook for reading
interactive notebook in language

interactive notebook shows
exactly what you need to know
interactive notebooks and vocab
interactive notebooks focuses on
general reading skills
use peer tutors in class and with
technology

Axial Code: Tweak: Making changes to lessons either from one year to the next or as the lesson is being
implemented; makes changes based on student reactions; making changes to resources in order to better align with the content

Open Codes:

**Tweaking Lessons:**
Teaching changes every year
Know the big picture but the
path changes
Instruction changes every year
Made change that morning
May make immediate changes
Not sure why she makes changes
Makes changes as she goes
Makes changes because kids
change
Makes changes during the day
Make changes to plan if
something new comes that is
beneficial
Makes changes to plans at the
last minute
Won’t change lesson if it is
flowing well
Don’t do the same stories every
year
don’t carbon copy from year to
year
Don’t do the same thing every
year
Tweak plans as she goes
Constantly changing as you go
Constantly changing things
Can’t always change instantly

Example of tweaking lesson by
leaving out video
Made a few tweaks after the first
day
Still needs to tweak list
Usually tweaks list
Gauges student reaction to
lesson
first period are guinea pigs
makes changes to plans based on
student needs
may change plans from day to
day
may change weekly plan
change plans due to student
response
changed brochure assignment
this year
polished it first year
Tweaking from year to year
Tweaks lessons from year to
year
Tweaks through the year
Some tweaking needed
Still tweaking program
do tuning during school year
added or dropped a project
despite planning she make
changes

**Tweak Materials:**
Makes changes to interactive
notebooks
Tweaked interactive notebook
Tweaks lesson after first period
Tweak for order and student
reading level
Tweak PowerPoints to make
them appropriate
Tweaked interactive notebook
Had to tweak predone SMART
Board lessons
always made changes to things
from the past
premade study island test didn’t
align with content
premade
premade SMART Board lesson
have mistakes
prefix Jeopardy doesn’t align
perfectly with quiz
science textbook not aligned
with standards
modify interactive notebooks
preferred her own activities for
the oceans unit
prefer developing to finding

Axial Code: Use of Textbook: how textbook is used pedagogically to both plan and implement lessons

Open Codes:

May get information from
textbook
Will have to start over with new
textbook
Watersheds aren’t covered by
textbook
Uses poetry anthology with
advanced kids
Uses basal with average and
remedial
Used to working without a
textbook

Used textbook more than she
thought she would
Use of textbook for review
Too much non-test information
in textbook
Spot read textbook
Read textbooks to students with
modifications
Planning with textbook
Plan using resources from
various texts
Not enough money for textbooks

Neither text is good for tectonic
plates
Last year used textbook for
homework
Has to find her own way to teach
plates without textbook
Kids can read textbook on own
Kids take reading textbook home
Has second science textbook in
room
Kids won’t remember textbook
examples
Grammar textbook
Grammar workbook
Uses review pages and practice pages in textbook
Unit themes for curriculum come from reading book
Textbook as anchor
Textbook as resource
Got away from using the textbook
Textbook information quality varies
Textbook pages
Textbook provides different information
Textbook workbook
Textbook as reinforcement
Rarely use textbook
Does teach in the order of the textbook
Doesn't teach from the textbook
Textbook is a supporting piece
Pulls our particular pages from textbook
class set of textbooks
hates textbook
Textbook teaches parts of speech
Seventh grade textbook for advanced kids
Textbooks
Textbook differentiates problems
Textbook has good resources
Textbook has exam view questions
Science textbook for real pictures
could pass class without reading the textbook
at least four or five years before new textbook
doesn't use textbook a lot
doesn't use textbook the way she remembers
textbook differentiates problems the textbook doesn't determine order and curriculum
one textbook is better with earthquakes and volcanoes
one textbook is better with oceans
one textbook may have better resources than the others
uses textbook mainly for practice
uses workbook for practice and homework
using textbook for homework was stressful
follow textbook
follows the textbook
**Textbook Difficulty:**
Tests were too hard from book
Science textbook
Science textbook for trivia
Science textbook for extensions
Science textbook is too hard for sixth graders
Science textbook is too hard for fifth graders

**Textbook Alignment with Content:**
Problem with following the textbook
Textbook doesn't cover standards
Problems with textbook versus standards
Textbook test bank isn't geared to standards
Science textbook not aligned with standards
Science textbook is not helpful about half of textbook questions can be used
didn't like how textbook covered tenses
textbook test bank isn't geared to standards
one textbook is better aligned with standards
book provide comprehension questions at end of each story

**Axial Code: Time:** getting it all in during the year, getting it all in during the class period, not wasting time, time to plan

**Open Codes:**
- **General Lack of Time:**
  - Wish I had more time
  - Concerned about time
  - just keeping head above water
  - Questions of time
  - Wants the video to be worth the time
  - Use the time you have
  - Planning depends on time
  - Behind after the first day
  - Would love to have a month of review
  - Comprehension takes too long
- **Fear of not getting things done:**
  - Afraid of losing time
  - Stick to time frames
  - Afraid of not getting everything done

Concerned about timing of experiment
Concerned about wasting time
This year's students will take longer
Research takes a lot of time
Winter weather causes trouble

**Losing Time/Finding Time:**
Easy to fill fifteen minutes with review
Compensating by changing interactive notebooks
Can adjust the time for units
Save time by dropping a test
Dropped a test last nine weeks
Benchmark assessments impact instructional time
Benchmark assessments affect schedule

Loss of instructional time due to benchmark assessments
already made copies of notes
The wars good place to make up time
Eliminating gluing will give time for tech
could manage experiment time better
experiment took longer
finished notes more quickly than planned
lost two days
losing one day is OK

**Axial Code: The Pacing Guide:** the pressure of getting through the curriculum based pacing of content that has to be covered before the test

**Open Codes:**
Students guide planning but also pacing guides.

Worried about getting behind.
Can’t get much further behind.
Use pacing guide to locate resources.
Use of pacing guide.

Concerned about pacing.
Teachers created pacing guide.
Still figuring out pacing.
Spending more time on each standard.
Pacing guide is a skeleton.
Talked to other teachers about pacing and ordering.
Teach a certain amount of things in a certain amount of time.
Pacing guide covers the whole year.
Pacing guide is padded a bit.
Pacing guides.
A little behind the pacing guide.

Behind a bit on pacing guide.
Pacing guide will change with new standards.
Behind on pacing guide.
Try to spend time based on state standards outline.

Hate to be narrowed into pacing guide.
Try to spend time based on number of questions.
Try to spend time based on amount and challenge of information.

Doesn’t quite have the pacing yet.
School doesn’t have a pacing guide.
Modified another school’s pacing guide.
Planning starts with pacing guide.
Planning done with the pacing guide.

Compares agendas from past year’s for pace.
Compares from year to year.
Modified another school’s pacing guide.

Have requirements to get through.
Have to stay on track.
Downside of standards based curriculum.
Upside of curriculum is that it gives you a pace.

Have deliberately slowed down.
Had too much review time last year.

Get everything covered before the test.
General idea of how long concepts take.

About two weeks off from last year.
After getting through three units will have better idea of the year.
Earlier units are taking longer than expected.

Cover writing and grammar by March.
Covering curriculum.

Covers content for exam.
Can’t read a story every week.
Got a little ahead this year.

Selective Code: Technological Content Knowledge: technologies related to a discipline or topic without concern for how to teach it or student understanding.

Axial Code: Mathematics: Use of digital tools in math

Open Codes:

- haven’t found an online graphing calculator
- use of manipulatives on SMART Board
- you would look silly using a calculator
- use of calculators in math
- doesn’t like SMART Board
- United Streaming for scale models lesson
- use of calculators on standards test
- protractor
- United Streaming on pemdas
- lots of resources out there for science and social studies
- United Streaming for teaching properties with race cars
- few resources for math
- United Streaming on pemdas

Axial Code: Other Content Areas: technology in support of and changes content

Open Codes:

- part of civics is learning about innovations
- overwhelmed by number of Web sites
- Youth Leadership Initiative about political process
- know some general databases
- usually has a Web site to go with each required knowledge piece
- Hasn’t found a way to integrate photostory into writing
- knows about Inspiration for reading
- primary and secondary resources lesson
- used video on Plymouth and Jamestown
- use of calculators on standards test
- use of gilderman Web site
- used video on American Revolution
- hints were wrong in the millionaire game
- trying to infuse technology in reading
- use of library of congress Web site
- United Streaming on pemdas

Selective/Axial Code: Technological Pedagogical Content Knowledge: interaction of technology, pedagogy and content; descriptions of activities that show all three components

Youth Leadership Initiative

about political process

Hasn’t found a way to integrate photostory into writing

used video on Plymouth and Jamestown

used video on American Revolution

trying to infuse technology in reading
you put the pieces together
what makes a great lesson
lesson met objectives
lesson went well
use of calculator
still wants to do graphs on
computer
made graphs of elements of body
air ocean
important to put lesson in the
right place
lesson needed three days
would do backup before pencil
and paper
wouldn't do it paper and pencil
time when technology fits
naturally
did research on candidates
did Geometer's Sketchpad in the
library
did similar lesson for WW II

Selective Code: Planning process: the teachers have practices related to planning; planning is part of
the school day; teachers have certain planning requirements; teachers adopt different formats for
their lessons

Axial Code: Planning Period: time reserved during the day when teachers are not supervising or teaching
students
Planning is not protected
Planning period each day
Lose planning period for
remediation
Can't really count on planning
Give planning minutes back to
instructional time
Don't have time to plan
40 minute planning is enough
40 minute planning period
added a second planning period
planning activities
planning activities grade papers
planning activities hanging up
materials
planning activities makes copies
planning activities prep for next
day
Planning time gets shorter every
year
Planning time period
Planning time spent
collaborating
Planning time spent researching
Planning time used for grading
Planning used for meetings
Planning wasn't protected in
previous district
Protect personal planning

Axial Code: Informal Planning: this happens when the teachers aren't officially planning (ie, sitting at
their desks engaged specifically in planning)
Planning pops into my head
Always planning
Ideas comes at odd times
Writs informal ideas into
formal notes
Informal planning
Informal planning takes place at
other times
Information comes from
different places
Jots down good ideas
Other types of planning
Plan by feel
Plans in the car
Plan on the run
Planning happens spur of the
moment
Updates lesson plans as a
reminder of informal planning
Updates lesson plans to help
with next year
Updates lesson plan with
informal planning
Planning happens when you are
doing other thing
Planning has been chaotic
Plans in her head
Planning hodge podge
Planning ideas comes from an
idea I've seen or an article I've
read
Something good on NPR

Axial Code: Planning routines: the systems (or lack of) they use to put their plans in place from the
yearlong plan to daily plans including the planning intervals
Putting together units:
Unit on each part of speech
units based on standards
go over standards at beginning
of unit
her job is to change standards to
student language
standards are teacher language
divide big units into smaller tests
units were her own division
Thinks about the goal of the unit
Thinks about her stages of
planning
Take out units at beginning of
the year
Units are a work in progress
Units are the main focus of the
class
Units change due to student
needs
Units change often
Units come from topics that will
take the longest
Units include standards for each
category
Units provide an outline that is
flexible to change
Unit plan
Plans units
Plan out units at beginning of the
year
Plan the first two weeks of the
units
Create unit structure first
Divides year into three units
Create units
All levels get the three units
Plans what she wants to cover
Plans a lot at school
Do some work at home
Don’t like to take work home
Plans a week at a time
Plans for more than a week
Plans are done by Friday
Axial Code: Pedagogical Routines: Recurring activities that teachers use with each unit or each daily class period

Start the next six weeks with a new story
Start with terminology
Start with the pieces
Starts class with introduction not using textbook
Start with a review
Starts with big picture and then plans details
Starts with review questions
Start new topic by talking to students
Do vocab with every story
Does comprehension questions with each story
Daily class format
Daily class format from previous year
Day to day activities like nouns
Day to day instruction is the same
Day to day planning
Changes to daily class format
Changes to warmup

Changes to warmup due to test scores
Changes to instruction due to test scores
Current events only recurring assignment
Current events schedule
Warmup may or may not be something she has taught
Warmup will be grammar mistake to fix
Warmup will be something to copy
Tuesday Wednesday Thursday start with warmup journal free write on Mondays for 10 minutes
Journal topics from social studies teacher
Use of journals on Fridays and Mondays
Journals and warm ups help structure classroom

Use of a timer downloaded from Internet
Picks up where she left off
Picks up where they left off
Plan open ended questions for discussion
Do daily oral language
Use overhead for daily oral language
Brainstorm about new topic
Grade notebooks at end of unit
Guided practice every day
Scripts questions for students
Axial Code: Lesson Reflections: teachers think about how their lessons go and look for ways to improve them either immediately or over time

Lesson assessment
Learned from previous year
Lesson did not play out the way she expected
Lesson was not successful
Lesson went well for the amount of planning
Lesson worked better with smartraw
Always room for improvement
Assistant principal says she likes my plans
Having the SMART Board has made me plan more thoroughly
Hasn’t looked at plans because she’s on a roll
Never received any comments on lesson plan

Next time would customize it better
No feedback on week at a glance
Note section provided for reflection
Does self evaluation
Plan went fine
Realized she wasn’t planning as thoroughly
Reflect on teaching
Reflecting
Reflected on use of notebooks over summer
Reflects on lessons each night
Staying late to plan has been positive
Super prepared now
Might use study island test earlier

Axial Code: Observed Lesson Plan: descriptions of technology-enhanced lesson plans

Took one period to find oceans information
Ocean lesson student needs
Ocean lessons movie
Ocean lessons technology
Ocean lessons powerpoint
Ocean lessons lab sheet
Ocean lessons took six periods
Oceans movie was a good experience
Oceans unit is technology heavy
put ocean links in a documents
had to give up whole group instruction
kids were more independent without whole group piece
technology piece of cycle was easiest to plan
may use classroom computers in cycles
cycles might put kids on the spot who are having trouble
gave up interactive review component
kids on computers explored links without finishing work
kids have to read to find information
liked being able to show the whole group in the lab
technology access is forcing a change in plans
cow is unavailable
use of classroom computer in cycles for oceans unit
will let gifted students come in and create graph
didn’t have time to run another cycle
would choose computer lab over cycles
may have to give up planning to use lab with kids
cycles worked a little better than lab
Put whole ocean research project in PowerPoint
Research project on ocean animals
Students chose ocean organisms
Find one reliable website
Thrilled by the chain
Students were excited about making a movie
Thinking about making a movie
May incorporate making videos
May need a day to teach logging in skills
Still thinking about writing project
She focused on research part
Will do writing part herself this year
Students completed research form
Use of rubric for research project
Didn’t grade writing part of the research project
Movie wouldn’t give practice in writing a paper
Plan for finishing videos
Offer writing prompts for research project

Project was about research as much as writing
Prefix quiz review
Kids enjoyed SMART Board prefix activity
Standards based website
do millionaire on the SMART Board
SMART Board for grammar study
Dichotomous key
Watershed
Water pollution
use study island to assess student skills
use study island to work on math 7
Created a spreadsheet from the study island results
Students may not have finished study island questions
Kids worked hard on study island
Will have to document sources
Showed fossil in class
Thinks they will be interested in fossils
Tie into muckmackers
United streaming video clip on fossils
Fossils aren’t part of the standards before fifth grade
She remembers learning a lot about fossils
Students struggled with writing word problems
Students were not prepared with word problems
Differentiation of project
May use classroom computers in cycles
Past process for word problems
Past word problems have been simple
Publish word problems booklets
Think Quest
Process for introducing students to think quest
Saw a summer school teacher using blogging
Using mobile units for ThinkQuest
Think Quest allows blogging
Think Quest allows her to find out about kids
Tech coach wrote the technology part of the plan
Math teacher dealt with content
Tech coach introduced her to ThinkQuest
Tech coach took care of registering with ThinkQuest
Tech coach will lead the class brainstorming how to make it work
brainstormed with tech coach plan for using laptops
Assign students to solve word problems
Worked with computer teacher
Talked to tech coach about blogging early in the year
Wanted site for blogging and discussion
Has seen jeopardy before
Jeopardy
Jeopardy powerpoint is easier than jeopardy game
Jeopardy questions are the same as standards questions
Jeopardy questions from standards
Jeopardy will take the whole period
Used spelling as part of jeopardy game
Substituted spelling for whistle in jeopardy
Research
Didn’t have trouble finding information

Axial Code: Specific Content: The content to be taught, often expressed in the language of standards
Open Codes
political process
interest groups
voting
create and solve word problems
word problem incorporates writing
ocean cycles
ocean lesson
converted to metric
fossils
oceans lesson
food chain
food web

vocabulary is a big part
vocabulary
volcanoes
subjects and predicates

industrial revolution
immigration
Ellis Island
Content is 13 colonies

AxialCode: Lesson Plan Formats, Requirements and Planning Tools: how the teachers organize their lessons and units; requirements related to planning

Stopped using planning form during test review at the end of the year
Make notes in the planbook
No planbook
Did not use a planbook
Don’t use a planbook
Don’t use planbook
 Writes general outline in planbook
 Writes more in plan book
 Going to use old fashioned planbook
 In her third year she can go back to binder
 Includes standard and key concepts on planning form
 Included handouts in binders
 Included overhead transparencies in binders
 Writes more detailed plans in notebook
 Create binders and folder for unit
 Formal planning
 Easy to access lesson plans on laptop
 Going to use a planbook this year
day to day planner
 keeps plans in a three ring binder
 keeps plans on computers
 kept track of time on planning form
 keeps folders for each chapter
 keeps binders for different units
 keeps resources on computers
 keeps detailed notes
 last year planned weekly lesson plan
 lesson plans are multiple pages
 lesson plans are on laptop
 lesson plans include guide for day with questions
 leaves space in planbook for specific day’s activities
 have several years worth of weeks at a glance
 hasn’t figured out planbook this year
 seemed crazy to redo binders organized planning forms by weeks
 organized planning forms in binders
 lessons are in smart notebook
 has step by step plans
 Madeleine Hunter lesson plans
 likes the idea of writing in the planbook
 binders have selections of different things
 binders mean she knows where everything is
 used a planbook in the past
 Written plans help remind
 uses a planbook
 uses a planbook mostly for the principal to look at
 Will move from planning form to plan book
 Handwrites lesson plans
 Can erase and rewrite in planbook
 Doesn’t do as much detail as first few years as teacher
 Didn’t script the plan
 Didn’t write plans down
 Used to use planbook
 Going back and forth between plan book and plan form
 Don’t write out plans for the week
 Another teacher could follow my plans
 Only she could teach from planning form
 Week at a glance includes coordination
 Saves weeks at a glance on computer
 Week at a glance
 Week at a glance changes
 Week at a glance completed before weekend
 Week at a glance includes standard

Week at a glance submitted via email
 has gotten more specific with week at a glance
 make notes in planbook
 must write standard on agenda
 Not going to rewrite planning form for this year
 Not required to turn in plans
 Required to turn in lesson plans
 School requires objectives each week
 School requires weekly lesson plans
 Note section of planning form basically a checklist
 Note section of planning form was helpful
 Planning form had note section
 Planning form included details of plan
 Planning form is simplified
 Planning form was a good system
 Plan book is bare until Thursday
 Plan book looks like a nightmare
 Planbook is a mess
 Planbook used to outline and change
 Planning requirements
 Turn in course of study and syllabus
 Turned in planning form
 Turns in a weekly agenda
 Planning requirements at other schools
 Planning spreadsheet
 Plans with topics and bulleted list
 Plans don’t have all the parts of a lesson
 Previous planning brings back memory
 Provide lesson plans to building person
 Used self created planning form on computer
 Technology makes lesson plans easier
Selective Code Context: student access to technology outside of school, the impact of the rest of the school on teacher planning

**Axial Code: Student access to computers and the Internet outside of school**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>student access at home varies</td>
<td>more kids have access</td>
</tr>
<tr>
<td>student access to computers at public libraries</td>
<td>assumes no support at home</td>
</tr>
<tr>
<td>students access to computers outside of school</td>
<td>can't give Internet assignments for home</td>
</tr>
<tr>
<td>student access to Internet</td>
<td>limitations due to student access at home</td>
</tr>
<tr>
<td>student access varies</td>
<td>students access from home</td>
</tr>
<tr>
<td>student access to technology varies</td>
<td>half of students have access at home</td>
</tr>
<tr>
<td>more academic students have computers at home</td>
<td>can't rely on parents</td>
</tr>
<tr>
<td>wealthier kids have more access</td>
<td>kids use of technology out of school</td>
</tr>
<tr>
<td>students access from home</td>
<td>kids might get to community college for access</td>
</tr>
<tr>
<td>half of students have access at home</td>
<td>no middle ground for student access</td>
</tr>
<tr>
<td>can't rely on parents</td>
<td>some students only get access at school</td>
</tr>
<tr>
<td>wealthier kids have more access</td>
<td>took it for granted that everyone had a calculator</td>
</tr>
</tbody>
</table>

**Axial Code: Unpredictability: “even the best-laid plans,” things happen that the teachers can’t control events such as assemblies or snow days; requires flexibility**

**Open Codes:**

- can't control for unexpected things
- change it up
- rearrange schedule to fit events
- extra time can always be used for review
- had to plan weekly because she didn't know about time
- it's just part of teaching things didn't go as she planned
- you live and learn
- interrupted by an assembly things happen that affect planning
- have to be flexible and make adjustments
- outside responsibilities affect planning
- doesn't always know where she'll end up at the end of the period
- somehow plans don't necessarily go perfectly
- do the best you can
- not an ideal situation
- lessons don't always go the way you expected
- sometimes you can't go back to redo lessons
- always something would happen
- you just have to adjust
- impact of schedule changes on planning
- impact of testing on planning
- SMART board lesson
- interrupted by principal
- Loses projector and has to change lesson
- Lost grade book files
Appendix 12: Reflexive Journal Entries Examples

27 April 2007 @ 07:17 pm
The Writing Process
I blocked out three days--Sunday, Monday, Tuesday--next week and have fiercely protected them so I would be able to have large sections of time when I didn't have to leave the house. I could stay in my jammies, drink coffee and write. I still plan to do that...but I am so itching to get at this proposal that I couldn't wait. I started editing my conceptual framework the minute I got it back from Judi, working particularly on summarizing/paraphrasing some of the quotes and adding more of my own ideas about why I am adopting the constructivist paradigm.

I also started reading the texts I have on phenomenology. Took some notes, but it really makes a lot of sense to me as a strategy. I am not interested in a case; I am interested in a phenomenon. And the contemporary North American version fits perfectly with my ideas about how I want to show the world through a noncritical lens. I am trying to extend the camera metaphor here that I have been playing with but as with all metaphors, it is imperfect. I have been arguing against what photographers would call the high contrast photo, one that has few grays. A low contrast photo, on the other hand, may be under-exposed. And that's not my intention: I want to expose the experiences of teachers, frame the lens around them. Hmmm...maybe I'm just thinking too much about it. Now that I've started incorporating the metaphors, I feel like I have to continue.

29 September 2008 @ 09:31 am
Thinking About Future Memos
The memos I wrote this morning helped me both technically in terms of figuring out how to navigate HyperResearch and also emotionally as they showed me that there really are connections between my participants.

Here's a list of possible memos for future writing:

- The differences between the content and how that effects teacher planning (ie, social studies versus language arts)
- Example of long-range and short-range planning (ie, knowing where you're going and knowing how you're going to get there)
- Making changes from year to year
- How students influence choices about planning and technology (ie, Amy's primary and secondary sources lesson)
- Perceptions of access
- Access in the classroom and planning
- Planning ahead, planning spontaneously, and how it's all influenced by how much time it takes

15 January 2009 @ 09:16 am
Getting Caught Up
Well, some time has elapsed since I've written. But I haven't been slacking...just wrapped up in management issues and data collection. However, I am going to set a goal of writing at least one memo every day going forward. I have coded the early interviews and have several topics to cover in terms of planning.

Today, I am heading to the newest school district. I need to figure out how to refer to them. I don't think I can use east/west as that makes it too obvious maybe? And no reference to mountains or rivers. For now, I'll just call them #1, #2 and #3 until I can get more creative.

I'm going to be able to complete at least two observations, I hope, and do the start up interview for a teacher. That leaves me just one and she actually returned an email this morning so I'm going to chat with her at the end of the day. I've been a little frustrated about email communication with some of my teachers.
But I know they are busy and don't have the luxury of sitting at the desk like I do most of the day. It's hard to remember that sometimes.

These are not people who are just sitting around surfing the web. Most of them do some of their planning at home...Sunday afternoon is a popular time. And they carry their planning with them, too. Susan talked about thinking of ideas when she was running or doing the laundry. At least two--Wanda and Mark--talked about thinking of ideas as they drove back and forth to work. (I was an in-the-car planner myself, musing over the lessons and always ready to change at the last minute.) That's something that Michelle talked about: how she makes changes up until the last minute. This isn't like teacher school where you plotted it all out and then just went through it...and it probably doesn't work like that in teacher school either. There are constant adjustments as they plan and then as they implement the plan. They may be tweaking it for different classes or because something didn't work at all or the way they thought it would during first period. (The researcher in me wonders how much work has been done on time of day in terms of influencing classroom climate and student learning?)
Appendix 13: Interview Member Checking Examples

Initial Interview with Deirdre

D: Actually what I would do is a google and powerpoints to go with what I was looking for. There is also a site, and I think it's Jefferson County, I can't remember exactly, I could find out. They created powerpoints within their school system.
K: And then once you download them, do you tweak them at all?
D: No, not those I haven't. I also planned at the beginning of the year to use United Streaming but there have been some problems with that. We didn't have the password in order to use. There was some concern about the live streaming. Our assistant principal was going to be working through that and give us some more information about it. We do have mobile units now, one per grade and I will be using the mobile unit Thursday with my challenge smart block.
K: And what's the mobile unit?
D: The laptop computers. It's a set of 20 per grade for 5th, 6th, 7th and 8th.
K: And what will you be doing with those?
D: We will be using them for testing and we also have a program that's called interactive achievement. I set my benchmark up and it's ready to go but I've not set up a test for like the decimals or rounding. We're doing algebraic expressions now and I haven't set anything up with that. As far as what I've been using for my tests is just tests that are online with my textbook series.
K: So on Thursday you will be doing the interactive achievement test?
D: What I've been doing with my challenge group is imagery, visualization, being able to visualize different math problems and different designs. They've been doing incredible with it and it's a group that really likes competition so I happened to bring up that I had used before a logical thinking thing called the Tower of Hanoi. And so we are just going to set up a competition on Thursday with five disks and see who can move all the disks in the least number of moves. And hopefully figure out if there's a pattern of moving the disks to do it in the fewest number of moves possible. We'll do that second period. I have not used it with any other class. It's just recently gotten in, got them all checked in, got them charged and ready to go.
K: This is the laptops?
D: These are the laptops.

Pre-Lesson Interview with Michelle

K: So anything else about your plan that you'd like to tell me?
M: Well I mean I don't know if you were looking for something totally me created or whatever.
K: I was looking for what you were doing. So I come in with no expectations at all. You seem to feel guilty about using things that other people created?
M: Yes.
K: You do?
M: Well like I said some of the prefixes on there aren't the ones that we will have on the quiz on Friday.
K: But they will be prefixes that they will learn next time.
M: That's right. They'll have them on the next one.
K: But have you made use of stuff that other teachers have made?
M: Well because it doesn't totally match up.
K: So it's the content alignment piece?
M: Yes.
K: And if you had time you could have gone in and fixed it.
M: Yeah.

Pre-Lesson Interview with Marion

M: Basically this is my first time trying this.
K: Describe the lesson plan that I'll be observing and talk about how you are doing it differently?
M: Originally this used to be three different lessons. And because of a change in how we use our computer lab, a change in the computer resources
K: And can you explain that a little bit. You mentioned it in your last interview but I never pursued it. What changed?
M: Basically what we are doing is the principal set up so that the guidance counselor has a rotation in the schedule where she gets to have a guidance lesson during enrichment time. And to be able to do this, he had to work the schedule in a way that the computer lab became part of it. So we have an alternating schedule in which it alternates every other week so one week certain classes, certain grade levels, are in the computer lab at certain times of the day while others are with the guidance counselor. Then the next week it switches and the groups that had computer have the guidance counselor and the other groups that had the guidance counselor have the computers. This is a kind of lesson that I don't want to just delegate to a teacher's aide to oversee. Because I really want the students to be on track and I'm the one that knows exactly where they are supposed to be and what they are supposed to get out of each activity. So instead of just delegating to the aide that watches the computer lab and have the kids do it over five different days, I figured out a way of trying to do this in cycles. Sort of stations. So I changed what used to be three days, because I used to have one day that was dedicated to the computer lab lesson and one day for the other things the experiments and so forth to three stations. And this is my first time trying this. Now I would have tried to do the computer lesson all in one day with everyone if the computer on wheels would work but we have that modem problem. So I couldn't make that work. So there goes plan B. So now I'm on plan C. Now so far this being my first time trying this, it's worked out ok. One of the classes it felt a little rushed because I do have to split up the kids into their groups and their rotations. Basically the way the rotations work is one group of kids is going to be at the computers doing the computer, doing the web explorer. I have one group that's going to be working on experiments, hands on activity with me. That's going to be an experiment and the second half is a graphing activity where they get to plot data into a bar graph and compare the oceans by their data as opposed to just talking about it. So they create a graph from that data. Then the other group is going to be doing the lesson review. So pretty much they are doing class work answering questions that review the lessons that we've done because we are at the end of our unit. Next week, I'm giving the test. So they are doing their review portion. And this rotation is going to happen since there are three groups, three days. So, today, Monday and Tuesday. Pretty much what I've done is I've set up a links page for them that way they only go to those websites. And for the ones that work on the computer. And they have a set of eight questions. I try to keep it enough that regardless of ability, because I know some kids are faster and more web savvy, so they can find information faster than others, so I figured a nice amount of questions was eight. And that would keep it you know giving everybody the opportunity to finish. Now anyone that finishes early then gets to go to the fun websites where they get to see more material but that's in a more light type of presentation. The experiment people, we start with first an experiment. They are learning how ocean currents work. And I'm doing it with a focus on water density. And so that way they get to see for themselves how water behaves when more dense water encounters less dense water. And then like I said we do the graph activity. And pretty much that's it. That's the extent of what we are doing today. And everything, whether you're on the computer, whether you are on the experiment or whether you are doing the review, you are touching on the same thing, how ocean currents work, aspects of the physical characteristics of oceans, and the biological characteristics of oceans. The experiment group is focusing more on currents and physical characteristics of oceans. The other two groups have the added component of the biological relationships and characteristics of the ocean.

K: But essentially all three have the same content?
M: The core, everything the same, just in a different way.
K: Is it a particular standard?
M: Yes, it's from the earth systems strand. And basically in that standard it's all about the geological, physical and biological characteristics of the ocean.
K: So how much did you have to, because you've done this in the past, you've done this in the computer lab, how much did you have to redo or recreate in order to change this plan with the different technology setup?
M: As far as the technology is concerned, the web explorer activity is pretty much setup almost the same. The only difference is that now it's part of a rotation instead of just one day dedicated to that. There was a component in which I would demonstrate to the whole group using the projector. And that component I had to take out. And it was easier for me because if there were four or five kids that were lost, like I don't know what I'm supposed to do, I could just go to the projector and say look at my screen, this is where you need to click. And that made it easier. Now it's more like walk up to the computer who needs help, you know what's going on. It's more, I guess, instead of being to show them, I just kind of walk them through, talk
them through. On that aspect, I really you know that's the biggest difference. But that actual way the activity is structured as far as where they do and what they use to get there is the same. That didn't change.

K: So just sort of how it all plays out.

M: Basically the setup.

K: Normally all the kids would have done it in one day in the computer lab and then you would have moved on to the experiment. You still would have done all the same things. You just split them into three.

M: Yeah. And of course it doesn't have the guided lesson element. I had to take that away. So it's more independent now.
Appendix 14: Interview Summary Examples

Planning Process Interview, Mark, May 7, 2008
Summary and Member Check

Summary:
I am required to submit a week at a glance which is basically like your weekly lesson plans. It is a general overview of what I plan to do for the week. It includes the standards will be covering and the activities we will be doing. There is also a place to share with the special education teachers where they can make suggestions or comments about possible modifications. I email my week at a glance to both the administrators and the special education teachers. I keep slightly more detailed notes for myself. The week at a glance is the roadmap that the administration uses to know what we are doing. I created a pacing guide that is a basic skeleton that I follow. I tweak it as I go along. We are also asked to post periodically to our echalk site.

Because my planning period is often taken up with errands, meetings and grading papers, I do my planning in the car. I kind of plan by feel. I put together concepts at home on Sundays and I use resources from various texts. Since I did a lot of research to set up the pacing guide, I generally follow it as I plan. I use my time to look for additional appropriate resources from the library and online. Some of the resources our library has are movies and DVDs. I'll pre-screen those to make sure they fit in with where we are in the pacing guide. I will try to put together the week at a glance before the weekend. But usually it ends up getting modified or tweaked over the weekend as I think about it and look at it. And then as the week goes on if I see the class is not progressing at the pace that I would like to go, it is often modified again during the week. I try to plan as much as I can at school but often times it happens on the run.

I'm following the basic time frames that I have laid out in the pacing guide, which covers the whole year. I generally know about how long it should take to cover certain concepts based on the outlines that the state puts out. The outlines provided the major guidelines when I was putting the pacing guide together.
Generally, I spend more time than what the pacing guide would suggest what you might need to because I feel like there are a lot of connections that aren't made in the standards themselves. They are very general skeletons. But I think to understand the standards, the in between connections have to be made. For instance, I include Theodore Roosevelt even though he isn't mentioned in the standards because I think students need to know about him. So, I might take time away from more matter-of-fact instruction such as that related to the wars in order to include some of these other people and concepts. I've been doing this long enough that I generally have what I feel is a pretty good comfort zone of how long it should take to cover these things. I don't carbon copy what I do from year to year but try to include new things.

I try to encourage my students to see history as a continuing story instead of a series of facts that need to be just memorized and spit out. The new expanded scope and sequence guides and the released tests have reinforced what I've already been doing but they haven't changed my planning at all. I'm preparing the students for more than just the minimum requirements of the standard. I want my kids to know more than just a list of facts. I want them to understand more about the time period and be able to use the lessons from that time period to help them make judgments in the future.

I try to use the textbook as an anchor for the kids. They are still very text dependent but there are many sections where we just spot read. There are certain pages I ask them to read and certain pages I tell them not to. Often times I give them information in notes or show them a powerpoint that extends the textbook information. I'm not wedded completely to the textbook.

Usually I put the powerpoint presentations together to meet a specific need. If there's something that I don't feel is covered very well or is confusing, I'll use a powerpoint to try to show a different approach. They include texts and images. I also emphasize that you should cite your sources, which will be important in the later grades. I will often use powerpoints when the standard seems to have a lot of information, such as those associated with the Harlem Renaissance. That way the students can see the images. It helps make the
information more real to them. I may also use the powerpoint as a tool for review. So, I use the powerpoint for either condensing text or reviewing.

I choose to use a powerpoint based on what I want the outcomes to be. What do I want them to get from the presentation? They may include information that isn't in the text or images that aren't in the text or videos that will help with understanding.

Closer to testing time, I will have the students do review games and visit some of the tremendous review websites that are out there. We use them to address areas in which they may be weak. I will also have them do online practice tests. We do this in one of the computer labs because there aren't enough computers in the library any more to accommodate my classes.

There are two labs accessible throughout the day and there's a third lab that's accessible the first two periods. You sign up for them ahead of time. There are situations where once you sign up for it that pretty much locks your day in because sign ups will come in around you. So if you need to move the day, you're either wrecking someone else's plans or not going to have access to the computer on the day you need it. Generally I can reserve a lab a week ahead of time.

There are a few teachers that go in and do review activities every week such as the math teachers. They have a supplemental site that they can use to create tests and quizzes that goes along with the text and so they are able to generate things from their resources that they can put on for all the kids to access.

There's also interactive achievement. It's a new program of review activities or review questions where teachers can go and pull from the different standards and make their own tests and have them on the network for kids to come in and access for review purposes. It's available for math and English. We have one teacher that signs up for every Friday for the lab, for one of the labs. But that still leaves another one open.

Usually I can get into the lab as long as I have a little foresight of maybe wanting to use it. Sometimes I sign up just to make myself go in there. It helps to break up the routine of the classroom. I will often go in when we have a complicated chapter. Sometimes, I will sign up for the lab and then plan what I'm going to do. I'll go in ahead of time and just to make sure that it's not going to be wasted time. There's nothing worse than going in there and spending the period with everybody not having any idea what they are doing.

We are still dealing with the slow network. They are upgrading to a T-1 line but still working on getting it up and running. The network has been very slow during the preliminary online testing. It can be frustrating for the students because they are all pumped up and may have test anxiety.

I have a school provided laptop and projector in my room. I use it to show images and other sites while we're working. Unfortunately, the filter makes it more difficult to access some websites and you may have to visit several duds before you get to one that's open. It slows down the process. I know that you can plan ahead but sometimes you just want to grab something quickly and show it. My understanding is this should enhance instruction instead of hinder it. If it's going to enhance instruction, you need to be able to go grab something quickly and use it when it comes in. You're not always going to plan ahead. When I take the kids to the lab, I make sure they can access what they need to but sometimes in class I just want to show something quickly.

They loaded Integrate Pro on the laptops and it includes student data so it is easier to access without running to the office. The intention of using the laptops was for more people to get comfortable with technology. Then, technology would start to bleed over into the classrooms. In the last week, they have hooked up a wireless connection in the library but it doesn't reach my classroom.

I don't keep a planbook. Instead I keep things in binders and I add to them each year. I also have my weeks at a glance from the past few years that I reference as well, mostly to make sure I'm on track but also to see if there's anything I might want to use. This year, I have gone back and looked more at the weeks at a glance to try to maintain consistency. I'm still tweaking the program. I have been pretty consistent.
I have added a project or dropped a project. Unfortunately, it's more likely to have dropped one due to reliability issues than adding one. But periodically I do add some different things to different projects.

I did a letter writing project where students wrote a letter to Franklin Roosevelt in the voice of someone suffering through the Depression. Then, the students wrote a return letter as Franklin Roosevelt. We went into the lab to type them. I did drop that project though because the Depression is not heavily stressed in the standards.

One project that I've added is an Ellis Island scavenger hunt that gives the kids a little better understanding of what that experience was like. I use National Park resources as well as History and Biography channel resources. Those are good starting points for historical research. We usually do that project through smart block. Smart block is a period that is basically for enrichment and remediation. The students rotate through the core subjects and then Friday is a reading day so they get moved to where they need to be. And the kids rotate through the different core subject areas through the week and then on Fridays is a reading day. We'll take that day and just read whether it be individual or guided by the teacher. The Friday period is devoted to reading. That way they rotate through each of the four core subjects one day a week for reinforcement and enrichment.

I generally try to meet as many diverse needs as I can. I don't always want to teach to the middle. I don't always want to teach to the top. I don't always want to teach to the bottom. I also try to draw in all levels of Bloom's taxonomy, not just recall knowledge. That's not how you learn history, just by learning facts. I want to get them thinking so I'll include current events, maybe something I heard on NPR on my way to school. I want to show the relevance of what they are learning. I think it helps them think more. You want to take them from where they are and get them to process more and start using it for their own purposes.

Right now what I'm doing is I'm oscillating between the overhead and the projector and powerpoint that are basically going through the standards to review for the upcoming tests. I'm using the projector and laptop to access websites and the overhead to do maps and practice quizzes. I've used a video of a Holocaust survivor. Just trying to make it fresh for the students as they approach the test.

Sent to Mark via email:

Greetings:

Thanks for a great interview. The summary is attached. Please feel free to make any changes/additions/corrections and return it. If it is fine, just send me an email to let me know.

Good luck with all the test prep! I'll be in touch about the last two weeks of school and will probably be coming over to work with one of the other participants so we can chat then.

Thanks again for being willing to do this!

Best,
Karen

Mark's Reply:

It looks ok. I made one or two minor grammatical changes (literally), but left pretty much alone with the content. I reattached it to this email. Thanks for the encouragement on Spring Testing.

Initial Interview, Kelly, August 7, 2008
Summary and Member Check

Summary:
I just finished my twelfth year. I've always taught language arts. I started out over in another school district for five years. I did do some social studies. So teaching social studies won't be a total shock. I am comfortable in doing that as well. After that district, I came here. I love it here. It's close to home. It's really nice. Here I've been teaching just strictly language arts, the writing portion. Up until this year when I will be picking up social studies.

I will be teaching five writing, one social studies. And then I've got planning and team planning still. So, we're transitioning from a seven period day to an eight period day. The only thing that concerns me is that they are doing it to block math so math is going to be ninety minutes but then you still have a half hour of enrichment from 8:30 to 9. So kids who have math first period, they are going to be dying because from 8:30 to 9 and then from 9 to 10:30 they are in math for two hours. He said that we could talk about remediation and different things but I think maybe do two days of reading, three days of AR and just get the math in through the block.

 Educational Technology

I've gotten a lot better at it over time. The thing that I like to do most up until I've recently gotten a SMART Board is powerpoint. I'll try to do a few things through different powerpoints. I created brochures when the math teacher was here before Miss Forbes came. She would do a unit on percentages, taxes and things like that. And then I would have the kids create a menu and we would take them to the lab and have them kind of pull the two together so that was really good as far as integrating math and the writing and vice versa. But basically other than powerpoints and having kids do powerpoints, it's been kind of limited. I've put in for a SMART Board. And I got it. I don't know where I want to put it but I've got one coming. So I'm looking forward to using that and engaging the kids interactively. I think the kids will enjoy that.

The kids have access all the time so the limited access refers to my own skills. What I felt comfortable generating for them was limited. But it's gotten better and I've taken courses. Last summer, I did the Intel course for technology. The summer before that we did photostory, moviemaker, those kinds of things. I just haven't found a way to integrate that into my writing yet. But I love photostory.

The first year that I taught they offered three three-credit courses from UVA on different types of technology and things like that and so I took those. A lot of that was powerpoint, spreadsheets, databases, just things like that. And then I took the intel class last year with Judy Murray and I had to create a unit and actually used it and the kids enjoyed it. And that sort of challenged me because I was learning how to drop things from United Streaming into powerpoints and when I ran the powerpoint, I could just click the link and it pops up. I don't know that I remember how to do that but you know so each time I just kind of challenge myself a little bit to do a little more and I enjoy it.

The unit was on the writing process. And Mr. Murray had found this really great clip on the writing process on Brain pop and so we just had to figure out how I could get it in there and did it for the kids and the kids loved it. So, it was something fun for them. Something besides just standing up there talking, writing, taking notes, that kind of stuff because I think that bores children. That's why I'm excited about my SMART Board.

I do have ideas for the SMART Board. It comes with a Jeopardy. All we have to do is type the categories in, type the questions, type the answers, the format is there. And so I definitely want to do something with that with social studies. I think it would just be easier to do something like that with social studies. With the writing, I have to teach so much of it before I can have a good diverse Jeopardy game. Get through all the parts of speech, parts of a paragraph, and things like that. With social studies I think I could do the games a little faster, a little more frequently because it's just so facts based. I'm looking forward to getting the kids interactive with it. And I think they'll enjoy it because it gives them some movement. It gets them thinking.

I had SMART Board training once last year. Last year and that's it. One teacher on our team got a SMART Board last year and she uses that thing almost every day. She is our resident expert so I think if we have any questions we can just go to her for help. It would be good for the parts of speech because the kids can write on it. I definitely need a refresher course though. Hopefully when we come back there will be an inservice on SMART Boards.
I found out about SMART Board through the technology coach. I asked for one because I liked its capabilities. I liked the fact that it's interactive. You know, it's engaging with the kids. I'm certainly not scared of technology and not willing to try anything new. So, I see these cool things and I go put in for them for the next year.

I'm going on the record. I hate Moodle. I think it is the biggest waste of time. We had edutest. It had a national test bank. It had all these great things. And they did away with it because Moodle was free. We spent hours upon hours upon hours typing questions in. You couldn't download graphics. You couldn't import venn diagrams or outlines or things like that. And so for me Moodle was really of no use. If I have to give an assessment, I will print a released test. It was not an efficient use of my time to sit there and do tons of clerical work when there were programs already out there that I could already pull. And considering your planning times get shorter and shorter each year, you just don't have time for that. I did get part of a test typed and I lost it.

The school has provided me a laptop. The technology supervisor is supposed to be getting me two computers for the back wall so that the kids can do AR tests and things like that. We have the 7th grade lab that has 20 or 22 computers in there for the kids. There are 14 or 16 I think in the media center that the kids can use. And the media specialist has done a lot of interesting things with the kids this past year. Had them do a scrapbook but they had to plan a trip with a full intinerary. In different countries so they were on google a lot and learning about air fares and booking flights and different things. So they have plenty of access to technology. Access isn't the problem, it's limited knowledge of different things that they can do. But I'm learning.

To schedule for the computer lab, we have a calendar in the work room and we just sign up for whatever days we want. And typically if somebody has an activity that is two or three days long and somebody else is booked they give it up. That's not a problem. There are five teachers that make use of the lab and so usually there's never been a scheduling problem. You just sign up for it when you need it and we work together really well so that helps.

Student Use of Technology

They text and use My Space. I hate that being a writing teacher because of the way they write. It is horrendous. They use Moodle. The teachers who do use Moodle, the kids use Moodle in school. Part of the site had to be shut down because of kids' inappropriate use of Moodle so part of that had to be shut down. They play video games. I think technology in that sense is warping their minds. They don't take the time to text grammatically correctly. We had a speaker come talk about Grand Theft Auto. You know the violence, the killing, the shooting, the sex. Kids this age don't need to be messing with that stuff. When I was their age, I had outside. That was my big video game: outside entertaining yourself. I just think it's dangerous when you start playing with all that stuff and putting your information out there for everybody in the world to see.

What they were doing in appropriately with Moodle was that they were getting on Moodle at home and just writing trash about each other. And then kids could view it here at school. So that part of Moodle had to be shut down.

My general experience with educational technology is that I find that it works really well. The kids love computers. I like its many purposes. I wish I had more time to create all my lessons that way. I do like it because it engages them. I think it holds their interest more. I might not be good at writing but let me put this powerpoint together and I can incorporate my sense of art. Let me see if I can put it to a photostory and incorporate my sense of music. I think technology can integrate many more things than just what you are teaching. It's just finding the time to plan it all so that it comes off without a hitch. That's the tricky part because you don't want to be standing up there clicking on a link that doesn't work. I just wish that there was more time to plan it and have everything go smoothly.

Planning Process
Usually I'm here because I try to plan everything here. I am a day to day planner because I learned early on that you can do the nice Madeleine Hunter elaborate lesson plans and after the first day you're already behind. And so I don't like to do that. I'm a day to day planner. I have a plan for the first day when that period is over, I fill in Tuesday. This is where we left off. This is what I need to review. This is where I need to go. And I just find that that is easier than planning out for the whole week. Now, if I plan a unit, I estimate how many days I think it will take and I just kind of adjust it accordingly. And I just see where the kids are and if they need more time. And I can adjust the time for units like the writing process unit. My pronoun unit is probably one of the longest units that I teach. I do a music day with that. I bring in songs and have the kids listen for the pronouns and whoever comes the closest gets candy. And then I draw groups and they have to create skits using all the pronouns correctly. So that takes me about a month.

My plan book is pretty bare until Thursday. After Thursday's classes, that's when I fill in all the blocks for Friday. It's easier for me that way and that way I don't have to worry about where did we stop.

I do a lot of planning in my head. I do a lot of planning driving to and from because I'm just kind of thinking OK what could I do to make this a little more and less monotonous and droning. Then if I get a good idea, I'll jot it down. Sometimes I'll just write a topic and do bullets. This is I want to cover. My guided practice for each class usually varies. I don't do a lot with the textbook. I have the kids try to generate a lot of the examples. And I try to encourage them to use each other because those are the examples they are going to remember. They are not always going to remember what's in a book.

I generally do guided practice every day. And I review every day what I did the day before. I will start with a review. A lot of times I'll have the kids come up and write on the board. And I do a lot of peer work. Having them write on the board engages them. Makes them not sit there half asleep. Because they never know when you're going to call on them so they are a little more attentive. They want to come write on the board.

The big unit topics come from what I feel are going to take the longest and are like the main focus of my class. I'm a writing teacher so I'm definitely going to have a unit on the writing process. I try to do a unit each on the parts of speech. And how they interplay in writing and how everything kind of fits together. I spend a lot of time on compound sentences and compound complex sentences, just wherever I see the kids struggling the most. The writing process is definitely one of my biggest units and we just kind of break it down. We go through each step. I have them go through each step as we work our way through it. I have them peer edit and that's always fun.

I just use the textbook as sort of a reinforcement. I really don't use the textbook very much because when I first came here we had the Writer's Choice and when I started doing verb tenses, and the book didn't have future progressive, which isn't a tense but it's the "ing" and I thought I didn't like the book very much. And then I just kind of got away from it. can't come in and be the type of teacher that says here is the house, let's break it down because I don't think that way. I am a carpenter. You start with the foundation, subfloor, walls. And I do that. I start with the parts of speech and sentences and how does all that work and then we get into the paragraph. Then we get into the writing process and then they are done. And I partly do that because I had them write a paper and I just cried because I just couldn't stand to read any more. I just wanted to gouge my eyes out. So, I teach them from the ground up so I can see different areas that need help. And the problems don't seem as monumental. They are just minimal things and that way you're not crying. You can give some positive feedback after reading 120 papers and say hey good job, you just have your commons in the wrong place. And it just works out better for everybody.

There isn't a 7th grade test so I keep teaching until the end of the year. The scores have been super the past few years. I have been really pleased and I know Linden who teaches 8th grade has been very pleased.

One of the concerns we have with the high school going to block scheduling. The students will have to take the test in late September or early October. Those kids have been out all summer, haven't had English since the fall before so from January to September these kids have had no English. And they are hit with the test. I think they should test in January when the semester ends. But it takes so long for them to grade the essays.
Planning for Technology Use

If I think that I can do something quick and easy on the computer, I will do it. If I feel that it's a unit where I can go ahead and provide the examples, and then have kids come up and generate their own, I will do it. If it's something that I think is quick and easy, then I try to knock it out for the kids. If it's something that I know is going to be lengthy that kind of deters me a little bit. If I don't find time to do it in the day, I don't.

The other problem is that not all my classes are geared the same but sometimes I will try to go in there and edit. I'll change a name in and out for each class period because that doesn't take long at all but as far as different classes stopping in different places, that just makes it really hard. For me, it's more of a time decision.

I have a library of presentations. Bev Hardin and I got together and pulled famous quotations. And she put together a powerpoint with the famous quotations and so we just sit in class and discuss the quotes. I've kept all that stuff and I will use things from year to year.

I work on the powerpoints during my planning period. I have been late to team planning on occasions trying to get something finished up. I'm not sure how to do one from home and then get it to school. Plus, once I get home I'm fried. I'm just fried and I have an 8 year old going on 18 and I've got to devote some time to her so I don't like to take work home. I don't give a lot of homework because I think the kids have suffered enough. 8 hours, they need to be outside but if they've struggled with something, I'll assign a few sentences but it's not much. Just enough to see if they've truly got it or not.

Other Information About Planning

This year, my planning is only going to be 40 minutes because we are going to an 8-period day.

During team planning, we talk about student issues, bring students in to discuss behavior or organizational skills, bring parents in. This coming year, we will probably do some team planning for social studies and science.

We do some interdisciplinary work. The reading teacher and I work together to coordinate things in terms of how to reinforce each others' skills. I would draw Friday journal topics from the social studies teacher. We often do this planning after school. We'll just come out and sit at the table and talk about the day. But we'll try to incorporate each other's things. Everybody takes off mistakes in writing, which is good, so it forces kids to pay attention to everything in all classes. So I kind of have the best of both worlds because I am teaching it and I know everybody else is reinforcing it.

I plan a lot in the car. A lot here at school.

On Mondays, the students do a 10-minute free write. The rules are they can write about anything, no profanity and it stays between the student and myself unless they have written of harming themself and harming someone else and then all bets are off. And boy you learn more stuff than you ever wanted to know. But it's a good outlet for the kids. And then Tuesday, Wednesday, Thursday, they have a five minute warm up. Something will be on the board that they have to come down and copy. It might be an editing mistake, subject/verb agreement mistake, capitalization, they just have to try to figure out what's wrong. It may be something that I've taught; it may be something that I haven't taught. And then Fridays that I don't go to the media center, they have a journal topic. I've found that helps structure the classroom because they know exactly what they have to do when they come in. It's get the journal out either copy it, freewrite, or you've got a topic.

Last year, they did this in two separate notebooks. But over the summer I decided they are just going to do it in the same notebook.
The kids go to the media center twice a month with me and twice a month with Judy. They go every Friday. And our media specialist is really good about getting them involved in different activities and things like that. They take AR tests.

Sent to Kelly via email:

Greetings:

Hope all is well and you are enjoying the opening days of school. Attached is the summary of our first interview. Your pseudonym is Kelly, and I will use that in all the interview summaries. Please feel free to make as many changes as needed and return it to me via email. Focus on the content to make sure I represented your ideas accurately.

Thanks again for your willingness to be part of my study!

Best wishes for a great first day,

Karen

Kelly's reply:

I finally got a chance to read. It sounds good. I am really getting good with the SMART Board, so you can come whenever you want on Thursday.

Initial Interview, Carol, April 10, 2008

Summary

Demographics:

Been a teacher for five years teaching English 5th grade at the middle school
Previous education experience includes paraprofessional working with an inclusion group and an autistic child
Prior to that worked for an international fraternity organization and used a variety of software programs as well as doing some programming on a System 36

Technology in the Classroom:

Considers "technology technology" to be hardware such as the elmo and the whiteboard (machinery rather than programming)
Has used a variety of different technologies in the classroom:
• Whiteboard
• Overhead projector for different types of review (writing, math, social studies)
• Jeopardy game
• Online sources such as portaportal and quia
• Powerpoint presentations that help give information in a fun way
• Echalk
• Computer lab for test review

Loves technology and would love to know what else is available for them to bring into the schools
It is important for the students to have access to technology on a regular basis since that's where they will be headed when they graduate.

Time is an issue due to the need to teach certain content. It's hard to get equipment set up in the 50 minute class period. It would be better if the equipment could be kept in the classroom rather than shared amongst teachers. (Example: the led projector is shared by six teachers)
Room does not really have any technology, not even a desktop where the students could work
If it were in the classroom, it could be used every day.
Prefers interactive technology where the students are actually doing something

Student Use of Technology:

Believes students have a lot of interaction with technology outside of the classroom
There are not a lot of programs that support academics.
In addition, the use of technology limits their time outside getting exercise.
The children's access to computers and the internet outside of school varies due to economic status and those without computers are at a disadvantage.
It would be great if the school division could provide laptops to the students that they could use for school work.

Professional Development:

Has had some professional development through UVA and T/TAC. The latter is often the same information dealing with inclusion and No Child Left Behind.

Sent to Carol via email:

Greetings:

Hope all is well and you are enjoying the opening days of school. Attached is the summary of our first interview. Your pseudonym is Carol, and I will use that in all the interview summaries. Please feel free to make as many changes as you like and return it to me via email.

Thanks for your help!

Best,
Karen

Carol's Reply

Karen:

I would like to make a few changes from our first interview.

Under "Technology in the Classroom"
#1 instead of "considers" can we use the word uses "hands on" technology as well as "programmable" technology, however considers the "hand-on" (elmo/whiteboard) when speaking about technology - Not sure if this is correct; but I consider all (written/hands-on) as technology - but not aware of everything that's out there?

#2 "Powerpoint and interactive websites that help give information in a fun way"

Under "Student Use of Technology"
#2 "Students don't use a lot of programs to support academics, they would rather play games that don't incorporate academics"

#3 In addition, the use of gaming technology is limiting outdoor activities that are needed for social interaction and exercise.

I hope I'm not being a pain, but I don't want to sound "anti-technology" or "technology unaware".

Thanks,
My Reply to Carol

Greetings:

Thanks so much for your prompt reply. I will make certainly these changes for you. This is NOT a problem at all and I would encourage you to continue to do this through our other interviews. Having the participants check/confirm/clarify the summaries is a very important part of the research process. I want to make sure that I am clearly communicating your concerns and ideas.

Thanks so much for being part of this! I’ll send along the summary from yesterday’s interviews early next week.

Best,

Karen
Appendix 15: Grand Member Checking Examples

Grand Member Check: Bonnie

Email Sent to Bonnie:

Greetings:

I hope this finds you well. Attached is what is called the "grand member check." It includes the information I collected from you as part of the study that will appear in the final report. If possible, could you please review and reply by Friday, May 22. Thanks!

Please take some time to review the document and make any changes you feel would better clarify the comments and quotes. You can make them directly on the attached document.

I will share a copy of the final report which will be done this summer. I am planning to send an electronic copy to your school email address. If you have an alternative email that you would like me to use, let me know. Also, if you would prefer a printed copy, just send me your home address and I would be happy to mail one to you.

Best,

Karen

Document Sent to Bonnie

NOTE: I wrote a short description of each teacher that starts with a quote and gives background information about the teacher as well as the technology available. Please check to see that I've gotten all that correct in your description.

I think the thing is as a teacher with technology I really have to when I'm planning I want to make sure that I think about its purpose and how it's going to facilitate the children and what goal I'm trying to accomplish out of the lesson that I'm doing. Am I doing it to review and remediate? Am I using it to expand upon instruction? You also have to stop and think about how you're going to instruct the children with the program. Because some kids are obviously going to be—it's just like anything else—some will have more experience than others with technology and I think that it's important that we consider that and that we have to realize in our instruction we can't just assume that sometimes they already know all the things and the parts of it.

Bonnie has been teaching for 16 years, beginning with first grade and then moving to middle school math. She currently teaches seventh grade civics and economics, a position which she has held for four years. Bonnie uses technology in a variety of ways in her classroom. One important way for her is to make her class more accessible for special
Bonnie has done this lesson for four years, only introducing the technology during the past two years. She has several reasons for using technology as part of the project. It is a way to introduce the students to a software program they will be using throughout the year. In addition, because the final products look more professional, Bonnie feels the students take more pride in their work. Finally, it's just important for teachers to incorporate technology as they prepare their students for the future. She said, "I think the technology is just really important for the world we are living in, so if we can start to teach them at all about technical design and the use of technology, it's going to benefit them in the long run."

NOTE: Here are the other quotes/summaries that I used from your interviews and observations.

Bonnie, for instance, was helping her students understand elections and voting. Her students, according to Bonnie, needed to know "information about the predictors of who might vote, education, age and income. And we talk about what causes people not to participate in voting, which is lack of interest and failure to register."
Bonnie was the only teacher who identified technology as part of her content since she felt that it was important in a civics course to understand technological innovations and the impact they will have on students’ careers and everyday lives.

Bonnie, for instance, began her units by brainstorming with the students as a way to assess their current understanding. From there, she moved on to vocabulary study.

Similarly, Bonnie determined technology use was if she could use it to provide relevant information to her students that would help expand upon the topic being studied.

They might change this order from year to year. For Bonnie, a Presidential election year meant changing the order so her students were learning about the political process during the election. Her mock election activity, which involved the whole school, fit into this unit.

Bonnie felt there was a "natural flow" to concepts that would help students.

All the teachers talked about the importance of using technology in a purposeful way; none of them used technology just for the sake of using it or having fun. Bonnie commented, “It has to serve a need within your class. You don’t want to just have it as a filler.”

In order for her students to create their brochures, however, Bonnie needed access to a computer lab in which the software she wished to use was installed.

These resources had to be reserved in advance and, depending on their availability, might influence when teachers completed certain activities. Bonnie commented: I think that, of course, you sometimes get frustrated I guess as a teacher not having those computers available to you when you need them. And it really does affect your planning. You have to plan weeks in advance, sometimes, to figure out when the computers are available so it’s not always the most conducive to when it’s appropriate to teach it but when you get access to the computers.

In fact, this limited access caused Bonnie to postpone her students’ completion of the brochure for several months. Due to an absence, she had to cancel her lab reservation. When she returned, she found that she would be unable to schedule the lab in a timely manner, and her curriculum required that she move on. She chose to grade the students’ rough drafts created with pencil and paper and planned to complete the digital portion as part of the spring test review. Her stoic reaction was typical of all the teachers in my study as they juggled the demands of their schedules: “You just sort of learn as a teacher to do the best you can with it and hope that you can get in there and if you have to reschedule, you replan, which can happen with any best laid plans.”

The teachers had different strategies for instructing the students in the use of technology. Bonnie commented:
You have to stop and think about how you are going to instruct the children with the program. Because some kids are obviously going to be—it’s just like anything else—some will have more experience than others with technology and I think that it’s important that we consider that...we can’t just assume that sometimes they already know all the things.

Bonnie showed them the basics and then let them explore on their own, using a system of trial and error as she facilitated their work.

For instance, while Bonnie was disappointed that she could not take her students to the computer lab to complete their brochures, she felt that they had grasped the content by completing the rough drafts.

However, they also connected that unpredictability to the practice of teaching as a whole. Bonnie commented:

Like I've said before, the best-laid plans can sometimes change or don't even work. So you have to, as I've found after seventeen years, you have to be flexible...you have to try to always be prepared and ready to adjust or change something around. Make sure that the children understand it. It's meeting the needs of what you are trying to teach. It's meeting the needs of the children. So, I think that's just a part of planning that you learn as a teacher. You keep rolling and going, and you don't let the little things hold you up...It's one of those lessons that you learn.

Bonnie did not use written directions, preferring instead to demonstrate the technology to the full group before letting students go to work.

**Bonnie’s Email Reply:**

Karen
Thank you for the email. We are counting down the days! I hope you are doing well. Everything in the attachment seemed correct.

Thanks!

**Grand Member Check: Samantha**

**Email Sent to Samantha:**

Greetings:

I hope this finds you well. Attached is what is called the "grand member check." It includes the information I collected from you as part of the study that will appear in the final report. If possible, could you please review and reply by Friday, May 22. Thanks!

Please take some time to review the document and make any changes you feel would better clarify the comments and quotes. You can make them directly on the attached document.
I will share a copy of the final report which will be done this summer. I am planning to send an electronic copy to your school email address. If you have an alternative email that you would like me to use, let me know. Also, if you would prefer a printed copy, just send me your home address and I would be happy to mail one to you.

Best,
Karen

Document Sent to Samantha:

NOTE: I wrote a short description of each teacher that starts with a quote and gives background information about the teacher as well as the technology available. Please check to see that I've gotten all that correct in your description.

Being part of your study? It gets you thinking about when did you learn the technology and when did you start using it? Because some of your questions, I told you, you just take for granted. It's there. You use it. I didn't have a SMART Board until this year and now it's nothing to go put up a lesson on the SMART Board and my PowerPoints work with the SMART Board perfectly without it being a SMART Board lesson in their format. So it's kind of nice just to have it there. You can make it interactive or not. You can do whatever you choose. So you just kind of do get used to it. But this made me go back and rethink it through again.

Samantha has been teaching sixth grade science for six years. She described several different uses for technology including having her students use software to create both graphs of scientific data and content-related multimedia presentations. She creates her own multimedia presentations as well that she displays along with digital videos and images on her interactive whiteboard. Students often come up to the board to interact with content.

The interactive whiteboard is located in her classroom along with a projector and laptop. She also has four desktop computers for student use. They might use them to research or complete assignments. Samantha has access to a computer lab as well as a cart of laptop computers.

Samantha used the computer lab for her lesson. As part of a unit on water pollution, her students completed an online activity where they used an interactive dichotomous key to identify organisms found in stream water. Using this data, students could determine the health of the stream under investigation. The day before they went to the lab, Samantha completed one stream identification activity with the students as an introduction. Then, students worked independently in the lab although Samantha allowed them to help each other if necessary. Students accessed the link to Web site from Samantha’s science bookmarks that she maintains as part of a school Web page.

Samantha had done the lesson several times in the past. One year, when she did not have Internet access, the students completed the activity using a printed key. Samantha
indicated that she would not do it that way again as it was not as engaging as using the interactive key on the Internet. While student engagement is important, Samantha said that she generally chooses activities and technologies make sense to help her students understand and learn. She commented, "Technology is part of the world they will enter so if you're doing what you're supposed to do, you will use technology. It just makes sense."

NOTE: Here are the other quotes/summaries that I used from your interviews and observations.

Samantha described her own concerns as she first started using the board with her students. Both she and the students had problems with it, and these technical issues during the first few weeks made her question whether or not she wished to continue using the board. She and her students eventually got used to it and now Samantha has trouble imagining being without her interactive whiteboard.

Several teachers mentioned colleagues within the school who helped them with the technology. For Samantha, it was primarily the librarian, but she also relied on other teachers to help her remember how to use software.

Samantha mentioned that she had learned some things about her interactive whiteboard from her students.

Samantha used cooperative learning groups with her students, but she varied the use of those groups depending on the students. For instance, Samantha felt as though this year’s group of students were not as productive when they worked in groups so she tended to plan more independent work for them.

Samantha commented:

I've always told my first period that they are guinea pigs. They are. Even if you are not tweaking your lesson, they are the guinea pigs because you’ve got it planned out, you know where you want to go, and you get part way through the lesson and you realize that they are going blank. Samantha generally preferred to start from scratch when she created interactive whiteboard activities, as she was not impressed with the quality of the materials that came with the board.

As part of their evaluation, the teachers considered the grade level as well as how, to quote Samantha, "kid friendly" it was, thinking about the students in general as well as how individual students responded to technology use.

Samantha felt her students were successful using the dichotomous key because she had taken them through the process prior to bringing them to the lab. In addition, Samantha also used an informal "peer tutoring" process, relying on students to help each other as they worked through the lesson.
For the teachers in my study, this was known as “Plan B,” and most mentioned having such a plan in place. For Samantha, it was essential when using technology. She commented, “Oh yes, whenever you’re using technology, you should have a backup plan. Things go wrong.” She indicated that she had learned this lesson the hard way by having the technology fail.

Samantha’s use of the dichotomous key with her students grew out of her TCK. In fact, it took her some time to work out the best way to use the simulation with her students. She commented on her learning process:

I think when I first discovered it, I didn't really understand what all was involved in it. We didn't do it. When I first found the site, I thought well this is seventh grade biology. So I just kind of discounted it. But I did talk about the organisms and how some of them were sensitive to pollution and if you found these it meant that the water wasn't polluted because they were too sensitive to live in it. And I did use it in a way that wasn't as meaningful to the students. Didn't grasp their attention. Won't make them remember it when they find these things. And then I, once I understood the site better, I thought the seventh grade teacher, some of our objectives overlap so I gave it to him and he was going to do because it really does fit seventh grade biology perfectly. He didn't get to it. And when I found that out, well I'm taking it over again. I told him I'm taking it back over and by that time I was beginning to see a logical sequence of how I can fit it in and have them understand it. But until I could find that logical sequence to just throw this in some teacher's lap and just say hey look at this, do it, they would probably be bogged down too. You still have to figure out how it fits in and how it makes sense. And that does take a lot of getting used to what it is. Playing with it. I played with it on my own. I had to get really familiar with it before I let the kids do it.

Samantha and Bonnie did not use written directions, preferring instead to demonstrate the technology to the full group before letting students go to work.

Samantha, in particular, found it difficult to discuss how she planned for the use of her interactive whiteboard. When first asked about her technology use, in fact, she failed to mention the board. She commented, “I didn’t even think about it because you just use it. It’s there. You use it.” Once she had created her activities using the software, she could use them from year to year, tweaking as necessary.

Email Reply from Samantha:

Hi Karen,
The info looks accurate, but there are little words missing. Would you like me to correct my grammar?

My Reply to Samantha:
Greetings:

Thanks for the reply. Your grammar is just fine. Since these are direct quotes, I will got back and check them against the transcript just to make sure I didn't leave anything out.
Best,
Karen
Appendix 16: Consent Form Samples

Teacher Consent Form
I, __________________, agree to participate in a study of teacher planning practices. The purpose of this study is to discover how teachers plan for the use of technology in teaching.

As a participant, I understand that I will be interviewed at least four times throughout the course of the study for approximately 45 to 60 minutes each time. During these interviews, I will be asked to discuss my perceptions of educational technology, describe my planning practices related to technology use, and reflect on my classroom use of technology. I understand that I do not have to answer every question asked of me, and will have the opportunity to review and correct the information I have provided prior to publication or presentation of this study's results. I understand that, if I name someone who helped me with the planning process, that individual will be approached to be included in the study. In addition, I understand that I will be observed at least twice teaching a lesson in my classroom, for about 30 minutes each time. I will share any documents created as part of the lesson planning process for this instruction with the researcher, permitting her to take copies of these document with her as part of the data collected for the study.

I have been informed that I will be identified by an alias that will allow only the researcher to determine my identity. At the conclusion of this study, the key that relates my name to the alias will be destroyed. Under this condition, I agree that any information obtained from this research may be used for publication or education. I understand that I will be provided with a copy of the results of the study.

I understand that there is no personal risk or discomfort directly involved with this research and that participation is voluntary. I am free to withdraw my consent and discontinue participation in this study at any time by notifying the researcher through whatever means I wish to use. If I have any questions or problems that arise in connection with my participation in this study, I understand that I should contact the project advisor, Dr. Judith B. Harris at 757-221-2339 or jbharr@wm.edu. I understand that I may also report any dissatisfaction with the study to either the Associate Dean of the School of Education, Dr. Thomas Ward, who serves as the School of Education’s representative on the Human Subjects Committee, at 757-221-2358 or tjward@wm.edu, or the Chair of the Human Subjects Committee, Dr. Michael Deschenes, at 757-221-2778 or mrdres@wm.edu.

My signature below signifies that I am at least 18 years of age and that I have received a copy of this consent form.

_______________________________________________
Participant/Date

_______________________________________________
Investigator/Date
Teacher Collaborator Consent Form

I, ____________________, agree to participate in a study of teacher planning practices. The purpose of this study is to discover how teachers plan for the use of technology in teaching.

As a participant, I understand that I will be interviewed at least one time throughout the course of the study for approximately 45 to 60 minutes. During this interview, I will be asked to discuss my perceptions of the planning process, particularly as it relates to the use of educational technology. In particular, I will be asked to describe how I worked with a teacher to plan for and use educational technology in a lesson. I understand that I do not have to answer every question asked of me, and will have the opportunity to review and correct the information I have provided prior to publication or presentation of this study's results. I will share any documents created as part of the lesson planning process for this instruction with the researcher, permitting her to take copies of these document with her as part of the data collected for the study.

I have been informed that I will be identified by an alias that will allow only the researcher to determine my identity. At the conclusion of this study, the key that relates my name to the alias will be destroyed. Under this condition, I agree that any information obtained from this research may be used for publication or education. I understand that I will be provided with a copy of the results of the study.

I understand that there is no personal risk or discomfort directly involved with this research and that participation is voluntary. I am free to withdraw my consent and discontinue participation in this study at any time by notifying the researcher through whatever means I wish to use. If I have any questions or problems that arise in connection with my participation in this study, I understand that I should contact the project advisor, Dr. Judith B. Harris at 757-221-2339 or jbharr@wm.edu. I understand that I may also report any dissatisfaction with the study to either the Associate Dean of the School of Education, Dr. Thomas Ward, who serves as the School of Education's representative on the Human Subjects Committee, at 757-221-2358 or tjward@wm.edu, or the Chair of the Human Subjects Committee, Dr. Michael Deschenes, at 757-221-2778 or mrdres@wm.edu.

My signature below signifies that I am at least 18 years of age and that I have received a copy of this consent form.

__________________________
Participant/Date

__________________________
Investigator
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