2005-03-28

Using Live Modeling to Train Preservice Teachers to Integrate Technology into Their Teaching

Richard Edward West
Brigham Young University - Provo

Follow this and additional works at: https://scholarsarchive.byu.edu/etd

Part of the Educational Psychology Commons

BYU ScholarsArchive Citation
West, Richard Edward, "Using Live Modeling to Train Preservice Teachers to Integrate Technology into Their Teaching" (2005). All Theses and Dissertations. 266.
https://scholarsarchive.byu.edu/etd/266

This Thesis is brought to you for free and open access by BYU ScholarsArchive. It has been accepted for inclusion in All Theses and Dissertations by an authorized administrator of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen amatangelo@byu.edu.
USING LIVE MODELING TO TRAIN PRESERVICE TEACHERS TO INTEGRATE TECHNOLOGY INTO THEIR TEACHING

by

Richard E. West

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Master of Science

Department of Instructional Psychology & Technology
Brigham Young University
April 2005
This thesis has been read by each member of the following graduate committee and by majority vote has been found to be satisfactory.

Date

Charles R. Graham, Chair

Date

David D. Williams

Date

Stephanie Allen
As chair of the candidate’s graduate committee, I have read the thesis of Richard E. West in its final form and have found that (1) its format, citations, and bibliographical style are consistent and acceptable and fulfill university and department style requirements; (2) its illustrative materials including figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the graduate committee and is ready for submission to the university library.

Date

Charles R. Graham
Chair, Graduate Committee

Accepted for the Department

Andrew S. Gibbons
Department Chair

Accepted for the College

K. Richard Young
Dean, College of Education
ABSTRACT

USING LIVE MODELING TO TRAIN PRESERVICE TEACHERS TO INTEGRATE TECHNOLOGY INTO THEIR TEACHING

Richard E. West
Department of Instructional Psychology and Technology
Master of Science

Many researchers feel that teacher preparation programs are not doing enough to prepare teachers to effectively use technology. The result is a plethora of teachers who may know the basic functions of different programs, but who are unprepared to integrate these skills into their teaching. One method used by a few preservice programs, including BYU’s, is the use of modeling sessions, otherwise referred to as live modeling. In these modeling sessions, the instructor models for the preservice teachers how a K-12 teacher could teach with technology, while the preservice teachers participate as if they were K-12 students. This thesis is a qualitative investigation of how this method of live modeling has impacted students, according to the perceptions of a sample of former students of the course. This project also has a practical focus of identifying strategies for improving modeling, and pitfalls that may indicate when modeling is not as effective.

Overall, this study found that modeling was perceived by most students to be effective at teaching technology skills and ideas for integrating technology as teachers.
However, there were some students who struggled to abstract principles from the modeling that could help them as teachers. In other words, they struggled to cognitively transfer the learning from the context of the modeling session to their own teaching contexts. In this research I identify five main contextual breakdowns that often occurred among students in the course. These were breakdowns, or differences, between the modeled context and the students’ actual contexts that were sufficiently large enough to disrupt the students’ abilities to cognitively transfer the learning. By adapting the live modeling method to more specifically address unique students’ needs and contexts, then the cognitive transfer of learning should be easier and the method could be a strong tool for training preservice teachers to use technology in their own teaching.
ACKNOWLEDGMENTS

One of the reasons why I have enjoyed teaching IP&T 286/287 over the past two years is how the instructors worked together to continually update and renovate the course. Because of this collaboration, I feel that many of the ideas and thoughts in this thesis are not really my own but owned by the collective IP&T 286/287 faculty, supervised by Charles Graham. I would like to thank them for their ideas, feedback, and help on this project. Especially I would like to thank Graham for his constant mentoring and selfless consideration of my development as a scholar and professional. I would like to thank Stephanie Allen for her mentoring and partnership as we reworked the one-credit version of the course. And without David Williams, I would still be struggling to fit a positivistic background into my naturalistic soul. Thank you for opening my qualitative eyes! I am also grateful to Michele Bray for sending out dozens of emails with links to my survey, and to Geoff Wright for creating two of the images.

Finally, I dedicate this thesis, and everything I might ever accomplish, to my wonderful wife, Stephanie. Without her support, patience, understanding, and selfless consideration of my academic needs, this would not have been possible. She’s now seen me through two theses, and will still work with me through a dissertation, and she has ever supported me and made my goals her own.

“And I guess I always knew, I’m who I am, because of you.” – Jeannine Lasky
# TABLE OF CONTENTS

ABSTRACT ........................................................................................................................................... v

ACKNOWLEDGMENTS ...................................................................................................................... vii

TABLE OF CONTENTS ...................................................................................................................... viii

LIST OF APPENDIXES ...................................................................................................................... ix

LIST OF TABLES AND FIGURES ...................................................................................................... x

CHAPTER 1: INTRODUCTION ........................................................................................................... 1
  Why Training Teachers to Use Technology is Important .......................................................... 1
  How Well Are Teachers Being Taught? ...................................................................................... 3
  A Possible Solution? .................................................................................................................... 4
  Research Questions ................................................................................................................... 4
  Glossary of Terms ..................................................................................................................... 5

CHAPTER 2: REVIEW OF THE LITERATURE ................................................................................... 7
  Why is Live Modeling Important? ........................................................................................... 7
  What is Live Modeling? .............................................................................................................. 9
  What Other Methods Are Used to Train Teachers? ................................................................ 10
  What Are the Theories Underlying Live Modeling? ............................................................... 13

CHAPTER 3: DESIGN OF THE RESEARCH STUDY ......................................................................... 21
  Research Methods .................................................................................................................... 21
  Trustworthiness and Qualitative Standards ............................................................................. 31
  Course and Participant Background ....................................................................................... 36
  Role of the Researcher in the Study ......................................................................................... 43

CHAPTER 4: FINDINGS AND DISCUSSION .................................................................................... 45
  The Students’ Experiences: Two Case Studies ......................................................................... 46
  Modeling’s Potential for Teaching Technology Skills ............................................................... 52
  Modeling’s Potential for Teaching the Integration of Technology in Education ................. 65
  Contextual Breakdown 1. Difference in subject or teaching emphasis ................................... 75
  Contextual Breakdown 2. Intended age level ............................................................................ 77
  Contextual Breakdown 3. Difference in teaching style .............................................................. 80
  Contextual Breakdown 4. Students’ expectations for the course ............................................. 82
  Contextual Breakdown 5. Technology availability/complexity ................................................ 88

CHAPTER 5: CONCLUSIONS AND QUESTIONS FOR FURTHER RESEARCH ......................... 91
  Questions for Further Research ............................................................................................... 95

REFERENCES ........................................................................................................................................ 99
LIST OF APPENDIXES

APPENDIX A: PROTOCOL FOR INTRODUCTORY INTERVIEWS ....................... 105
APPENDIX B: INITIAL ANALYSIS OF FIRST SEVEN INTERVIEWS ............... 107
APPENDIX C: PRELIMINARY INTERVIEW ANALYSIS ........................................ 113
APPENDIX D: SURVEY INSTRUMENT ............................................................... 129
APPENDIX E: SURVEY ANALYSIS AND RESULTS ............................................. 141
APPENDIX F: THEMATIC ANALYSIS OF INTERVIEWS AND SURVEY ........... 151
APPENDIX G: FINAL INTERVIEW PROTOCOL .................................................. 155
APPENDIX H: RESEARCHER PARADIGMS, ASSUMPTIONS, AND VALUES ... 157
LIST OF TABLES AND FIGURES

Figure 1: A Model of Narrative Interviewing ...............................................................23
Figure 2: BYU’s Method for Modeling Technology Integration .................................39
Table 1: A Description of Six Different Modeling Sessions Used in IP&T 286 ...........42
Table 2: Survey Question #10 .......................................................................................55
Table 3: Survey Question #24 .......................................................................................56
Table 4: Survey Question #13 .......................................................................................58
Table 5: Survey Question #19 .......................................................................................59
Table 6: Survey Question #26 .......................................................................................62
Table 7: Survey Question #22 .......................................................................................67
Table 8: Survey Question #24 .......................................................................................68
Figure 3: Contextual Breakdowns Present in Modeling Sessions ............................74
Figure 4: Depiction of Student’s Difficulty to Transfer ..............................................77
Table 9: Survey Question #17 .......................................................................................79
Table 10: Survey Question #7 .......................................................................................83
Table 11: Survey Question #18 .....................................................................................92
Table 12: Survey Question #20 .....................................................................................92
Table 13: Survey Question #16 .....................................................................................93
CHAPTER 1
INTRODUCTION

Why Training Teachers to Use Technology is Important

The question may be asked why it should be a priority to prepare future teachers to use technology in their teaching. Richard Clark ignited a famous debate in the 1980s and 1990s that continues today when he claimed that technology does not influence learning (Clark, 1983; 1994). Robert Kozma, and others, responded that while technology may not influence learning by itself, teaching methods may be impacted and changed by technology in a way that can influence learning (Kozma, 1991; 1994). Kozma has most recently been overseeing a massive qualitative investigation looking at many case studies around the world where teachers have effectively used technologies to improve learning (Kozma & Anderson, 2002). Rochelle, Pea, Hoadley, Gordin, & Means (2000) also found that technologies can be used to improve the learning of students. These researchers argued that there were four fundamental characteristics of effective learning: (a) active engagement; (b) participation in groups; (c) frequent interaction and feedback; and (d) connections to real-world contexts. They identified cases where K-12 teachers had used technologies to effectively improve the teaching in each of these four areas.

More recently, the Office of Educational Technology of the United States Department of Education released a study (2004) reporting on an investigation into the importance of using educational technologies in schools. The report describes how technology has dramatically changed the world, and that it is now changing the learning environment inside of schools as well. The investigation further reported that often this change has been driven by the students themselves, who have been born in the age of the
Modeling Internet. Giving several action items to help guide educators to a “spectacular rise in achievement” and a “new golden age for American education,” the writers of the report ask that there be an increased focus on improving the training of future teachers to use technology effectively.

Together with Charles Graham, we completed a year-long investigation in 2004 where we also found strong support for the claim that training teachers to use technology effectively can improve teaching and learning. In our study, we completed case studies of master teachers at BYU to discover what patterns might indicate possible ways that technology could be used effectively to impact learning. We sought recommendations from department chairs and campus instructional designers about those professors who were the most innovative users of technology, and we then narrowed our list to 35 cases, which represented 24 departments and 11 different colleges. While these professors used technology in very different ways, five patterns emerged that represented common ways technology was improving their teaching, and these patterns were evident in different contexts and departments. We found that five ways technology could improve learning were by (a) helping students to visualize content; (b) promoting student/teacher and student/student interactions; (c) supporting meaningful student reflection; (d) providing opportunities for involving students in authentic, real-life learning activities; and by (e) improving the quality and quantity of students’ practice (West & Graham, in press).

Most educational researchers would not claim that simply using a technology would always improve students’ learning; however, there are many research studies, such as ours, those conducted by Kozma and Anderson (2002), Rochelle and colleagues (2000), and others, that indicate that the appropriate and reflective use of educational
technologies can often have positive effects on learning. This is one reason why training preservice teachers to be able to employ effective strategies as they use educational technologies is so important.

**How Well Are Teachers Being Taught?**

Recent studies have found good and bad news about the use of technology in education. The good news is that, more than ever, teachers and students have access to educational technologies including the Internet, computers, handheld devices, and software programs. The ratio of computers to students was one computer for every six students in 2000 (Doering, Hughes, & Huffman, 2003), and most of these computers were connected to the Internet. Less positive feedback for is that also in 2000, a major survey of over 2,000 teachers found that only 50% used technology in their instruction (Barron, Kemker, Harmes, & Kalaydjian, 2003), and, in another study, only about 11% of the teachers surveyed felt they had enough knowledge about technology that they could use it in their daily teaching (Doering et al., 2003). Even more recently, the situation has not improved, and the U.S. Department of Education’s Office of Educational Technology (Office, 2004), found that teachers have more resources available through technology, but have not been trained sufficiently in how to use this technology effectively. These disappointing findings are surprising, especially since some researchers (Faison, 1996) predicted that with new technology standards, such as those recommended for preservice programs by the International Society for Technology in Education (ISTE), teachers’ use of technology would increase.

Many researchers feel that teacher preparation programs are not doing enough to prepare their teachers to effectively use technology. One researcher believes, “The
capacity of teachers to use technology in classroom instruction has not kept pace with the increased access to technology in schools” (Sandholtz, 2001). Another study reported that less than one-third of students leaving preservice programs felt prepared to use technology (Francis-Pelton, Farragher, & Riecken, 2000). The result is a plethora of teachers who may know the basic functions of different programs, but who are unprepared to integrate these skills into their teaching.

A Possible Solution?

One method employed by a few preservice programs, including BYU’s, is the use of modeling sessions, otherwise referred to as live modeling. These modeling sessions involve the instructor showing the students how a K-12 teacher could teach with technology, and the students participate as if they were K-12 students. The belief of the IP&T 286 instructors at BYU has been that this modeling helped students visualize how teaching with technology can be done effectively, gave students ideas for how they could use technology in their own teaching, and helped the students gain new technology skills.

Research Questions

This research study had three goals. First, I wanted to investigate the experience of the modeling sessions from the point of view of the students. I then wanted to study the impact the modeling may be having on preservice teachers’ attitudes, self-efficacy, knowledge, and intentions toward the integration of technology. Finally, I tried to identify patterns and principles to guide effective modeling. More specifically, the following questions guided my inquiry:

1. What were the students’ experiences as they participated in the modeling sessions?
2. After participating in the modeling sessions, were there any changes in the students’ knowledge, attitudes, and intentions concerning technology integration?

3. What principles, ideas, and strategies can guide effective modeling?

**Glossary of Terms**

This thesis uses some terms that may not be understood outside of the context of Brigham Young University’s IP&T 286 course, or outside of the context of this study. Because of that, I have included a glossary so the reader may understand my meaning when I use these terms.

**Cognitive transfer.** Transfer has been defined as “the ability to extend what has been learned in one context to new contexts” (Byrnes, 1996, as cited in Bransford, Brown, & Cocking, 1999). In the literature, transfer usually connotes that the students actually implement the learning through action. In other words, there is evidence that the transfer has occurred. Cognitive transfer, as I have defined it, is when students appear to have applied the learning from the class to their own unique contexts and situations, but they have not yet implemented this learning through action. The transfer has taken place in a cognitive way only, but it implies that the students will be able to implement the knowledge when given the opportunity.

**Contextual breakdowns.** A difference, real or simply perceived, between the context of the modeling sessions used in IP&T 286 and a student’s own unique context. For example, if a high school English student participates in an elementary science modeling session, then there could be said to be two contextual breakdowns, or areas where the student’s context is different from that of the modeling session: first, a difference in the subject matter, and second, a difference in the intended age level.
Live modeling. In other words, in-class modeling of a sample lesson plan infused with technology by an IP&T 286 instructor.

Modeling. Presenting an effective example of the use of educational technologies to improve teaching/learning. Modeling can be done through videos, or demonstrated by an instructor or peer.

Modeling session. IP&T 286 modeling sessions include three parts: (a) in-class demonstration by an instructor or peer of a sample lesson plan using technology; (b) student projects completed in groups; (c) student reflection, in an attempt to cognitively transfer the learning to their own unique contexts.

Preservice training. Education majors are in preservice training to become teachers. In contrast, teachers who are already working in the schools sometimes receive inservice training.

Technology integration. According to Hargrave and Hsu (2000), technology integration is the “ability of future teachers to use technology to expand the learning of K-12 students” (p. 304). Hughes (2004) reflected on the difference between technology integration, and simply diffusing or disbursing technology into schools, and commented that technology integration implies that the tools are being combined with the content and pedagogy in a way that they “work together well.” Thus technology integration implies more than simply using technological tools. It means that the teachers are using the tools in concert with what they understand about the subject, students, and any pertinent educational psychology issues in an effort to improve learning.

Video modeling. Viewing/analyzing video case studies of teachers using technologies.
CHAPTER 2
REVIEW OF THE LITERATURE

The methodology behind the use of modeling sessions, as used here at Brigham Young University, seems to be fairly new and unexplored in the literature. In my investigation of different areas of the published literature, I have only been able to identify a few schools that appear to use similar methods. It may be that what we call modeling is called something else by other schools, or that the method is relatively unused. Either way, there are pieces and elements that provide the foundation for live modeling that are employed in various ways by other preservice training programs. Because of this, I have organized my review of the literature to address four main questions regarding modeling: First, why is modeling important? Second, what is modeling? Third, as a way of comparison, what other methods are used to train teachers to use technology? And fourth, what are the theoretical underpinnings justifying the use of modeling to train teachers to use technology? Each of these questions will be a main area of focus for this literature review.

Why is Live Modeling Important?

Many possible solutions to the problem of teachers being inadequately prepared to use technology have been suggested in the literature, including the use of modeling. One definition of a model is “an example for imitation or emulation” (Merriam-Webster, 2004). Preservice students observe many models of teaching before they themselves become teachers, including their own K-12 teachers, higher education faculty, and teachers they might observe while immersing themselves in the schools. However, most
K-12 teachers and higher education faculty do not use technology effectively in their teaching, and so they are not appropriate models for preservice teachers to emulate. For example, in a 2000 study conducted in Chicago of 8,572 elementary and 2,642 high school teachers, 60% were found to use technology in a limited fashion or not at all (Hart, Allensworth, Lauen, & Gladden, 2002, as cited in Barron, et. al, 2003). In higher education, Spotts and Bowman (1995) found that half of faculty surveyed did not have sufficient knowledge or experience with any educational technology except word processing, and this translated into poor use of available technologies in their teaching. More recent research has found that this is still a problem. “Despite pockets of innovation, most higher educators make little use of instructional technology,” Surry and Land (2000) reported.

Because most teachers are not using technology, tomorrow’s teachers need alternative models to observe. Christy Faison in 1996 observed that “teacher educators are failing to consistently model instructional technology use in their professional education courses,” (p. 57), and she believed that “the key to producing technologically literate students is modeling technology use and providing opportunities for students to integrate technology into the teaching/learning process” (p. 58). Francis-Pelton, et. al. (2000) also felt that it was crucial to give preservice students adequate models of effective technology use, writing that they believe “one reason for this disparity between the intentions of the teacher education programs and the reality in the schools is that new teachers have had very limited exposure to appropriate models of how the computer can be used in a classroom setting” (p. 178).
What is Live Modeling?

It seems logical that the most effective models of effective technology use for students would be their own teacher education faculty. However, many teacher education faculty themselves do not use technology effectively in their own instruction (Smith & O’Bannon, 1999). In the absence of effective faculty modeling, the model might be provided by the instructors of the instructional technology course, such as IP&T 286, if there is such a course at the university. One method employed by a few preservice instructional technology teachers is to model, or show by example, correct technology integration principles in the context of actual lessons (Brush, Glazewski, Rutowski, Berg, Stromfors, Van-Nest, Stock, & Sutton, 2003; and Doering, et. al., 2003).

Thomas Brush, along with other ASU researchers, explored the use of live modeling sessions as part of a Preparing Tomorrow’s Teachers to Use Technology (PT3) grant. In this project, they developed a series of activities where the instructor for a technology-for-teachers course taught sample K-12 lessons infused with technology. While these instructors played the role of K-12 teachers, the preservice students participated as if they were K-12 students. By observing effective models from the student point of view, and by then using technology to complete example K-12 assignments, these students were better prepared to use technology in their own teaching (Brush, Glazewski, Rutowski, Berg, Stromfors, Van-Nest, Stock, & Sutton, 2003).

A different attempt to use modeling was reported by Doering and colleagues (2003), who explained a new program being implemented at the University of Minnesota, also as part of a PT3 grant. In their program, instructional technology instructors worked with methods faculty on a 1.5 credit course. In the course, the IT instructors would
typically teach a new technology, and the methods faculty would discuss possibilities for using the technology to teach a particular subject. It is difficult to know for sure from their article, but it appears that the methods instructor also occasionally modeled, or showed possible ways to teach with the technology, but it seems that the modeling was not formally organized and taught as a complete K-12 unit of instruction, as was the case with the ASU model, but was more brief and informal.

Besides these two examples, there appears to not be very many instances of live modeling reported in the literature. This could be because there is emphasis on using other methods, such as video case studies as I describe a little further on, or it could be that modeling methods that are being used are not being reported. Regardless, there is a need for more discussion about the possible merits of live modeling, and suggestions for how to effectively model in a way that could best help preservice teachers.

In IP&T 286, we have used live modeling sessions since fall semester of 2002. Our methods have been largely adapted from those used by Brush and his colleagues, and include three stages: First, the instructor presents a K-12 lesson or engages the students in a typical K-12 learning activity. The students then work together in groups during the week to complete projects. The final stage is to reflect on how well the technology was used in the teaching, and how similar technologies could be used in different situations. I will give more detail about our methodology in using the modeling sessions in the methods section of this thesis, where I discuss the context for the study.

*What Other Methods Are Used to Train Teachers?*

Traditional approaches to training teachers. Teaching preservice teachers about technology integration usually implies training them to use technology effectively in their
teaching to improve learning. Hargrave and Hsu (2000) explained technology integration as the “ability of future teachers to use technology to expand the learning of K-12 students” (p. 304). These authors reported that they conducted a survey of 53 different preservice training programs and found that the majority of these (73%) used an introductory instructional technology course, similar to IP&T 286, to teach technology integration. At 36 of these institutions, the class followed a lecture and lab format with no basic technology prerequisite. They also reported a growing trend to “focus on computer technology and not … instructional design topics” (p. 313). In other words, most instruction in courses similar to IP&T 286 teach technology skills more than general integration principles that may be independent of any particular technology.

Often universities following this approach focus on workshop days when the instructor helps preservice teachers acquire new skills in a particular technology. There may be discussion about how the tools could be applied to teaching situations, but the focus often seems to be on learning the tools. Sandholtz (2001) commented on this pattern, writing that “much of the training provided to teachers emphasizes fundamental computer operation rather than preparation on how to use technology as a teaching tool and how to integrate it across the curriculum” (p. 350). Sandholtz reflects that something more needs to be done than simply helping teachers acquire “computer literacy.”

Video modeling. One method commonly used to try and improve how well teachers learn techniques for using technology is the use of video cases, video models, or case-based teaching (all of these terms usually mean the same thing—the use of video-recorded examples of expert teachers to stimulate students to reflect critically). The method for using video cases is often to have the students either view the videos in class or on their
own, and then reflect and discuss different aspects of the videos, evaluating how well the models used the technology and considering alternative methods (Wetzel, Wilhelm, & Williams, 2004).

The use of video case studies for providing models of effective practice—but not necessarily in the area of technology integration—has been studied since the 1980s. More recently, Beck, King, and Marshall (2002) found that using video cases in preservice programs had the potential of helping student teachers bridge “theory and practice because they present opportunities for applying theoretical, conceptual, and pedagogical knowledge about teaching and learning in real-world classrooms and explicating such knowledge embedded in practice” (p. 346). These researchers went on to explain three reasons why video cases can be effective in training student teachers: (a) video cases are authentic portrayals of realistic situations; (b) students viewing video cases learn by dual coding (Clark & Paivio, 1991), and (c) events and contexts are expressed in ways that are believable and more easily interpretable by the students (p. 347). These authors further explained that the use of video cases allows prospective teachers to vicariously experience the classroom situation through the eyes of the video model, while still being sufficiently removed so that the students can reflect critically.

Beck and colleagues (2002) also considered the negative aspects of video modeling, which included that the modeling has decontextualized elements that may cause students to consider the video case to be less authentic, and overexposure to the same case might cause boredom. Copeland and Decker cautioned that video cases might not be the most effective way to train teachers, saying, “little empirical evidence has been developed to date concerning the effects of video-based case pedagogy in teacher
education. With this, as with many innovations in teacher education, optimism precedes evidence” (p. 467).

The use of the lecture and lab format, along with video case studies, are perhaps two of the most-used methods for training teachers to use technology. Other methods include project-based learning tasks, where students are given pedagogical problems and are required to solve these problems through the use of technology, and spreading out technology integration instruction throughout the methods courses, rather than in a single course (Hargrave & Hsu, 2000). There are probably many other methods used, but these are the methods most often mentioned in the literature.

*What Are the Theories Underlying Live Modeling?*

Live modeling, at least as performed in IP&T 286, focuses on actively involving the students; anchoring the learning in an authentic context; helping students learn through visual, auditory, and kinesthetic methods; involving students in collaboration; promoting student reflection; and other ideas. I will now discuss each of these principles and briefly review some of the literature associated with them.

*Situated cognition and anchored instruction.* Situated cognition is a view of learning that claims that what students’ learn is situated in their social context. A popular article in this strand of research was written by Brown, Collins, and Duguid (1989), where they explained that all learning is contextualized in the same way the “meaning of a word cannot, in principle, be captured by a definition,” (p. 33) but is best understood in the context of spoken language. How things are learned depends on the community of the learner, because, for example, the knowledge of how to use a chisel is different among carpenters than cabinet makers. They both use the same tools, but use them differently, so
the knowledge of how to use a chisel is situated and held by each distinct community of practice. In a later article, Brown and Duguid (1993) claimed that knowledge is “stolen” by learners as they interact with professionals through authentic practice and attempt to model their behavior after these professionals.

Anchored instruction is a parallel line of research associated with situated cognition, and is the theory that learning should be anchored in an authentic, or realistic context, which aids students in transferring the learning to real-life, after-school contexts. This theory was popularized by the experiments performed by The Cognition and Technology Group at Vanderbilt (1992, 1993). The CTGV were researching interactive videodiscs that allowed students to view a rich case study and seek possible solutions for the character in the case study. In this way, the students were making decisions as if they were the character in the case study, and if the case study approximated an authentic, “real, on-the-job” context or situation, then the learning of the students would be more anchored in an authentic context and the knowledge learned would transfer to their career after their schooling ends. The ideas behind anchored instruction are very similar to those involved in problem-based learning environments, since the “anchor” is usually a problem situated in an authentic context.

Dual coding theory. Many times, instruction focuses on language as the medium to teach students, as when a teacher gives a lecture or a student reads a textbook. However, some cognitive scientists feel that there are two possibilities for coding information into memory, one is textual, and the other is graphical (Clark & Paivio, 1991). Thus, when students learn by viewing something in addition to hearing or reading it, then they can double-code the material in their memory, more or less underlining it in
their memory so that it is more solidly remembered. It might be possible, also, that other methods for coding information into a students’ memory exists.

_active learning_. Active learning is the belief that students learn better by being actively involved in the learning, instead of passively receiving lectures at the hands of their instructors. It implies that the students will be participating, writing, reflecting, talking, doing, and performing in the classroom. Chickering and Gamson in their explanation of their seven principles of effective undergraduate education (1987) wrote that students do not learn well when they are required to memorize pre-packaged assignments and repeat answers. Rather, students need to talk about, write about, and apply what they are learning to their daily lives. Bonwell and Eison (1991) believed that learning could be made more active through many different methods, including the use of role play, discussions, in-class writing assignments, debates, simulation, and peer teaching.

The idea that students should be actively participating in their education is a foundational idea related to many other theories, including situated cognition, cognitive apprenticeships, anchored instruction, and problem-based learning (Driscoll, 2000; Savery & Duffy, 1996; and Lave & Wenger, 1991).

_Collaboration/group work_. Many theorists believe people learn best in social situations, where there is interaction and collaboration with peers and mentors. Lave and Wenger (1991) emphasized “the inherently socially negotiated character of meaning” (p. 50), and believed that meaning, or knowledge, was socially, not individually, constructed. Dunlap and Grabinger (2003) wrote that to promote lifelong learning, teachers need to encourage collaborative work among their students so students can appreciate “multiple
perspectives; refine their knowledge through argumentation, structured controversy, and
the sharing of ideas and perspectives; learn to use colleagues as resources; and (become)
willing to take on the risk required to tackle complex, ill-structured problems” (p. 11).
Teachers who believe in these ideas feel that collaboration between students is a critical
component of an effective education. Driscoll (2000) summarized the importance
collaboration plays for many teachers by paraphrasing Brown, Collins, and Duguid
(1989): “Collaboration is not just a matter of asking students to work together in groups
or to share their individual knowledge with one another. Rather, collaboration enables
insights and solutions to arise synergistically” (p. 385).

Reflective practitioner. Educational researchers for many years have promoted the
process of reflecting on one’s learning as a necessary component of anyone’s education,
but it seems there has been special attention to the importance of reflection for students
preparing to become teachers. This focus on reflection began with John Dewey, but
intensified in the late 1970s and 1980s through the work of Max Van Manen and Daniel
Schön, among others (Van Manen, 1977; Schön, 1983, 1987). Van Manen described
three levels of reflection: technical, which was the judgment about the effectiveness of
certain means to achieve desired ends; practical, which examined goals and actual
outcomes; and critical, which involved making judgments about personal action and
locating this within wider political, social, and cultural contexts. Schön believed that that
there are two different kinds of reflection, reflection on action (which occurred after an
event occurred) and reflection in action (which happened simultaneously with the event
being reflected upon). It was his belief that teachers must first be trained to reflect on
their actions until they progressively gained the skills necessary for reflection in action, which would have the ability to guide a teacher’s actions as events unfolded. Other researchers like Zeichner and Liston (1996) and Mackinnon (1987) continued the discourse on reflection throughout the 1980s and beyond, spurring many research studies attempting to measure a student’s ability to reflect or to create a method for promoting better student reflections. Quantitative (Kirby & Teddlie, 1989) and qualitative methods (Hatton & Smith, 1995; Griffin, 2003; Mackinnon, 1987; and Rovegno, 1992) have been used to attempt to better understand how to teach students to think, and teach, reflectively. The vast amount of studies published investigating how to improve student reflections highlight the importance many institutions place on teaching students to think reflectively.

*Applying these theories to the modeling sessions.* With the modeling sessions, the underlying principle was to engage the students in a learning activity that is active, memorable, and situated in a context that approximates real K-12 situations. The modeling was designed to follow some of the principles of the learning theories I have described in this section. In a way, the modeling uses anchored instruction/situated cognition principles, even though Tripp (1993) makes the point that true situated cognition is learning that is situated in real, not modeled, contexts. However, because the learning is centered around a problem, or project, that needs to be completed, and this project is situated in the simulated context of a typical K-12 lesson plan, we believed that in using modeling sessions, the learning would be easier for students to transfer, at least cognitively, to their own future teaching careers. While they still learned technology
integration in an artificial context, it was more realistic and authentic than activities that did not include modeling.

The IP&T 286 modeling sessions were designed, in part, to involve the students actively in using technologies and experiencing, first-hand, technology-enhanced instruction. Most of the modeling sessions involved little presentation and demonstration, and instead focus on guiding students through experiments, activities, and information-gathering. Instead of live modeling sessions, we could have used video case studies, but one advantage that we felt the live modeling sessions had over video modeling is that in live modeling, the students were active learners. Stephen Tripp believed that the video situations used in the CTGV studies put students in the role of observer, rather than participants, thus creating an illusion of a community of learning that didn’t really exist (Driscoll, 2000; Tripp, 1993). One advantage of live modeling is that the learning revolves around skills and pedagogies needed to teach an authentic K-12 lesson plan, and the students get to actively participate.

The projects students complete in IP&T 286 modeling sessions were collaborative in nature because the instructors believed this would enable the students to better handle the workload, mentor each other as they learned new technology skills, and allow for greater reflection about how the tools used in a modeling session could be used in other situations. The students were grouped in threes, and usually worked in the same groups for all five of the modeling sessions, allowing them to develop a community of support as they helped each other learn technology skills and application ideas.

The modeling sessions also used dual coding ideas because they employed several different ways of learning technology integration besides ordinary textual methods. For
example, students viewed the instructor modeling correct techniques (a graphical representation). They participated in the lesson by conducting experiments, collecting survey data, taking pictures, or creating projects typical for K-12 contexts, thus learning kinesthetically. Finally, in preparation for the modeling sessions, students read material and view videos related to technology integration. The belief of the instructors is that using multiple methods for teaching technology integration helped record key principles more permanently in students’ memories.

Perhaps the most important activity in the modeling sessions were the reflection activities. Because many different teaching majors would participate in the same modeling sessions, it was crucial for each student to reflect on the modeled experience and apply the learning to their future, unique teaching contexts. The IP&T 286 instructors have used different technologies and methods for encouraging student reflection, including blogs, wikis, discussion boards, face-to-face discussions, and individual written papers (West, Wright, & Graham, 2005). The instructors also modeled for the students how to reflect and apply the modeling sessions to their own situations through class discussions and the instructors’ own blogs and discussion posts.
CHAPTER 3
DESIGN OF THE RESEARCH STUDY

Research Methods

There were three phases to this research. In the first, I interviewed 11 former students of the course. The second phase was the creation and administration of a survey to all of the former students of the course over six semesters from Fall 2002 to Spring/Summer 2004 (response rate=159 acceptable responses). The final phase of this research was nine interviews with a different sample of former students to help me clarify and solidify my growing understandings and theories.

Preliminary interviews. I sampled my first interviews by asking IP&T 286 instructors to recommend students from their previous classes who appeared to be fully integrated in the class and who participated in the activities and who would likely be good interviews because of their “talkativeness.” I choose to sample students according to these criteria so I could understand the experience of students who participated fully in the modeling so they could give me a fuller picture of what this experience is like. Because I would be interviewing students about what had occurred in the past and would not have any way of collecting observational data, I felt that I needed to interview students who would talk freely about their experience and give me the most information.

I attempted to sample at least one student from each instructor, each semester. I was able to do this, for the most part, but not entirely. Two instructors did not provide me with any students from their classes to interview, and from the pool of students provided by the other instructors, not every student contacted wanted to participate. There were other problems as well, including the fact that some students had left BYU and could not
always be contacted easily. The result was 11 interviews representing five different instructors. I felt this was a sufficiently diverse sample for the purposes of this study.

After receiving recommendations from instructors, I recruited each participant by email and explained the research project and requested their participation. Each of these interviews was conducted in person, except for one interview conducted by phone with a graduated student. The interviews followed a narrative format that stressed the importance of allowing the participants to tell their own stories about their IP&T 286 experience. My interview protocol consisted of possible prompts related to my research questions, but I allowed the participants sufficient flexibility and liberty to discuss any aspect of IP&T 286 that seemed important. The interviews were structured in this way to allow me to understand how well students remembered their experiences in the modeling sessions, and how these specific experiences were situated in the IP&T 286 experience as a whole. During the interviews, I constructed my understanding of the students’ experiences by checking my assumptions with the students, restating my understanding of what they had said and referring to the specific words used by the students to express their feelings. This method of interpretation, participant check, and re-interpretation is a style of interviewing modified by Justin Poll (2004), based on the ideas of Steinar Kvale (1996) and Michael Murray (2003). I used this model because it allows participants the freedom to retell their experiences in a narrative, storytelling style, while helping researchers to develop and test theories as their understanding of the situation grows. I believe this method of interpretation and participant checking adds credibility to the research data (see Figure 1). The protocol for these interviews is included in Appendix A.
Example

Participant: “I have always noticed that when you experience what you’re gonna teach you learn better. Because she could have just said, here’s a lesson plan and here’s what you can do. It was good for us to actually see, this is how you do it, this is how you put it into the computer.” (participant’s story)

Interviewer: “So, it was good to kind of experience the lesson as someone else would experience it before you then taught it?” (test meaning)

Participant: “Yeah.”

Interviewer: “Can you tell me about an activity specifically when you did this?” (specific examples)

Participant: “I remember one time when she taught us about digital storybooks …”

Interviewer: “So, for you, experiencing first what you might teach later as a teacher yourself helped you because you understood the students’ perspective?” (interpret meaning)

Participant: “I think so.”

Figure 1. A model of narrative interviewing that emphasizes encouraging the participant to tell the story of their experience, asking for specific examples, and testing and interpreting meaning with the participant. Image created by Justin Poll (2004).
The purpose of these preliminary interviews was primarily to help me identify the types of questions I should be asking on the survey, and I was especially interested during these early interviews in what language the students used to identify activities (for example, did they call them “modeling sessions” or something else?), what parts of the modeling experience they remembered, and how they described the modeling sessions overall.

Analysis of preliminary interview data. Analysis of the preliminary interview data began during the actual interviews. Because I recorded the interviews, I only took notes about key ideas stressed by the participants and some verbatim quotes to support these ideas. I also noted down some of my perceptions as a researcher of the things the interviewees were describing to me. After each interview, I wrote a one- to two-page summary of the major themes of the interview, along with quotes and paraphrased remarks to support those themes. I also wrote short statements about my ideas and theories regarding what the participants said. This method is called memoing by Glaser and Strauss (1967), Hatch (2002), and other researchers.

I also borrowed a method typically associated with grounded theory, that of a constant comparison approach to data analysis. At first I compared different statements by the same participant within an interview to identify major themes stressed by the interviewee. After I had conducted the first two interviews, I began to compare emerging themes not only within an interview, but to other interviews as well, sometimes referring to other interviews in my memos. This helped me to identify patterns and themes early on so I could test these ideas in subsequent interviews. When doing this, I would watch for any statements by participants that might support or reject one of the themes or patterns I
had previously identified, and if not explicitly mentioned, I would sometimes introduce the idea into the interview to see if it applied to the participant’s experience. For example, I started realizing that there were patterns in how students performed their group work, so in later interviews, if the participant did not mention working with a group, I would ask whether they had done so, how that group had functioned, what their personal role was in the group, etc. This allowed me to solidify themes that may have been present in a participant’s experience, but was not immediately recalled without prompting. However, I was careful to not induce answers that might be expected, and when I prompted participants, I did so with open-ended types of questions.

After I had conducted seven interviews, I read through the memos and notes that I had made and compared themes from one interview to another and made a list of the most salient themes best supported by the interviews (this analysis is included in Appendix B). I met with my committee chair, Graham, and explained the themes I had found, along with my justification for each theme and possible conclusions that could be drawn from the work done to that point. Graham queried me on my assumptions and conclusions and helped me to further my understanding. He also gave me suggestions for my remaining interviews and the development of my survey.

After meeting with Graham, I interviewed four more participants, looking more specifically for evidence for or against the patterns I had identified. I also continued to take notes and write memos after each interview. After concluding my interviews, I arranged to have transcripts made of the recordings, and I imported these into NVivo, a qualitative analysis tool. NVivo allows researchers to code vignettes in a transcript and assign the vignette to one or more categories, which represent patterns emerging in the
research. It also allows the researcher to aggregate the vignettes from many different transcripts and look for patterns across cases and time. With the assistance of this program, I went back through the transcripts with two purposes: first, to find evidence for and against the themes and patterns I had identified from my notes, and second, to be aware of any other themes I may have missed in my initial analysis. Thus, I used a mixture of inductive/deductive approaches to coding the data, highlighting key phrases to support ideas and writing short phrases to explain the general idea of each category or theme. After doing this, I considered the major patterns that seemed to be the most vital to the experiences of the students and tried to identify a core category (Strauss, 1987) that would summarize, link to, and include all of these other major themes. This method of identifying a core category, and the categories connected to this core category, is one method used by grounded theorists to develop theory.

The results of this analysis are included in Appendix C. In this and other instances where I performed some preliminary data analysis, I have elected to include these in the appendix so that the focus of the body of this thesis can be on my final conclusions, and not on my preliminary ideas. However, I didn’t want to eliminate these preliminary reflections completely from my thesis because I feel it is important to see how these earlier analyses were used to develop subsequent stages in the project (i.e. the interviews helped me construct the survey, which helped me conduct my final interviews). Hopefully by including these in the appendix, the reader can see how I compared and contrasted the data within each phase of the research, and then across all phases of the project, before arriving at my final conclusions.
Survey of former students. The purpose of the survey was to see if the themes and ideas discovered through the initial round of interviews would be supported by the population of former students of the course. I created the survey using Surveymonkey, an online survey construction, dissemination, and analysis tool used by the College of Education at Brigham Young University. Using this tool has advantages over paper-based survey research because it is easier to collect, store, and analyze the surveys. Most of the items and possible responses for the survey were created based on the themes identified from my analysis of the interviews. As much as possible, I used the same or similar wording as the interview participants to describe events, situations, feelings, and ideas so that they would be easily understandable. Some of the items and possible responses were created based on my experience as an IP&T 286 instructor and the feedback I have received from my students. Most of the questions were quantitative and included a mix of rating, ranking, and multiple-choice questions. There were also several open-ended questions. A copy of the survey is included in Appendix D. It was particularly challenging to try and create survey items that would provide meaningful and useful information, without leading the participants to choose any particular response, and while still keeping the survey simple enough to be understandable. In at least one question, this delicate balance was especially difficult, and several students complained that the question was difficult to understand. This question, number 21, was not used in my analysis.

After creating the survey, I tested the validity and usefulness of the survey in two ways. First, I asked Graham to look over the survey, assess the face validity of the instrument, and give me suggestions for improvement. Second, I emailed the survey to a
practice sample of about a dozen of my former students and teaching assistants for the course. I asked these students to take the survey and then email me any problems they encountered or suggestions for improvement. I incorporated their feedback, along with Graham’s feedback, into the final instrument, which was distributed by email to a potential population of 1,220 former students of the course. Many of these students have changed their email addresses, so the actual number of students who received the survey is not known. About 200 students at least attempted to take the survey. A few of these did not consent to participate in the research study, and a few more were accidentally emailed the survey despite being students from the current semester (fall of 2004). I decided that I would not include students from the Fall 2004 semester because we had temporarily decided not to do modeling sessions that semester while we struggled to redesign the one-credit version of the course. After filtering out those respondents who did not consent to be participants in the research study, along with those from the fall 2004 semester, there was a final response tally of 159 participants, 13% of the entire population. This was a disappointing response rate; however, it represented a good diversity of students from different majors, instructors, and course sections. Rather than include the descriptions of the patterns, themes, and interpretations that I made at this point, I have put this analysis in Appendix E and F.

*Analysis of survey data.* As I analyzed the survey results, I considered the data as a whole, rather than each individual survey item, as I attempted to determine which themes from the preliminary interviews were best supported by the survey results. Most of the quantitative data were reported as descriptive statistics, percentages, and averages and used to aid the holistic, qualitative analysis of all of the data.
The open-ended questions on the survey were extracted from Surveymonkey and imported as NVivo documents. In NVivo, I first analyzed the answers to each question individually. To do this, I read each response and attempted to summarize the feelings and opinions of the students in short, one- to three-word phrases. These phrases became the coding categories used to code the other responses to that question. I then looked at the coding categories and attempted to collapse similar categories together and extract the two or three most important ideas and themes from the data. This was done for each qualitative question on the survey, after which I compared themes and patterns between and across the different qualitative questions to the quantitative data to see if some overall patterns were evident and supported by the data.

After analyzing the survey data separately, I looked back through the themes identified in the interviews and in the survey results, and tried to reduce the data to a list of the most important, and best supported, patterns. I also reflected on possible implications of these results for the IP&T 286 course. This analysis is provided in Appendix F. I shared these ideas again with Graham, and considered with him which patterns I would investigate more deeply in the final round of interviews.

*Final interviews with former students.* For my final interviews, I did not follow up with my original sample of participants, but interviewed a new sample of former students. I considered interviewing the original sample of participants again, but I felt, intuitively, that not very many of them would want to be interviewed again because they were all busy students and I was not able to offer compensation for their time. One “favor” seemed appropriate, but two seemed to be a stretch. Instead, I included an item on the survey that requested permission to interview a new sample of students. It was still
difficult to solicit participation, and only 40 initially agreed to the second round of interviews. I emailed all of these requesting their participation, and 13 replied favorably to my email. Of these, I interviewed 10. I sensed some concern from these interviewees in regards to the time commitment required, and this prompted me to keep the interviews short (about 30 minutes) as I had done with the first interviews. However, these interviews were more focused than the first ones because I had already tried to understand broadly the students’ experiences with modeling sessions. In these interviews, I wanted more focused understanding about the issue of transfer that I had identified in the previous phases of research, and which I will explain about later in this thesis.

*Analysis of final interviews.* The interviews were again semi-structured in nature, but I created several prompts and possible questions to guide my inquiry, and these are included in Appendix G. These prompts were developed after discussion with Graham about my findings through the first two phases of this project. During our discussion, I related what I had learned, and he questioned my assumptions, pushed me to increase the trustworthiness of my findings, and helped me select the issues of the most practical significance. We then narrowed my conclusions down to a single issue (the idea of how to encourage students to increase how they transfer learning from one context to another) that we both felt had value not only to the teachers of IP&T 286 here at BYU, but to other instructors and researchers outside of our institution. I developed possible prompts to try and learn more about this issue, and approved these prompts with Graham.

Once again my interview style followed one of open-ended questioning first, followed by testing of growing theory through more specific and targeted questions near the end. I recorded the interviews, but did not have them transcribed. Rather, I wrote
careful memos after each interview of the thoughts I had as a researcher and of the themes I could identify from my handwritten notes. I used these memos to formulate my conclusions, and then went back through the recordings as needed to verify my notes and memos and to extract supporting evidence. This process of developing themes from memos, rather than transcriptions, is an accepted form of analysis for situations such as mine, when the researcher is in the final stage of research and quicker conclusions are needed and there is not enough time to wait for transcriptions (Hatch, 2002; Dick, 2002).

**Trustworthiness and Qualitative Standards**

Much has been written about the importance of a qualitative study to follow standards of rigor so that the conclusions of the research can be justified. However, applying the standards typically existing for positivistic research (such as reliability and validity) would not be useful for judging the quality of a more naturalistic research design. One difficulty in evaluating qualitative research is understanding that no two qualitative studies would ever be conducted in the same way. Amos Hatch (2002) wrote that there are nearly as many different ways to conduct qualitative research as there are qualitative researchers. There are also many different ways to evaluate qualitative studies. For example, a feminist researcher has very different standards for evaluating the quality of a research study than an anthropologist, although both may use qualitative methods. The main goal, however, remains the same: to establish the researcher as a trustworthy gatherer and analyzer of the data.

One of the most respected sets of standards designed to help a qualitative researcher establish trustworthiness is described by Lincoln and Guba (1985). These authors suggest four methods for establishing the trustworthiness of a qualitative study:
credibility, transferability, dependability, and confirmability. These have been the standards that I have used to guide my inquiry as I have attempted to carry out a rigorous and trustworthy study. I will describe each of these methods for establishing trustworthiness and give my evaluation of my performance in regard to each.

*Credibility.* Credibility methods help ensure that the research methods are more reliable by requiring that the sampling, collection, and analysis methods are appropriate for the purposes of the study. Credibility also implies that the conclusions drawn from the data can be justified as an accurate portrayal of the reality existing in the experiences of the participants. Lincoln and Guba (1985) suggest seven techniques for establishing the credibility of a study: (a) prolonged engagement, (b) persistent observation, (c) triangulation, (d) peer debriefing, (e) negative case analysis, (f) referential adequacy, and (g) member checking. I believe that describing Lincoln and Guba’s definitions for each of these processes is not necessary, and I instead refer the interested reader to their book, pages 301-316. In this section I will only discuss how I attempted to use these methods.

I attempted to establish credibility mainly through triangulation, using multiple data-gathering methods including multiple interviews, survey data, and personal observations of my own students which, while not directly recorded in this thesis, provided theoretical sensitivity (Strauss & Corbin, 1990) to my analysis. My thesis committee, especially Graham, acted as peer debriefers for this project, and I consulted with Graham before making major changes to methodology, interview protocols, or survey questions. In my audit trail, field notes, memos, and other writings, I described what patterns and themes I was identifying. This audit trail allowed me to conduct personal subjectivity checks. Because I have been immersed in the IP&T 286 culture for
a year and a half, I have had a sufficiently prolonged engagement and have been sufficiently persistent in my observations and interviews for the purpose of this study. Besides teaching IP&T 286, I have actively participated in many research studies investigating aspects of the IP&T 286 culture and context (see Graham, et. al., 2004; West & Graham, 2004a; West & Graham, 2004b; West, Graham, & Wright, 2005; and West, Wright & Graham, 2005).

As I reviewed the data to find evidence for patterns I had identified, I also looked for negative cases that could disprove my theories, and I adjusted my theories accordingly. For example, during my initial round of interviews, a couple of interviewees mentioned that it was difficult for them to learn integration principles in a modeling session because they were focused on learning the subject material needed to complete the activity. One time when this happened is when students needed to learn about the civil war in order complete the social studies modeling session. I continued my subsequent interviews with the theory that students couldn’t attend to learning both subject material and technology integration ideas. However, in subsequent interviews, other students said this was not a problem for them, so I rejected this theory in my final analysis.

I performed member checking with my interview participants during the interviews, checking my understandings of their experiences by restating what they had told me. When a section of an interview was included in my findings as data, I also emailed this section of the thesis to the participant to ask if I had interpreted their experience and position correctly. All of the participants responded that I had represented them accurately.
I declined to use Lincoln & Guba’s (1985) referential adequacy method of establishing credibility because it would require me to leave some data unanalyzed. Because of the small scope of this project, there did not seem to be enough data to warrant not analyzing all of it. However, enough care was taken to establish credibility through these other methods, and I believe this omission should not hurt the credibility of this study.

Transferability. Lincoln and Guba explained that the best way to increase the transferability of a body of research is through thick, rich description of the data and conclusions so that the readers can make a decision about whether their own contexts are similar enough to those described in the study. If the contexts are sufficiently similar, then the readers may transfer and apply the researcher’s conclusions to their own situation. To help other researchers and instructors make this transfer from the BYU context to their own, I have focused on providing rich and extensive details of the students, the instructors, and especially the methodology of the modeling sessions and the activities the students engage in. Drawing on my experience as an instructor, and using the interviews to provide the student point of view, I have also attempted to give a thorough description of the modeling experience as explained by the students, using many quotes from the interviews and open-ended survey questions.

Dependability. Lincoln & Guba (1985) admit that it is difficult to describe specific methods for establishing dependability that are different from those used to establish credibility, and Guba (1981) argued in an earlier publication that if the researcher can demonstrate credibility, then this is sufficient to also demonstrate the dependability of the methods. However, one method sometimes used to determine
dependability is to have an inquiry audit performed by an outside researcher. To allow for this possibility, I have maintained a research journal of some of my major thoughts regarding methods, actions, and decisions throughout the data collection and analysis process, as well as all the collected memos, coding structures, and files. This research journal is available to my thesis committee, and anyone who may be interested in it.

To allow the reader to perform a simplified inquiry audit of sorts, I have included in the appendixes, tables of the quantitative data and summaries of the themes generated from the qualitative data. I analyzed each phase of research independent of the other data, and methodically compared and contrasted what I learned in one phase to the other phases. This lengthy process seemed too drawn-out for the main findings and discussion section of this thesis, but if the reader will glance at the appropriate appendixes as I cite them, they will hopefully get a sense of how I arrived at my final conclusions. I could also include actual transcripts of the qualitative data and my accompanying memos in the appendix if it seemed that the benefit outweighed the cost and inconvenience to the reader of doing this, but it seems that records of my coding and theme summaries should be sufficient.

Confirmability. I attempted to establish confirmability by referencing any similar research studies in the literature and by confirming my insights and observations with other instructors of IP&T 286, particularly Graham, who has the most experience with the course. Lincoln & Guba (1985) also suggest using an inquiry audit to establish confirmability, but as outlined above, the budget and scope of this project did not seem to warrant a complete audit, and instead some of my analysis is presented in the appendix for the reader to perform an informal evaluation of my conclusions based on the data.
Course and Participant Background

History of the IP&T 286 course. This thesis is, in a way, the culmination of several years of effort to redesign the IP&T 286 course to better train preservice teachers to integrate technology in their teaching. To understand the context for this thesis, as well as the context for the participants, it will be useful to understand how the course has evolved over the last few years. Many of the ideas that follow are not my own, but largely are credited to Graham, who has supervised the teaching of the course since Fall 2002. Most of the ideas that follow are adapted from papers that I have written with Graham about the redesigning of the course (Graham, et. al. 2004; West & Graham, 2004a; and West & Graham, 2004b).

Brigham Young University hosts one of the largest teacher education programs in the United States, licensing over 1,000 teachers each year to teach in elementary and secondary schools. There are about two dozen different teaching emphases, and most of these students are required to take IP&T 286 or 287. Secondary education students take the course for one-credit (286), while elementary, special, and early childhood education students take it for two credits (287). However, before fall semester of 2004, there was only one course (286), which had one-credit sections and two-credit sections. This fact is important because secondary education majors, while not required to take the course for two credits, until Fall 2004, often did so. In this thesis, I usually refer only to IP&T 286 because the students I interviewed and surveyed took the course before it was split into two.

Before fall of 2004, the class had two purposes: first, to teach basic technology skills, and second, to teach students how to apply appropriate technology integration
principles to specific teaching situations (Graham, et. al., 2004). The assignments typically were project-based tasks situated in teaching scenarios, and they were often completed in groups. The majority of potential participants for my study were female students, and they represented every level of college experience, from freshman to senior. When conducting interviews, I sampled participants from the courses that I did not teach, but some of my former students did participate in the survey.

The instructors typically were members of the IP&T faculty, aided by graduate and undergraduate teaching assistants. Before Graham was given responsibility for the course, IP&T 286 had been taught in lecture format, with few opportunities to actually see technology modeled by a professor. As Graham and the other IP&T 286 instructors worked to redesign the structure of the course, three major barriers were found to impede the development of IP&T 286 towards the end goal of eventually eliminating the need to teach basic technology skills in favor of general, and widely applicable, technology integration principles. These barriers were: (a) the students entering the course had very different levels of experience with technology, requiring the teachers to either leave the unprepared students behind or bore the advanced students with the simplicity of the instruction. This problem was compounded by an absence of any kind of technology prerequisite, meaning that students could sign up for the class without any technical skills whatsoever; (b) The preservice faculty didn’t have the training to properly model technology integration in their own instruction; and (c) any changes to the curriculum was laborious and difficult, often taking a year or longer. More detailed discussion about these barriers is available in the Graham, et. al. (2004) article.
The subsequent redesigning of the course was divided into three phases by Graham. In the first phase, modeling sessions were added to the class to replace technology tutorials, and a greater emphasis was placed on project-based learning and collaborative work. In the second phase of the redesign, a technology prerequisite was added to the course and to the elementary education program that requires students to prove their ability to use basic technologies such as word processing, spreadsheets, presentation software, and the Internet. A collection of resources inside and outside of BYU to help those who cannot pass the prerequisite were also made available. I designed the first version of the online prerequisite assessment (West and Graham, 2004a), and the prerequisite has been in place since fall semester of 2004. This prerequisite will hopefully allow IP&T 286 to be focused solely on teaching technology integration principles, instead of specific technology skills (which the students must already have to pass the prerequisite). The final phase of course redesign is more of a vision that Graham has for the future, when the instruction of how to apply technology to teaching situations will be integrated into methods courses, and IP&T 286 may become more of a lab, or optional advanced course (Graham, et. al., 2004).

Description of the modeling sessions. The addition of modeling sessions was a major part of the redesign of the course to focus more on technology integration instruction. Until recently, the basic structure for our modeling sessions had been the same every semester and is divided into three stages (see Figure 2). I will attempt to illustrate each of these phases with a case vignette of one of the modeling sessions in detail. This description is based on my own experiences as a teacher in the course, as well as my observations of other instructors who teach the course.
In the first stage of the modeling sessions, there was an in-class activity where the instructor taught a sample lesson using technology, and the students worked on a project connected with the lesson. The instructor usually asked the students to suspend their disbelief for the duration of the class and to imagine they were observing the lesson through the eyes of K-12 student. The presentation or class activity was usually short, and often included a small tutorial on an aspect of a software program or other technology tool that students would need to be able to use to complete the project. There was usually a good portion of the class period left for the students to begin to work on their projects, while the teacher is available for assistance.

In order to help the reader understand the experience of participating in a modeling session, a case vignette of one possible modeling session is provided below. This vignette is drawn from my experience teaching the class, as well as from my interviews with students. The beginning portion of this case vignette describes the first stage of the modeling sessions.
The IP&T 286 instructor begins class by first giving the students the context for the modeling session. “Today,” she says, “We will be participating in a lesson geared towards younger students, although I’ll be also showing you some more advanced features in Microsoft PowerPoint that perhaps would not be necessary if you were in elementary school.” She then asks the class to get out of their desks and gather around her as she reads a giant copy of The Cat in the Hat by Dr. Seuss. After finishing the story, the instructor asks, “What is it about Dr. Seuss that we enjoy so much? Why do we like his stories?” The students begin giving answers such as, “the pictures,” “the funny names,” and “fun storylines.”

Finally someone comments that the rhymes, while unorthodox, are funny to read and hear spoken. “Yes,” the IP&T instructor says, “One of the greatest talents of Dr. Seuss is his ability to create rhymes. Today we’re going to practice making digital rhyming books in PowerPoint. First, however, you need to get in your groups and pick two or three main word stems, and using Inspiration, make concept maps of all the words you can think of that rhyme with your word stems. Then use your words to write a silly story.”

The second stage of the modeling session was for the students to work in groups to create a deliverable that demonstrates their understanding of the technology and the subject material. Some students worked individually and emailed the components to one team member, but they were encouraged to collaborate face to face. Continuing with the case vignette, following is a description of this stage of the modeling.
After the instructor finishes explaining the project to be completed, which will be a PowerPoint slideshow using narration and animation to illustrate their rhyming story, the students pull out the laptops and immediately cluster together to begin working out their stories. Later in the class period, the instructor stops the activity to give a five-minute tutorial on how to use the “record narration” and “add animation” features of PowerPoint, which they will need to know to complete the projects this week. A few hands fly up, asking for help, but most students pick up on these features relatively quickly because PowerPoint is not a new program for most of them. They finish by arranging to complete the group work during the week. While the instructors encourage the students to collaborate and work together in the computer lab on their projects, some will choose to do the work individually and get together to only put on the finishing touches before handing in their project.

The final stage of the modeling sessions was to help students reflect and make the connection between the environment of the IP&T 286 course and their future teaching contexts. For example, in the digital storytelling modeling session being described, students planning to teach high school science might have struggled to understand how the modeling activity was useful. There are many principles of effective technology integration that apply to most, if not all, teaching contexts, such as allowing the students to use the technology themselves, using the technology to support active learning, etc.; but students often needed help in extracting these principles from the specific context of a modeling activity. We have tried many different methods for encouraging the students to reflect on the modeling sessions, including the use of asynchronous online discussions,
written reflection papers, in-class discussions, and blogs (West, Wright, & Graham, 2005). The digital storytelling modeling session described here was only one of six modeling sessions used in IP&T 286. All of the modeling sessions are detailed briefly in Table 1.

Table 1

*Table 1*

*A Description of Six Different Modeling Sessions Used in IP&T 286.*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Subject</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd</td>
<td>Math/Social</td>
<td>Students collect survey data about the demographical Science makeup of the class and create charts in Excel</td>
</tr>
<tr>
<td></td>
<td>Science</td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>Science/Math</td>
<td>Students conduct an experiment by measuring the distance balloon rockets travel when inflated to a variety of sizes</td>
</tr>
<tr>
<td>4th</td>
<td>Science</td>
<td>Students take pictures of trees and identify them using the Internet</td>
</tr>
<tr>
<td>K/1st</td>
<td>Math</td>
<td>Students take pictures of shapes in everyday surroundings and use drawing tools to identify the shapes in the pictures</td>
</tr>
<tr>
<td>5th</td>
<td>Social Science</td>
<td>Students research the civil rights era on the Internet and create a documentary in iMovie</td>
</tr>
<tr>
<td>3rd</td>
<td>Language Arts</td>
<td>Students think of rhymes using Inspiration (concept-mapping software) and then create a digital storybook with their rhymes and clipart using PowerPoint.</td>
</tr>
</tbody>
</table>
Role of the Researcher in the Study

In qualitative studies, the role of the researcher is critical, and he/she becomes the main instrument through which all of the data is viewed and interpreted. Because of this, it is important to understand the background, assumptions, and values of the researcher. To help the reader understand who I am as a participant in the IP&T 286 context, as well as who I am as a researcher, I have included a description of my background in the course, as well as my personal reflections on what I was trying to learn in this study. These descriptions are included in Appendix H, instead of at this point in the body of the thesis, so that the main flow of the reading is not too disrupted.
CHAPTER 4
FINDINGS AND DISCUSSION

My focus as I analyzed the data was to look for themes that might indicate predictable patterns in the students’ experiences. This was important to me because, as a teacher, I was anxious to see what I, or other IP&T 286 teachers, could do to improve the instruction in the course, including the instruction connected with modeling sessions. I quickly learned that finding patterns that might be representative of the variety of student experiences would be difficult. Each interview and survey respondent had a unique perspective on the course. Some found the modeling sessions to be very useful, while others felt they were a waste of time, often for the same reasons.

For example, the modeling sessions required students to work in groups to complete projects. For some students, this was a very helpful aspect of the activity, and one student commented that

I think working in groups was the best thing for these modeling sessions for the reasons that the work was able to be equally divided, and if we ran into trouble there were more hands and minds to help fix the problem(s).

For other students, however, it seemed to be one of their least favorite elements, as this student explained: “Working in groups doing various assignments was sometimes a detriment because those who knew the technology better would take over, leaving others to just look and try to figure it out on their own at a later time.” Of course, these two comments probably indicate different group dynamics not necessarily under the control of the instructor, but they represent how different students could have very different opinions about the same aspects of the modeling sessions.
However, despite the uniqueness of each student’s experience and perspective, several themes seemed to persist across the different contexts of the students. I used these more prevalent patterns to answer the research questions for this project. In this section of my thesis, I will first present two case studies, one from a student who had a positive experience with modeling, and one who had a less positive experience. I feel these two case studies are indicative of some of the more common aspects of most of the students’ experiences. I will then blend my findings for my second and third research questions, and will spend the rest of this section of my thesis discussing how the modeling impacted the students’ experiences both positively and negatively. I will support my findings using quotes from students whom, when represented by pseudonyms, I have interviewed. I represent students with pseudonyms only if I interviewed them directly, not if my only contact with them was through a question on the survey.

The Students’ Experiences: Two Case Studies

Case study 1: A student with a negative modeling experience. Russ is currently teaching special education in Kansas, and took IP&T 286 the winter semester before he began teaching. He took the course for one credit, because he was majoring in high school social studies, and that was the subject he was originally hired to teach. Russ entered the course with a lot of technical skills, having worked in computer support in college. Because of this, he said that

Pretty much the only program that was new to me was where you can brainstorm and map things out and it gives you the different ideas, you have a central idea and then ideas out to the side. That was pretty much the only new program that I learned.
In this quote, Russ is referring to the program Inspiration. When I tried to restate what I thought he was telling me, I asked him if he thought learning this program was the most useful aspect of the course. He grew exasperated and said, “No, I’ll never use that program. I’m saying the class was so basic that it was a complete review. For me, it was below review.” He repeated this thought several times, that the class was “basic” and that there should be an advanced class for students like himself who could then be taught more advanced technologies. He explained that

There should maybe be an option of an advanced class because I would have been willing to take an advanced class for the same credit and have learned something. I know that there were a lot of people in my class in the same situation, but there were also the people that needed to learn those things. I would have liked to have a different advanced section.

To follow up on this idea, Russ then said that “I wasn’t really learning anything, I was just doing things for a grade.”

Russ was frustrated to learn, after he graduated, that there was not as much technology available to him as IP&T made it seem that there would be. He reflected that I thought that 286 taught the ideal, but I found, like what I said, once I got here there were things that weren’t available to me. Ideally, I think that you’d take that class and have all these good ideas but in reality all those things aren’t available to everybody. So, I learned a lot of good things and I had a lot of these good ideas, but … the first day of class, I asked my teacher if I could do PowerPoint presentations and it wasn’t even an option.
Russ then talked about being transferred to a new school, where the opposite is true, and teachers are issued their own laptops. In this new scenario, Russ plans to use technology more:

I envision using PowerPoint presentations or having my students do research on the internet and then doing projects more to what we did in IP&T, where I give them an assignment and they have to do a PowerPoint presentation on something like a social studies topic or something of that nature.

Russ couldn’t remember very much about any actual modeling of teaching tactics done by his instructor. He could only remember working on the projects, and didn’t seem to remember other aspects of the modeling. For example, he said,

I just remember that’s where we worked as a group and we had our project to work on and each group did their own little thing and we worked together as a group to get our information and stuff and we just worked on those things.

Russ’ modeling experience didn’t seem to really be much of a model. When I pressed him on this, and asked if his instructor modeled, or demonstrated anything, he only remembered that his instructor gave tutorials on the technology:

He went through and demoed how we were supposed to do it and we had it upstairs in that room. We all had laptops and he showed us how we should do it and he went through and we had the chance to do it ourselves and he came around and if we had any questions he helped us out. In that sense it was really good.

Russ later said that the class focused on subjects and contexts that weren’t helpful to him as a high school social studies teacher. He explained that “the things we did … were so focused, like either a biology teacher or a science teacher or a history teacher and
so some of the lessons had nothing to do with social studies.” Russ noticed that others in the class probably had trouble with this as well, explaining that there were elementary education majors in there who probably didn’t find the activities useful because they were geared towards high school-aged students. He concluded that the modeling sessions were usually not useful for him because, “I was studying to be a history teacher, and it was a science or a physics activity.” In fact, Russ would have preferred to have seen modeling sessions for elementary students if they had been about social studies—for him it was especially difficult when the modeling was for a different subject than his own. He wished the class had been organized to allow more flexibility for students from different teaching emphases:

I think what would be useful is where I create an activity that I would use in my class. So, somebody that was a science teacher would create a science activity and for me I would create a social studies activity. Completing the assignment but it was applicable to our content area.

*Case study 2: A student with a positive modeling experience.* Natalie plans to teach elementary school and took IP&T 286 for two credits. Unlike many of her peers, she entered the course already knowing how to use many different technologies, and she was the most expert technology user in her group. However, she felt that the class in general, and the modeling sessions in particular, were still valuable to her because they helped her to learn application ideas—ways to use the technologies in schools. She said this was her instructor’s focus:

I think that’s what one of the biggest focuses of the class was. It was not . . . and that’s what (my instructor) said at the very beginning. It is to teach us how to use
the programs, but more importantly it’s to teach us how to incorporate them into the classroom setting. I think by giving us the scenarios, it gave us some examples so we could identify situations where those programs would be useful to the students in our own class.

Because Natalie enjoyed using technology, she grew very excited to learn new ways of incorporating technology into her future teaching. She learned ideas she hadn’t considered before, and it helped her to better understand technology’s potential for education. She said that learning “scenarios” or examples when technology could be used was a helpful way to visualize the possibilities. “It was helpful because there’s a lot of different ways to use each different program,” she said. “… I do think the scenarios were important because different scenarios would use the program in different ways.”

Natalie said that her instructor chose to use very little demonstration or lecture during class, electing instead to give the students an opportunity to explore the new technologies and work on their projects. In this way, they were able to receive help when they needed it, yet they were more motivated to work because they were completing a “hands-on” project. “I think the, obviously, the hands-on things for me were most helpful—when we had to do the projects on our own. He would show us a demonstration how to do it and we would have to do it on our own,” she said. “… It was through the whole trial and error that I think I learned the most personally.”

During the modeling sessions, Natalie’s instructor told them to consider the subject material, explained what tools they had available to them as teachers, and asked them to explore possible ways of using the technologies to teach the subject. They then worked to complete one of these ideas. One example that Natalie remembered was going
outside to take pictures of trees, and then using the internet to learn more about the trees. During these modeling sessions, Natalie said she was able to not only consider the activity from the students’ perspective, but also from the teacher’s perspective. For example, it helped her to understand how active learning motivates students:

I thought, “this would be a really good way to get the kids excited about trees” or whatever we had been learning about by giving them an opportunity to use their own creativity in taking what they had learned in class . . . and applying that. . . . Even though, as college students, we know about all the different kinds of trees, still it kind of gave me that experience. If I were in elementary school and a third grader, this would be something that I would be really excited about, and it would really help me to want to learn about whatever the teacher was presenting.

Later, Natalie explained that she also learned ideas about the teacher’s perspective of teaching a technology-infused lesson. She said she learned the importance of giving students freedom to explore and create:

That’s one moment in that class where I realized as a teacher I shouldn’t just be feeding my students the information that they need. I should provide them opportunities to find it out on their own through using the internet or books or things of that sort or just simply observations.

Because the members of Natalie’s group lived in different cities, they would finish up their group projects by emailing Natalie their portions of the project, and she would put on the finishing touches and post the homework to Blackboard. However, she said they usually had enough time in class to complete most of the projects, which was helpful because her instructor, the TA, and other students were there to help students who
struggled. After all of the groups had turned in their projects, her instructor showed the finished projects, which helped Natalie see new ways and perspectives for completing the same assignment. She remarked that

Watching those presentations . . . was really interesting because everyone took a different view on it, but had the same results, and I thought that was kind of an interesting idea because we were able to see that there are lots of ways to teach something.

Overall, Natalie struggled to find any aspect of the course that she would have changed. Despite already knowing most of the technologies taught in the course, she felt she had learned many new things that would help her as a teacher, mostly ideas for how to apply technologies in different situations. “That was an opportunity for us to step into the teacher’s chair and say, okay, I’m the teacher now. Here’s what I’m going to do,” she said. “That was an opportunity for us to . . . see different ways where we could incorporate technology in the classroom.”

_Modeling’s Potential for Teaching Technology Skills_

At first, as I analyzed the interviews that I had with students such as Natalie and Russ, I tried not to be too limiting as I looked for themes and patterns, and I included any category of data supported by at least two or three students. This created lengthy lists of categories that I felt could be explored more in-depth (see Appendixes B, C, and F). I performed this initial analysis and theme identification after the first two phases of the research (initial interviews and survey).

From this long list of themes, thoughts, and ideas, I decided to narrow my study to look specifically at those themes that related to the two main goals of the course, which
were to first, teach technology skills, and second, teach technology integration principles, adaptable to multiple contexts and technologies (Graham, et. al., 2004). Because I was trying to identify strategies that could guide successful use of the modeling methods, I felt it would make the most sense to look at the data in terms of these two course goals that were the impetus for creating the modeling sessions. However more analysis and reflection were focused on the second of the two goals because the course is moving towards de-emphasizing technology skill instruction and emphasizing instead the understanding of basic technology integration principles.

Modeling sessions, for the most part, seemed to be useful in helping the students to acquire new technology skills they didn’t have before. The general population of students taking the course tend to have limited experience with technology besides basic use of the Internet, word processing, and sometimes presentation software. In a study conducted winter semester of 2002, Dr. Paul Merrill of BYU’s IP&T department found that students entered the course with no proficiency or limited proficiency in 10 of the 16 technology skills listed in the survey (Merrill, 2003). A critique of this study might be that some of the technology skills listed are unreasonable for education majors (such as computer programming); however, Merrill’s basic conclusion that education majors do not have, in general, basic proficiency in many technologies has been corroborated by regular pre-course surveys conducted by teachers in the course.

Modeling appeared to have three affordances that helped students learn technology: (a) it allowed the students to learn hands-on, by trial and error, (b) there was in-class help as students began to learn the technology, and (c) the learning was contextualized in a teaching scenario.
Learning “hands-on.” The most important affordance, by far, was that the modeling sessions allowed the students to learn technology skills by actually working with the tools. Eighty-four percent of the students agreed that modeling was enjoyable when they were working with the tools “hands-on” (see Table 2), and learning a technology through hands-on projects was the answer students rated most representative of their modeling experience (see Table 3). Some students felt that they had never had the opportunity to really use technology tools before. For example, one student wrote that “hands-on work with technology taught me the most because I hadn't done a lot of that before the class.” Another student commented, “Having us actually do the technology was helpful for us to solidify what we learned in class.” A third felt that this participatory style of learning was especially important for kinesthetic or visual learners:

I think I like the fact that it was hands on. I’m a very visual learner and I retain more when I can actually do the activity. . . . And I think frequently with technology you have to jump in and actually do it, so you notice, okay, there’s a glitch here or here’s a problem I ran into, how do I work around it?
Table 2

(Survey Question #10). Please rate each of these answers according to HOW WELL the statement described your experience during the IN-CLASS presentation of the modeling session by your instructor and the IN-CLASS group work.

<table>
<thead>
<tr>
<th>Statement</th>
<th>CA</th>
<th>GA</th>
<th>GD</th>
<th>CD</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I enjoyed it because I was doing something hands-on</td>
<td>34%</td>
<td>50%</td>
<td>13%</td>
<td>4%</td>
<td>1.87</td>
</tr>
<tr>
<td>During the activity, I started thinking how I could change this lesson so</td>
<td>20%</td>
<td>51%</td>
<td>22%</td>
<td>8%</td>
<td>2.17</td>
</tr>
<tr>
<td>it could work in my own teaching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I struggled because there were too many students with questions and</td>
<td>16%</td>
<td>23%</td>
<td>44%</td>
<td>17%</td>
<td>2.61</td>
</tr>
<tr>
<td>not enough teachers/TAs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I struggled to focus on both the subject matter and the technology</td>
<td>4%</td>
<td>24%</td>
<td>53%</td>
<td>19%</td>
<td>2.87</td>
</tr>
<tr>
<td>I felt the activity was forced and artificial</td>
<td>9%</td>
<td>26%</td>
<td>53%</td>
<td>12%</td>
<td>2.68</td>
</tr>
<tr>
<td>I felt the activity was fun and useful</td>
<td>18%</td>
<td>55%</td>
<td>21%</td>
<td>5%</td>
<td>2.14</td>
</tr>
</tbody>
</table>

Note: CA = Completely Agree, GA = Generally Agree, GD = Generally Disagree, CD = Completely Disagree, RA = Response Average.
Table 3

(Survey Question #24). Please rank how well each answer represented your experience in the modeling sessions. Rank these items from MOST representative of your experience to LEAST representative. (1 represents MOST and 7 represents LEAST). Please remember you are RANKING these items so only one answer can be put as #1, only one can be put as #2, etc. The computer will not let you rank two answers the same.

| Description                                                                                                                                  | Rank 1 | Rank 2 | Rank 3 | Rank 4 | Rank 5 | Rank 6 | Rank 7 | RA   |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------|--------|--------|--------|--------|--------|--------|------|------|
| Modeling sessions helped me brainstorm new ways of using technology in my teaching                                                         | 1 (26%) | 2 (15%) | 3 (22%) | 4 (13%) | 5 (9%) | 6 (8%) | 7 (7%) | 3.17 |
| Modeling sessions helped me learn a new technology in the context of a lesson plan                                                          | 1 (14%) | 2 (19%) | 3 (21%) | 4 (18%) | 5 (11%) | 6 (8%) | 7 (8%) | 3.51 |
| Modeling sessions helped me understand the students’ perspectives using technology                                                          | 1 (3%)  | 2 (6%)  | 3 (13%) | 4 (16%) | 5 (22%) | 6 (25%) | 7 (16%) | 4.84 |
| Modeling sessions helped me learn a technology through hands-on projects                                                                     | 1 (23%) | 2 (22%) | 3 (13%) | 4 (22%) | 5 (8%)  | 6 (6%)  | 7 (6%)  | 3.15 |
| Modeling sessions helped me want to use technology in my own teaching                                                                       | 1 (17%) | 2 (21%) | 3 (15%) | 4 (13%) | 5 (18%) | 6 (12%) | 7 (5%)  | 3.47 |
| Modeling sessions helped me understand how using technology in schools really works                                                           | 1 (6%)  | 2 (12%) | 3 (10%) | 4 (13%) | 5 (20%) | 6 (25%) | 7 (14%) | 4.58 |
| Modeling sessions helped me see how students react to using technology                                                                     | 1 (8%)  | 2 (5%)  | 3 (5%)  | 4 (6%)  | 5 (14%) | 6 (17%) | 7 (44%) | 5.40 |

Note: ED = Extremely difficult.
Students also said that the most useful aspect of the out-of-class portion of the activity was learning new technologies (Table 4). The survey item in Table 4 doesn’t specify why they felt the modeling was useful for learning new technologies, but the open-ended questions on the survey indicated that it was because the students were able to experiment with the technologies and participate in applying the tools. For example, one student commented that

I liked the out-of-class work because it gave me an opportunity to apply the ways I could use technology in my teaching in my group. This way I was able to see if I could really do it.

This student indicated that the hands-on aspect of the modeling sessions not only helped students learn new technology skills, but also helped them gain confidence. Another student said something similar on the survey: “When I was done with that class, I felt that I had learned so much, I felt very familiar with all the programs we used, and I was no longer intimidated by the advanced technology—as I was before.” The majority of survey respondents (92.5%) agreed by indicating that they felt more confident using technology in their own teaching after the modeling sessions (see Table 5).

One student, Nellene, especially found the hands-on aspects of the course helpful, but in an interview she seemed to indicate that these positive benefits were not unique to modeling sessions, but were affordances of any project-based learning activity. When asked what activities in the course were most helpful, Nellene responded, “I think . . . the hands-on things for me were most helpful—when we had to do the projects on our own.” She talked frequently about how it was effective when her instructor presented scenarios where a technology might be useful, and then gave the students projects to work on.
Table 4

(Survey Question #13). This question is to help us understand your feelings about the OUT-OF-CLASS work associated with the modeling sessions. For each answer, please rate HOW WELL the statement described your experience with the modeling session homework.

<table>
<thead>
<tr>
<th>Statement</th>
<th>CA</th>
<th>GA</th>
<th>GD</th>
<th>CD</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was frustrating because we had problems with the technology</td>
<td>17%</td>
<td>26%</td>
<td>18%</td>
<td>39%</td>
<td>2.79</td>
</tr>
<tr>
<td>It was frustrating because it felt like busy work</td>
<td>19%</td>
<td>33%</td>
<td>19%</td>
<td>29%</td>
<td>2.59</td>
</tr>
<tr>
<td>It was frustrating at first, but then it felt good to have a completed project</td>
<td>16%</td>
<td>53%</td>
<td>11%</td>
<td>21%</td>
<td>2.37</td>
</tr>
<tr>
<td>It was fun because the projects were enjoyable</td>
<td>13%</td>
<td>47%</td>
<td>19%</td>
<td>21%</td>
<td>2.49</td>
</tr>
<tr>
<td>It was useful because it applied to my future teaching</td>
<td>20%</td>
<td>50%</td>
<td>13%</td>
<td>17%</td>
<td>2.28</td>
</tr>
<tr>
<td>It was useful because I learned a new technology</td>
<td>30%</td>
<td>43%</td>
<td>10%</td>
<td>17%</td>
<td>2.15</td>
</tr>
</tbody>
</table>

Note: CA = Completely Agree, GA = Generally Agree, GD = Generally Disagree, CD = Completely Disagree, RA = Response Average.
Table 5

(Survey Question #19). After most of the modeling lesson activities, I felt:

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very confident in my ability to use technology as a teacher</td>
<td>26.7%</td>
</tr>
<tr>
<td>Somewhat more confident in my ability to use technology as a teacher</td>
<td>61.7%</td>
</tr>
<tr>
<td>Somewhat less confident in my ability to use technology as a teacher</td>
<td>5.0%</td>
</tr>
<tr>
<td>Not confident at all in my ability to use technology as a teacher</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

Nellene’s favorite activity or the one that she felt was most helpful, was learning to make a webpage because she already knew many of the technologies used in the modeling sessions.

The other things we learned about, like PowerPoint and Excel and things like that, I was already familiar with. I did learn more about them, but I was already kind of familiar with them. With the website, I had never done that before and I learned a lot with that.

She especially thought it was valuable to learn by struggling with the new technology. “I learned the most when I was making my own website and came across all these problems and on my own, and then I was able to ask him about it and he explained it.” She went on to comment that “it was through the whole trial and error that I think I learned the most personally.”

Nellene didn’t realize that the website activity was not actually a modeling session. Even after I prompted about modeling sessions and described them, Nellene continued to talk about the website activity as if it was a modeling session, and would
refer to modeling sessions and the website activity together in giving her answers. To her, it seemed that the key aspect of the modeling sessions was the hands-on, project-based activities. Because the website was also a project-based activity, where students were required to construct their own websites, she felt it was at least as valuable as the modeling sessions. In fact, she felt it was more valuable because it taught her a new technology she didn’t know before. Other students, especially in the broader, initial interviews, followed this same pattern of finding little or no difference between modeling sessions and other project-based activities, which may indicate that the biggest value in the modeling session—for the purpose of teaching a new technology—is not in the presentation of a lesson but in the activity that students engage in.

_In-class teacher assistance._ Nellene also introduced an idea that was important to many of her peers when she mentioned that it was important to be able to struggle on her own, but then to receive help from her professor when she needed it. Many students felt the structure of the class, which usually left time in class for students to begin working while the teacher was still present, was useful, and they wished there had been more opportunities for teacher assistance. Most students didn’t mind working on their own, and even struggling to learn a tool, as long as the struggle wasn’t excessive before help was available. Nellene’s experience was effective in this way because of the help her professor and TA gave:

> He provided plenty of time to complete most of the homework in class, which was beneficial for those who didn’t quite understand the programs. He would be right there. Our TA would be right there. The other students would be there to help anyone who didn’t understand.
However, other students said they needed more help than was given. For example, one student said that the only thing that would have worked (better), is that she would go through it and we had the classroom, seriously all of these computers were full, and she only had one TA, so if you weren’t understanding something she would come by and try to help you but she couldn’t spend that much time. Her modeling was fine; she went through step by step and explained everything excellently. I mean, she did great, there was just too many people in the class for her to help everybody at once.

Another student commented that “It really helped me to learn the technology better especially with a professor and TA on hand to help with any questions I came [up] with throughout the activity.”

Some of the strongest suggestions made by students for improving the modeling sessions were to improve the teacher and TA “help” while they worked on projects. When asked to rate how important different suggestions were for improving the course, students felt the most important improvement would be to have more time in class for technology help, while the fifth-rated suggestion (there were 17 possible options for this test item) was to have times during the week when teachers and TAs could provide assistance. The sixth-rated suggestion also concerned this topic, and it was to have a better TA-to-student ratio to provide help. These answers not only give the suggestion for improving the modeling through more help, but indicate that the current structure of hands-on work supported by TA/teacher assistance is useful when there is enough of the help to go around (Table 6).
Table 6.

*(Survey question #26). Please rate each of these options according to HOW IMPORTANT they could be for improving the modeling sessions.*

<table>
<thead>
<tr>
<th>Option</th>
<th>VI</th>
<th>SI</th>
<th>NVI</th>
<th>NI</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have more time in class for helping us learn technology</td>
<td>34%</td>
<td>50%</td>
<td>13%</td>
<td>4%</td>
<td>1.87</td>
</tr>
<tr>
<td>Have better trained lab assistants/TAs who can help us during the week</td>
<td>38%</td>
<td>27%</td>
<td>30%</td>
<td>4%</td>
<td>2.01</td>
</tr>
<tr>
<td>Have smaller class sizes or more TAs to help us during class</td>
<td>42%</td>
<td>28%</td>
<td>25%</td>
<td>5%</td>
<td>1.94</td>
</tr>
<tr>
<td>Meet twice a week for an hour instead of once a week for two hours</td>
<td>11%</td>
<td>25%</td>
<td>36%</td>
<td>28%</td>
<td>2.82</td>
</tr>
<tr>
<td>Put us in groups where there is someone who knows the technology</td>
<td>20%</td>
<td>47%</td>
<td>25%</td>
<td>7%</td>
<td>2.20</td>
</tr>
<tr>
<td>Have more individual accountability in the group work so lazy students don’t get the same credit as industrious students</td>
<td>35%</td>
<td>38%</td>
<td>18%</td>
<td>9%</td>
<td>2.01</td>
</tr>
<tr>
<td>Have more reflection/discussion activities</td>
<td>5%</td>
<td>10%</td>
<td>47%</td>
<td>38%</td>
<td>3.18</td>
</tr>
<tr>
<td>Have less focus on specific, minute details that need to be accomplished to get a good grade</td>
<td>25%</td>
<td>40%</td>
<td>26%</td>
<td>10%</td>
<td>2.20</td>
</tr>
<tr>
<td>Use a wider variety of technologies in the modeling sessions</td>
<td>28%</td>
<td>45%</td>
<td>21%</td>
<td>6%</td>
<td>2.06</td>
</tr>
<tr>
<td>Connect the modeling activities more closely with methods classes in my major</td>
<td>45%</td>
<td>34%</td>
<td>17%</td>
<td>4%</td>
<td>1.81</td>
</tr>
<tr>
<td>Have times during the week when teacher/teaching assistants could provide assistance</td>
<td>37%</td>
<td>40%</td>
<td>23%</td>
<td>0%</td>
<td>1.87</td>
</tr>
</tbody>
</table>

*(Table 6 continues)*
Table 6 continued.

(Survey question #26). Please rate each of these options according to HOW IMPORTANT they could be for improving the modeling sessions.

<table>
<thead>
<tr>
<th>Option</th>
<th>VI</th>
<th>SI</th>
<th>NVI</th>
<th>NI</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teach more challenging technologies</td>
<td>16%</td>
<td>38%</td>
<td>29%</td>
<td>16%</td>
<td>2.46</td>
</tr>
<tr>
<td>Switch up the groups after each activity</td>
<td>12%</td>
<td>18%</td>
<td>31%</td>
<td>39%</td>
<td>2.98</td>
</tr>
<tr>
<td>Take less time in class on subject material and more time working on the projects</td>
<td>32%</td>
<td>41%</td>
<td>21%</td>
<td>5%</td>
<td>2.00</td>
</tr>
<tr>
<td>While we are in class, explain better the skills needed for each assignment</td>
<td>42%</td>
<td>36%</td>
<td>17%</td>
<td>5%</td>
<td>1.86</td>
</tr>
<tr>
<td>Give a general purpose for each activity and allow students to be creative in finding ways to complete the activity (i.e. don’t require everyone to do exactly the same thing)</td>
<td>42%</td>
<td>36%</td>
<td>19%</td>
<td>3%</td>
<td>1.83</td>
</tr>
<tr>
<td>Do less modeling sessions and more activities where we see videos of teachers using technology</td>
<td>4%</td>
<td>16%</td>
<td>38%</td>
<td>42%</td>
<td>3.17</td>
</tr>
</tbody>
</table>

Note: VI = Very important, SI = Somewhat important, NVI = Not very important, NI = Not at all important, RA = Response average.

Learning technology skills in context. Many students also indicated that it was useful to learn a new technology, not in a workshop or tutorial setting, but in the context of a K-12 learning activity. This supported a major theoretical underpinning for the creation of the modeling sessions, which was that the learning would be more useful if it was contextualized. Nellene said this was an important aspect of the course activities, and discussed how her professor gave examples of how technologies could be used in teaching situations. She said a variety of scenarios were helpful, “I do think the scenarios
were important because different scenarios would use the program in different ways.”

Another student commented that

I think I like modeling, I’m not sure if I can see a better way to do that because
the same time you are modeling you are learning the technology. You get an idea
for how to use it, they give you a sample lesson plan for using that technology,
integrating it into your lesson

In a different interview, a student said that

the pseudo lesson (her term for modeling sessions) is really important because
you learn how to do the technology while you’re doing the lesson. I think that
that’s one of the ways that they have to help us learn how to use it.

However, some students did not share these feelings, not because they felt it wasn’t
useful to learn a technology in context, but because the context of the modeling sessions
didn’t match their own contexts, but I will discuss this more in the next section of this
thesis.

The major criticism of the modeling experience, as far as how useful it was for
teaching technology skills, is that some students felt they were not taught the right skills.
In other words, they felt the modeling sessions taught technologies they already knew,
and they wanted to be able to learn more “advanced” technologies. This is not really a
criticism of the activity’s ability to teach skills effectively, but rather an opinion about
what technologies the modeling activities should emphasize. The students who felt this
way were usually more advanced, technologically, and felt the course emphasized
gaining skills they already had. One of them explained that “I thought they (modeling
session) were probably unnecessary because they were very simplistic, but then again
that might be just because I was more familiar with the programs.” In particular students wanted to spend less time learning PowerPoint. As one student explained:

I think PowerPoint was a little overused. Every project had an accompanying PowerPoint, which to be fair, was one of the only ways he had to assess if we had everything done. So I understand it in that light. But I was a little PowerPoint-ed out.

*Modeling’s Potential for Teaching the Integration of Technology in Education*

In contrast to the teaching of technology skills, which most students seemed to think the modeling sessions were well-suited to do, there was somewhat greater disparity in their perceptions of the effectiveness of modeling for teaching technology integration principles. Most students, especially elementary education majors, felt the modeling was very helpful in showing how technology can be used effectively as a teacher. For example, one student, Ann, said she already had learned most of the needed technology skills before the class, but she still felt the modeling was helpful because it helped her see the application of technology in schools, “I had already known how to do just about everything else in the class to that point, but I was able to learn how to utilize that in lessons in a teaching atmosphere.” Nellene felt the same way and said:

I kind of already knew how to do PowerPoint but what it did for me was helped me to discover different ways of incorporating PowerPoint into a lesson plan. I think that’s what one of the biggest focuses of the class was. . . . And that’s what (my instructor) said at the very beginning. It is to teach us how to use the programs but more importantly it’s to teach us how to incorporate them into the classroom setting. I think by giving us the scenarios, it gave us some examples so
we could identify situations where those programs would be useful to the students in our own class.

Breanne said that the instruction on technology integration was helpful: “the benefit for me is that I saw the application to a lesson,” while Kirsten added that

I think the main idea that I got from the class was that technology is not just this thing, oh, let’s go learn technology. It’s something that can be integrated into the rest of the curriculum. You can teach computers while you’re teaching English, while you’re teaching math.

Students also indicated on the surveys that learning how to apply technology to their teaching careers was often a positive impact of the modeling. For example, 71% of the students agreed that during the modeling, they started thinking about how to apply the technology to their specific context (see Table 2, page 46), and 70% felt the modeling applied to their future careers (see Table 4, page 48). Most of the former students said a lack of knowledge about how to apply technology to their teaching was one of the least challenging barriers to actually using technology, although this result cannot be directly linked to the modeling sessions alone (see Table 7). However, on another survey question, students ranked highly (rated 3.17 out of 7) the feeling that modeling helped them brainstorm new ways of using technology in teaching, and helped them want to use technology as teachers (rated 3.47 out of 7, see Table 8).
Table 7

(Survey question #22). This question is about why you do not use technology in your teaching when otherwise you would. Please RANK the following items according to how much of a challenge they present for you as you try to use technology. Rank these from 1 – MOST CHALLENGING to 4 – LEAST CHALLENGING. Please remember you are RANKING these items so only one answer can be put as #1, only one can be put as #2, etc. The computer will not let you rank two answers the same. If there is a major challenge to your using technology that is not here, please list it as “other.”

<table>
<thead>
<tr>
<th>Challenge</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Other</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I’m not sure how to use technology in my specific discipline</td>
<td>19%</td>
<td>13%</td>
<td>26%</td>
<td>35%</td>
<td>6%</td>
<td>2.82</td>
</tr>
<tr>
<td>I’m not sure how to use technology and handle class management issues</td>
<td>17%</td>
<td>26%</td>
<td>27%</td>
<td>22%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>There is a lack of technology at my school</td>
<td>43%</td>
<td>23%</td>
<td>12%</td>
<td>14%</td>
<td>9%</td>
<td>1.96</td>
</tr>
<tr>
<td>There is a lack of administrator/cooperating teacher support</td>
<td>9%</td>
<td>31%</td>
<td>28%</td>
<td>22%</td>
<td>9%</td>
<td>2.70</td>
</tr>
</tbody>
</table>

*Note: RA = Response average.*
Table 8

(Survey question #24). Please rank how well each answer represented your experience in the modeling sessions. Rank these items from MOST representative of your experience to LEAST representative. (1 represents MOST and 7 represents LEAST). Please remember you are RANKING these items so only one answer can be put as #1, only one can be put as #2, etc. The computer will not let you rank two answers the same.

<table>
<thead>
<tr>
<th>Modeling sessions</th>
<th>Rank</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling sessions helped me brainstorm new ways of using technology in my teaching</td>
<td>1 (26%)</td>
<td>2 (15%)</td>
</tr>
<tr>
<td>Modeling sessions helped me learn a new technology in the context of a lesson plan</td>
<td>1 (14%)</td>
<td>2 (19%)</td>
</tr>
<tr>
<td>Modeling sessions helped me understand the students’ perspectives using technology</td>
<td>1 (3%)</td>
<td>2 (6%)</td>
</tr>
<tr>
<td>Modeling sessions helped me learn a technology through hands-on projects</td>
<td>1 (23%)</td>
<td>2 (22%)</td>
</tr>
<tr>
<td>Modeling sessions helped me want to use technology in my own teaching</td>
<td>1 (17%)</td>
<td>2 (21%)</td>
</tr>
<tr>
<td>Modeling sessions helped me understand how using technology in schools really works</td>
<td>1 (6%)</td>
<td>2 (12%)</td>
</tr>
<tr>
<td>Modeling sessions helped me see how students react to using technology</td>
<td>1 (8%)</td>
<td>2 (5%)</td>
</tr>
</tbody>
</table>

Note: ED = Extremely difficult.

However, in contrast to these interviews and survey results, there was also evidence that modeling was not effective in helping some students understand how to integrate technology successfully as teachers. Some students felt the modeling showed inappropriate uses of technology, so the examples were poor ones that made it more difficult to understand how to integrate technology appropriately. For example, one student said that “we felt like we were forcing technology on projects that didn't require it and didn't really make it helpful. Do more realistic and applicable projects.” Another
suggested that “there were times that technology was thrown into a lesson plan, just for
the sake of using technology. Make it all relevant to the topic. Cut down on the details.  
Capitalize more on creativity!” Similarly, some students thought the teachers tried too
hard to use technology when it wasn’t useful, for example: “Sometimes I did feel like we
were trying too hard to use technology when it would be just as easy and effective
without it.”

Other students felt that IP&T 286 showed visionary applications of technology
that would not be practical in most school settings. For example, one student commented
that “I would have liked some ideas of how to implement some of the modeling sessions
when there may be a lack of technology at the school you may be at. I know many
students complained about this.” Another added that “some of the activities were a bit
complex for most public schools. I highly doubted that any school we went to would have
access to all the technologies we used.”

The problem of transfer. One student summarized the feelings of some who felt
the class was only useful if it taught new skills they didn’t know before. This student
commented that

Frankly, I thought that IP&T 286 was generally useless for me because I already
knew the technology, and any of the "new" stuff was very easy to pick up. It was
mostly busy work that had nothing to do with my subject matter.

Several students felt as this student did, which may indicate that they feel the only value
in the course is to learn new technology skills, and when these skills are already
possessed by the students, they struggled to see the usefulness of the course. This
prompts the question of why these students felt the only value was in learning skills, and not in learning integration, even though other students didn’t have this difficulty.

Similarly perplexing were those students who seemed to find no value in modeling sessions simply because they reflected teaching in a different context from their own. Because there are so many different teaching majors serviced by IP&T 286, it is impossible to have the course instructor model using technology in everybody’s unique teaching context. What the instructors hoped would happen, however, is that if a modeling session was presented in a context different from that of a particular student, that this student would be able to reflect and consider how the same technology and basic principles for integrating the technology could apply to the students’ future teaching as well. Basically, the instructors were depending on the students’ abilities to complete a cognitive transfer of the learning to their own contexts. Bransford, Brown, and Cocking helped establish the idea of transfer, which has been discussed long before, in their book, *How People Learn: Brain, Mind, Experience, and School* (1999). In this book, they paraphrase Byrnes’ (1996) definition of transfer: “the ability to extend what has been learned in one context to new contexts.” Essentially, this is what successful students in the course, who seemed to have the best learning experience engaging in the modeling sessions, were able to do—they were able to cognitively transfer the learning from the context of an IP&T 286 pseudo example, wrapped in the context of either math, science, social sciences, or language arts, to their own unique teaching context and situation.

In this, and other discussions of transfer issues, I refer to the transfer that instructors hoped would take place for students as a cognitive transfer. This is because transfer in the literature usually connotes that the students take the learning and apply it
through action to the new situation. Because many of the students that I interviewed and surveyed for this project were not yet teaching in the schools, I could not say if they had truly transferred the learning, because there was no action involved. However, it appeared that some students made this transfer from the modeled context to their own future teaching contexts in a cognitive, mental fashion, and that they believed they would be able to actually use technology as teachers. Because this type of transfer is different from the kinds of transfer usually talked about in the literature, I am referring to it as a cognitive transfer only.

The important question is why some students were able to perform this cognitive transfer, and why others could not, and what key improvements to the method of live modeling in IP&T 286 might improve the likelihood that students will be able to make this transfer. Bransford and colleagues felt that there were three key characteristics of transfer in educational settings:

1. Initial learning is necessary for transfer—a student must first learn something before that learning can be transferred to a new context

2. While it can be useful to contextualize learning, “knowledge that is overly contextualized can reduce transfer” (Bransford, et. al., 1999). These researchers felt it was important to teach concepts in the abstract so that they were not context-bound.

3. Transfer is an active, dynamic process instead of a passive “wrap-up” of a particular learning experience.

While this current project did not yield too much understanding about Bransford, Brown and Cocking’s first and third key characteristics of transfer, I did identify several patterns that may indicate how the IP&T 286 modeling sessions were not adequately
addressing their second point about overly contextualized learning. Many students felt that the modeling sessions were too context-specific, and they struggled to abstract the learning from that context to their own. A specific context for a modeling session was helpful, but only if the context was the same as the student’s. Otherwise, a contextualized modeling session was difficult to apply to the student’s own teaching careers. Another difficult factor was the context the students brought with them to the course of prior experiences with technology, technical abilities, experience with teaching methodology, etc. Sometimes the students’ existing ideological lens was very different from that of IP&T 286, or of the mindset that most educational technologists have for K-12 teachers, and this difference made cognitive transfer difficult as well.

Bransford and colleagues paraphrased Thorndike (1913), who felt that the degree of transfer between contexts depended upon the match between elements in the two contexts. It appears that when the students’ teaching context matched that of the modeled context, then cognitive transfer was easy for students. While there can be many possible breakdowns in the congruency of contexts, depending on the unique position of the preservice teacher, there seemed to be a few major patterns, or instances, when a breakdown in the similarity of contexts would occur. I called these patterns “contextual breakdowns”, and was able to identify five that seemed to be the most prevalent among students in the course, which were:

1. Subject or teaching emphasis
2. Intended age level
3. Teaching style
4. Student expectation and expected role in the course
5. Technology availability or perceived availability

From the data it seemed that if a student’s context and the context for the modeling session differed in only one or two of these areas, then the student could still think creatively and apply the learning to his/her future career. In a way, the context of the modeling session could be visualized as one side of a cliff, while the students’ own contexts were on a cliff on the other side of the valley (see Figure 3). Each of the contextual breakdowns could represent a pit, and each might be a different size for each student, depending on their own situation. If the students are only required to cognitively jump across one or two pits, they might still be able to make the cognitive leap. But each new contextual “pit” present would make cognitive transfer successively more difficult. How many pits could be “jumped,” and which breakdowns were most crucial, depended on each student, but in the interviews I could see where the leap was difficult when students would mention, for example, that modeling sessions for a different age level were not a problem, while different subjects were.

There also seemed to be a great difference in how well students could cognitively transfer the learning depending on their own dispositions and attitudes in the course. However, in this project I chose to focus my inquiry into issues other than learner agency, even though that could be a possible avenue for future research. What interested me as I probed deeper into this issue of cognitive transfer were these contextual breakdowns and how the students would struggle to see the usefulness of the activities because of these breakdowns, and often conclude they were just “busy work.” I will now explain a little more about each type of contextual breakdown, and describe the students’ experiences.
Figure 3. A representation of the difficulty some students had cognitively transferring their learning from the context of the modeling sessions to their own future teaching. These barriers, or contextual breakdowns, acted as valleys, and the more that existed for any particular student, the wider the cognitive leap required to transfer the learning to that student’s own context.
1. Difference in subject or teaching emphasis

A difference in subject or teaching emphasis seemed to be the most difficult contextual break to overcome when attempting to transfer the learning in the modeling sessions. Unfortunately, it was also a common situation among secondary education majors since a single modeling session would sometimes only apply to a handful of students in a class of 50. Elementary education teachers-to-be had less difficulty because they will generally teach all subjects to the students. A vivid example of how difficult it was to complete a cognitive transfer from one subject to another was described, unknowingly, by one of my initial interviewees. This student, Crystal, was preparing to be a science teacher. When I asked her about the modeling activities, she excitedly described a biological modeling activity where the students identified different trees from pictures they took outside. She felt this type of activity was something she would replicate with her own students:

One of my favorites was my tree one that is one I would use. . . . It’s good for them to get out and see what is actually in the world around them and then apply it to science. It’s more of a discovery process . . . it’s a good educational tool.

She even admitted that she probably learned more from this and other science modeling sessions, “I probably remember the science ones better because those are the ones I had more interest in.” For Crystal, modeling sessions such as this one were very useful because they were similar in subject matter to what she was interested in, and thus cognitive transfer from the IP&T 286 context to her own was easy. She indicated that during the tree modeling session, she was able to think creatively about how she would
adapt the lesson if she were the teacher: “with the science one I was thinking how I would do it differently and the different approach I would take on it.”

After hearing how positive her experience had been with this modeling session, I was shocked to hear how forcefully she rejected any positive aspect of other modeling sessions. The interview took an abrupt turn towards the negative, as she described another modeling session, one that focused on English skills:

The storybook one I was like, yeah right, like I’m ever going to use this because I want to be a science teacher and I don’t take the English very seriously. None of my English classes have ever intrigued me.

The ironic twist is that this student felt digital storybooks had no application to science, when a BYU geology teacher is currently studying successful ways to use digital storytelling to teach geology (Thompson, Graham, & Bickmore, 2005). This student also struggled to cognitively transfer the learning from a social studies modeling session, and she commented that “with the storyboard one I had a hard time finding a way that that would be applicable.” She then mentioned that “but if you stretched it you can make anything applicable to any subject,” but from her interview it seemed she struggled to do this. The interview with Crystal is portrayed in Figure 4, which, though a cartoon, is not meant to trivialize the situation for the student, but rather to point out how drastic the students’ experiences could be from one modeling session to another. As this student reflected with me, I asked her why it was easier to apply the learning from some modeling sessions and not others, and she responded it was due to, “the subject mostly. Some of them were science, and some of them were science-related, like graphing, and others were pure history or English.”
Figure 4. This is a graphical representation of how dramatically different the students’ experiences could be from one modeling session to another, depending on the subject of the modeling session.

2. Intended age level

Each modeling session was targeted towards a specific grade level. Once again, secondary education preservice teachers struggled more with contextual breaks because of the intended age level of a modeling session than elementary education majors. This was because elementary education majors were required to take the course for two credits, so the two-credit version of the course featured only modeling sessions for elementary levels. Secondary education majors, however, only had to take the class for one credit, but frequently took the class for two credits. When this happened, they usually struggled to see how elementary lessons could be adapted for upper levels.

One student in this situation, Dan, is now teaching high school physics, and he felt most of the class was unhelpful, mostly because of the elementary style of the modeling sessions. “Being in the students’ shoes in that instance didn’t really help that much because the activity was very distinct from the type of activity I’d be doing, do you know what I’m saying?” he said. He went on in the interview to explain that the
modeling session didn’t help him to see how well the technology could be used with high school students because he wouldn’t know what challenges using more advanced technology—like he would expect to use in high school—might create.

In this instance, with elementary, it didn’t seem like the subject matter was at all challenging and it didn’t seem like the technology was challenging because our application was so limited. I would like to see a modeling session that was on the same level that I was at and then [I could] come up with my own, and if we’re not going to do that, they could have explained in five minutes what a sample lesson for an elementary teacher would be and say come up with something specific for your area.

As Dan explained, he felt that if the modeling wasn’t specific to everyone’s context, then the presentation should be shorter (“they could have explained in five minutes”), with more time spent on discussion that could pertain to each unique context.

One student on the survey explained that “I think it would be helpful to offer a variety of activities ranging in various grade ranges. Also grouping the students in groups of grade level they wanted to teach would be helpful.” Another student felt that some of the modeling sessions taught skills very elementary for high school students, which made it more difficult to apply the activity: “I thought the modeling sessions were fun, but as a future high school science teacher they were completely missing the boat. . . . Drawing shapes on a computer is something I assume that all high school students know.”

In the survey, one question asked students barriers to applying what they learned in the modeling sessions to their own teaching, and different intended age levels was rated the most difficult barrier to overcome, with 25% of the students saying this made
transfer very difficult or extremely difficult (see Table 9). The percentage might be much higher for those secondary education students who participated in the two-credit class (and thus participated in modeling sessions geared for grades they will not teach), but this kind of analysis is not possible because I neglected to ask the students on the survey whether they took the class for one credit or two.

Table 9

*(Survey question #17). Please rate *HOW DIFFICULT* it was to apply what you learned in the modeling sessions to your own future teaching in each of the following situations:

<table>
<thead>
<tr>
<th></th>
<th>ED</th>
<th>VD</th>
<th>SD</th>
<th>ND</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>When the subject matter of the modeling sessions was different from the subject I will teach</td>
<td>7%</td>
<td>12%</td>
<td>47%</td>
<td>34%</td>
<td>3.08</td>
</tr>
<tr>
<td>When the example lesson activity in the modeling session was for students of a different age than I would teach (for example, you plan to teach high school, and the modeling sessions were for elementary school)</td>
<td>7%</td>
<td>18%</td>
<td>44%</td>
<td>32%</td>
<td>3.01</td>
</tr>
<tr>
<td>When I had to learn a new technology as well as learn the subject matter of the modeling lessons</td>
<td>7%</td>
<td>12%</td>
<td>44%</td>
<td>38%</td>
<td>3.13</td>
</tr>
<tr>
<td>When I had to think like a student when I’m really going to be a teacher</td>
<td>5%</td>
<td>2%</td>
<td>34%</td>
<td>58%</td>
<td>3.46</td>
</tr>
</tbody>
</table>

*Note:* ED = Extremely difficult, VD = Very difficult, SD = Somewhat difficult, ND = Not at all difficult, RA = Response average.
3. Difference in teaching style

I hadn’t considered a difference in teaching style between the IP&T 286 instructors and the preservice teachers to be a difficulty until I interviewed Martha, who wants to teach music to elementary students. I understood, of course, that all teachers have unique methods, mannerisms, ideologies, and pedagogies when it comes to teaching, but I did not feel that the difference would be too drastic from the methodology used to teach a social studies lesson to an English lesson. However, Martha remarked that the most difficult thing for her during the modeling sessions was trying to understand how to use the technologies in a very hands-on, kinesthetic environment like music education, where students are clapping, singing, touching, dancing, and moving.

That style of teaching is sharply contrasted with the style used for the modeling sessions, which Martha characterized as being tied to a classroom setting of desks and chairs. “I wondered occasionally how would I be able to use this [what she learned in the class] for music, and I couldn’t think of very many ways I could use it,” she said. She further explained why the class was less helpful for her:

As far as music, the method that I’ve been trained in . . . it’s really more about doing stuff. So you sing, and you always have the kids doing stuff, they’re singing, or they’re placing notes on a page, or, I don’t know, it just seemed to be (pause) I don’t know, the technology stuff that was presented seemed more for a classroom setting where students are sitting in desks or in a computer lab and you’re working together to put this stuff together and not so much in a classroom setting where you’re sitting on the floor in a group sharing music experiences. So
I’m still not really sure how I would use technology in my music classroom other than, you know a CD player.

In contrast, what did help Martha to see how she could use technology was visiting an actual music teacher’s classroom, where she observed technologies specific to music education, which can be used in more kinesthetic activities as she described.

After my interview with Martha, I reflected on previous interviews and observations and understood that this may have also been a difficulty for other students, who weren’t able to articulate it as well as Martha. For example, in my own experience as a teacher in the course, the students who seemed to find the class the least useful were students who planned to teach more kinesthetically, like Martha. For example, a dance major in my class struggled to develop lesson plans that could use technology, especially after viewing examples all semester that were more geared towards traditional education. She admitted that iMovie and StudioCode could be helpful, and eventually did her projects on these tools, but felt she would never actually use them in high school because she’d rather have her students dancing than making or analyzing movies about dancing. She felt those tools could help her as a reflective teacher, but not necessarily help the students. My students studying home economics had similar frustrations. On the survey, one student voiced this frustration by saying,

Where I am a Dance Education major, there were never any specific activities that we completed that I could use in the classroom—I think that in the future it would be appreciated if other majors were considered besides English, Math, Science, etc.
In kind of a tie over to the previous discussion of different intended age levels, one student felt the modeling sessions were less applicable not only because high school students are older and have different characteristics than elementary students, but because all of this necessitated a different teaching style. He explained that, “I felt like it was busy work. Also, everything was completely directed to elementary ed majors, and I'm secondary ed, and we teach differently in high schools.”

Another set of students who seemed to struggle with this type of contextual breakdown were special education teachers. One teacher said that “I felt like this didn't really apply as much to me, as I am a special ed teacher emphasizing in severe disabilities. It is not beneficial or realistic to do a massive lesson with technology with my students.” Teachers in subjects such as special education, dance, and music need to use nontraditional methods for engaging their students, and while technology can be used effectively to do this, the modeling sessions focused on more traditional approaches.

4. Students’ expectations for the course and their role in the course

One of the patterns that appeared over and over in the interviews and survey is that the students didn’t understand the dual nature of the course—to teach technology skills and integration principles and ideas. Rather, most students seemed to feel that the only purpose of the class was to teach new technology skills—or if this wasn’t the main purpose, then it should have been. Some students even listed discussion on pedagogy as among their least favorite aspects of the class because they wanted more time spent on learning the technology. A few questions from the survey portray this trend vividly. For example, when asked what the most helpful activities were in the class, the second-highest rated answer was workshop days where the teacher taught a new technology (see
Table 10). The average student response for this answer of 2.67 out of six, one being the most helpful, was quite higher than class discussion about integration (3.83), watching videos of teachers using technology (4.28), and reflection activities (4.82)—activities that were all geared towards learning pedagogy and not technology. To revisit a question discussed earlier in this thesis, students felt the most valuable aspect of the modeling sessions was learning a technology “hands-on” (see Table 2; page Table 4, page 48; and Table 8, page 58). Students’ top suggestion for improving the modeling activities was to use more class time for teaching technology (see Table 6, page 53).

Table 10

(Survey question #7). Please rank the following IPT 286 activities from MOST helpful in preparing you to use technology effectively to LEAST helpful. (1 represents MOST helpful, 6 represents LEAST helpful). Please remember you are RANKING these items so only one answer can be put as #1, only one can be put as #2, etc. The computer will not let you rank two answers the same.

<table>
<thead>
<tr>
<th>Activity</th>
<th>1 (20%)</th>
<th>2 (33%)</th>
<th>3 (18%)</th>
<th>4 (16%)</th>
<th>5 (7%)</th>
<th>6 (7%)</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling lessons (where the instructor taught a sample lesson as an example)</td>
<td>1 (20%)</td>
<td>2 (33%)</td>
<td>3 (18%)</td>
<td>4 (16%)</td>
<td>5 (7%)</td>
<td>6 (7%)</td>
<td>RA = 2.75</td>
</tr>
<tr>
<td>Watching videos of teachers using technology</td>
<td>1 (5%)</td>
<td>2 (9%)</td>
<td>3 (12%)</td>
<td>4 (22%)</td>
<td>5 (31%)</td>
<td>6 (21%)</td>
<td>RA = 4.28</td>
</tr>
<tr>
<td>Creating a lesson plan that would use technology</td>
<td>1 (33%)</td>
<td>2 (23%)</td>
<td>3 (21%)</td>
<td>4 (11%)</td>
<td>5 (9%)</td>
<td>6 (4%)</td>
<td>RA = 2.53</td>
</tr>
<tr>
<td>Class discussion about technology integration</td>
<td>1 (3%)</td>
<td>2 (13%)</td>
<td>3 (24%)</td>
<td>4 (30%)</td>
<td>5 (20%)</td>
<td>6 (10%)</td>
<td>RA = 3.83</td>
</tr>
<tr>
<td>Reflection/writing activities</td>
<td>1 (7%)</td>
<td>2 (3%)</td>
<td>3 (8%)</td>
<td>4 (8%)</td>
<td>5 (26%)</td>
<td>6 (46%)</td>
<td>RA = 4.82</td>
</tr>
<tr>
<td>Workshop days when the professor taught us how to use a new technology</td>
<td>1 (32%)</td>
<td>2 (20%)</td>
<td>3 (20%)</td>
<td>4 (13%)</td>
<td>5 (6%)</td>
<td>6 (9%)</td>
<td>RA = 2.67</td>
</tr>
</tbody>
</table>

Note: RA = Response Average,
This was a disappointing realization for me and Graham, as I discussed with him my preliminary findings. Why did students feel learning technology skills, specific to one technology, were more important than learning pedagogy that could be applied to any technology? Did they enter the class with these desires and expectations or did the class somehow give the perception that this is what we valued the most? At first I investigated this issue independently of the cognitive transfer questions (see protocol in appendix), but I realized that a difference in the students’ and faculty’s expectations about what the class was, or should be, primarily concerned with was, in fact, a hindrance to students being able to cognitively transfer pedagogical learning. For example, one student, Corinne, struggled to even discuss learning pedagogy from the modeling sessions—in her mind, that was not their purpose. She kept repeating thoughts that the focus of the class was to “make all these projects, not really how to teach with technology.” Because of this, modeling sessions that dealt with tools she already knew she did not perceive to be useful: “I don’t want to go and sit and learn how to use things that I already know.” She made this comment after admitting that she didn’t know yet the methods or pedagogy for integrating technology into schools effectively. But despite being deficient in her understanding of methods, she felt there was nothing to learn from a modeling session dealing with a familiar technology. It almost seemed as though she, and students like her, had a blind spot and couldn’t see the usefulness of any activity that didn’t teach a new technology skill.

In the final set of interviews, I began probing students about this issue. Jason said that students often enter the class already expecting to be taught technology, and that the culprit may be the name of the class: Instructional Psychology and Technology 286. He
said that he is currently in IP&T 301, and some of his peers thought that class (which teaches educational psychology) was going to be about learning new technologies.

Another student, Jane, suggested that students, especially here at BYU, feel anxious that they don’t have a proficiency with technology, and they struggle to think creatively about application possibilities until they have learned the tools to an adequate level. “Especially at BYU, everyone has the perfectionist idea, that if they’re going to use it, they need to use it perfectly,” she said. Natalie further explained that many students feel inadequate in an age of such ubiquitous technology. “We didn't have the technology growing up,” she explained. "My little brother, who is nine, knows a lot about computers. It was really important to me to learn how to use technology.” Jennifer added that the uneasiness many students feel because they do not know technology well can even be fearful, and something that becomes a top priority for the student, over learning methodology. She explained,

I think maybe the teachers have this timeline that students might not be considering. The teachers know they’re teaching for the sake of our teaching. Their sight may be broader than ours. Ours is we don’t know as much as we want to, and we want to know it all before we get into the schools and have to teach it. . . . The fear of what you don’t know is kind of scary.

Jennifer went on to explain that now that she is in the elementary education program, she understands better the importance of learning how to use technology teaching methods, even thought that was not perhaps her first priority when she took the course.

Jason, who already knew the technologies used in the course, had a fairly easy time thinking of classroom applications for the technologies, and he suggested that the
issue is one of prerequisites—that students couldn’t think effectively about integration unless they had a prerequisite technical ability. If they don’t have these skills, then he believed they probably accept the instructor’s modeled use of technology in a lesson plan as the only possibility, and if this particular modeling session is not something they would replicate as a teacher, then they would probably just not use the technology at all.

Another problem was that the course, until very recently (fall semester of 2004) was not part of the education cohort for elementary education majors, but was instead a prerequisite for students wanting to be accepted to the program. This meant that students in the class were not sure if they would even be teachers yet, and that made reflecting as a teacher on pedagogy more difficult and made the class seem more like a technology hurdle they had to jump before they could be accepted. This insight came mostly from my interview with Jennifer, who said, “Because I wasn’t really involved. It was hard to see myself [as a teacher]. . . . For me it was hard for me to put that together with a future that wasn’t even a sure thing.” Jennifer also said that she understands now that she is in the elementary education program why it was important to learn technology teaching methods, and she suggested that IP&T 286 be moved into the actual cohort of classes that preservice students take in their first year of the program. “Because a lot [of what] we’re learning in the arts semester is the psychology of being a teacher, IPT would fit very well into the arts semester.” Jennifer was happy to learn that this is exactly what has happened.

Several students felt that, while students often enter the class expecting to be taught new technology skills, the structure of the assignments perpetuate this expectation. They pointed out that the modeling sessions were graded on technical qualities, not
pedagogical qualities. In the online syllabus, the modeling sessions were listed alongside which tools they would feature. During the actual modeling, much of the class instruction was on how to make a tool work, rather than how to use the tool in different school settings. Even the requirement for the class is to buy a key drive—a technology—rather than a textbook. These were all subtle clues that the students felt indicated the instructors’ primary goal was teaching technology skills.

The heading for this section of my thesis is “students’ expectations for the course and their role in the course.” The second half of this statement, I feel, ties into the first and more directly impacted the students’ abilities to achieve a cognitive transfer. Because most students expected the class to teach technology skills, they fell into the mindset of being students needing to learn from the instructors—rather than thinking like teaching professionals reflecting on possible classroom applications, as the instructors hoped. Thus, during the modeling sessions, students focused more on their own needs (especially technical needs), and what was required to get the homework done, rather than reflectively considering how it might apply to their future context as teachers with students of their own.

Some of the interviewees suggested implementing more teacher-focused tasks, such as creating lesson plans and teaching each other in microteaching situations. Jason felt that it was good to play the role of a student, the role required by the modeling session, as long as there was a move out of the student mindset into more teacher-oriented activities. “The teacher and TA took too much of a role of a teacher … maybe if … we got it more than from a student standpoint,” he said. “It’s obviously important, you need to learn it from all sides [teacher and student].” Jason wished he had been able to do
more teaching with technology, rather than just learning with and about technology in the course, “I didn’t get the experience of actually teaching that. It seemed more focused on we’re going to teach you how to use this technology [simply gaining the skills, not the pedagogy] so you can apply it.”

5. Technology availability/complexity

A final contextual breakdown that I was able to establish from the data was a breakdown in the ubiquitousness of the technology used in IP&T 286, and the students’ perceived expectation of how much technology they will actually have available to them as teachers. IP&T 286 is taught either in a computer lab or with carts of laptops, and there is usually a one-to-one ratio of computers to students. In contrast, most students feel they will not have access to very much technology as teachers. When asked on the survey what they perceived the greatest impediment to using technology as teachers to be, the top response was a lack of technology at their school (see Table 7, page 57). Ironically, only 16.3% of the students were currently student teaching or hired as teachers when they took the survey, indicating that they were answering what they perceived reality to be, not necessarily what reality is. Jane explained that not only would technology not be as available in real schools, she also felt it would play a less significant role. “I don’t think it (modeling sessions) seemed really realistic because they won’t have that much technology in front of them. Technology in a real classroom will be supplementary.”

Other students felt that the technology used in IP&T 286 was also unrealistic from authentic contexts because they were not convinced young children would be able to use technology that “advanced.” Comments such as, “we were all confused about the assignments, and we’re college students. Can you imagine elementary students?” from
Corinne, exemplified this concern. Because students who felt this way believed the modeling sessions to be unrealistic, they did not put as much effort into applying the principles learned to their own future teaching contexts. In fact, it sometimes deterred them from wanting to use technology, because they felt the technical bugs and problems would be intensified with K-12 students. “It took hours to fix all the bugs,” Amie said. “Kids won’t be able to do that.”
CHAPTER 5

CONCLUSIONS AND QUESTIONS FOR FURTHER RESEARCH

While it may seem from the previous section that the many different ways that students could struggle to relate the principles taught in modeling sessions to their own teaching contexts might make modeling ineffective, the positive feedback seems to be that the live modeling method of training preservice teachers is effective overall for most students. Overall, despite challenges faced by some students in cognitively transferring to their own unique contexts, it is important to remember that modeling was perceived by most students to be effective at teaching technology skills and ideas for integrating technology as teachers. Students felt that modeling activities were the third most useful class activity, out of six suggested options (see Table 10, page 73). A large majority of students also indicated that modeling helped them feel more excited and more confident to use technology as teachers (see Table 5, page 49; and Table 11, below). Most students said they would use technology often, if not most of the time, for various activities (see Table 12). Even with the challenges to cognitive transfer that I have described in this thesis, most students (79%) indicated that it was somewhat easy or extremely easy to apply what they learned in modeling sessions to their future teaching (see Table 13).
Table 11

*(Survey question #18). After most of the modeling lesson activities, I felt:*

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very excited to use technology as a teacher</td>
<td>26.7%</td>
</tr>
<tr>
<td>Somewhat more excited to use technology as a teacher</td>
<td>60.8%</td>
</tr>
<tr>
<td>Somewhat less excited to use technology as a teacher</td>
<td>0.5%</td>
</tr>
<tr>
<td>Not excited at all to use technology as a teacher</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

Table 12

*(Survey question #20). When working on projects or when teaching, HOW FREQUENTLY do you use technology to help you accomplish each of these purposes?*

<table>
<thead>
<tr>
<th>Purpose</th>
<th>A</th>
<th>M</th>
<th>O</th>
<th>NVO</th>
<th>N</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>To make yourself more efficient</td>
<td>23%</td>
<td>35%</td>
<td>28%</td>
<td>6%</td>
<td>7%</td>
<td>2.38</td>
</tr>
<tr>
<td>To improve your presentation to the students</td>
<td>16%</td>
<td>38%</td>
<td>23%</td>
<td>18%</td>
<td>4%</td>
<td>2.56</td>
</tr>
<tr>
<td>To add variety to your instruction</td>
<td>11%</td>
<td>40%</td>
<td>28%</td>
<td>17%</td>
<td>4%</td>
<td>2.61</td>
</tr>
<tr>
<td>To help your students complete projects</td>
<td>8%</td>
<td>31%</td>
<td>36%</td>
<td>19%</td>
<td>6%</td>
<td>2.85</td>
</tr>
<tr>
<td>To help your students learn in new ways</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To help your students learn more effectively</td>
<td>8%</td>
<td>37%</td>
<td>32%</td>
<td>18%</td>
<td>4%</td>
<td>2.75</td>
</tr>
</tbody>
</table>

*Note: A = Always (Nearly 100% of the time), M = Most of the time (About 75% of the time), O = Often (About 50% of the time), NVO = Not very often (About 25% of the time), N = Never (Almost 0% of the time).*
Table 13

(Survey question #16). This question is about how well the modeling sessions transferred to real-life teaching experiences.

<table>
<thead>
<tr>
<th></th>
<th>EA</th>
<th>SE</th>
<th>NVE</th>
<th>NE</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>rating</td>
<td>17%</td>
<td>62%</td>
<td>17%</td>
<td>4%</td>
<td>2.09</td>
</tr>
</tbody>
</table>

Note: EA = Extremely easy to apply what I learned, SE = Somewhat easy to apply what I learned, NVE = Not very easy to apply what I learned, NE = Not at all easy to apply what I learned, RA = Response Average.

While, in general, the modeling sessions seemed to have a positive impact on many students’ experiences and were effective in teaching new technology skills and integration principles, there were some students who struggled to abstract principles from the modeling that could help them as teachers, in other words, they struggled to cognitively transfer the learning from the context of the modeling session to their own teaching contexts. This led me to consider the obvious question: If most of the students felt modeling effectively prepared them to use technology as teachers, why was this not the case for all students? Why did some students have an entirely opposite experience and perception of the modeling sessions?

My experience in the interviews indicate that most of the students with positive experiences in the modeling sessions tended to be elementary education majors whose contexts were most similar to those of the modeling sessions. Thus, the core theory
suggested by the data in this thesis is that modeling can be very effective in helping students to visualize how to use technology effectively when it is used in a homogenous group of students with similar teaching experiences and contexts. The more variety (including variety in teaching emphasis, career expectations, etc.) existing in the makeup of a class’ students will make the modeling sessions progressively more difficult and less effective for the students.

In relation to this core theory, a sub theory generated by this research is that there are many different ways that students can vary from each other in their preparation for an instructional technology course, and that the five biggest potential pitfalls, or barriers, to students profiting from a modeling session are (a) a difference in subject or teaching emphasis, (b) a difference in the age level of the students that the teacher intends to teach, (c) the teaching style of the student teacher, (d) the student teacher’s expectations of the course and perceived role in the course, and (e) how much technology the student teacher expected to be available at their future teaching post. These barriers can be considered contextual breakdowns and can be overcome by students, but the more barriers existing for students will make it progressively more difficult for those students to complete a cognitive transfer of what they learn in a modeling session to their own future teaching context. By adapting the live modeling method to more specifically address unique students’ needs and contexts, then the cognitive transfer of learning should be easier and the method could be a strong tool for training preservice teachers to use technology in their own teaching.
Questions for Further Research

As I sifted through the evidence and refined my analysis to look at issues more directly related to my inquiry, I necessarily discarded some ideas, patterns, and questions that could potentially be insightful, but that I was not able to develop further at this time. These questions could provide the guidance for future studies into the impacts different modeling methods may have on the training of preservice teachers. Following are a few of these possible future avenues for research:

1. How does video modeling impact the training of preservice teachers? Does it address some of the contextual breakdowns found to exist with live modeling? Can video modeling be blended with live modeling to improve preservice training? If so, how?

For this project, I did not investigate the impact of using video models, but because we use video case studies in IP&T 286, several students commented on our use of videos. It appears that video modeling has some affordances that live modeling does not, and vice versa.

2. Are some contextual breakdowns more critical than others? Which ones?

My feeling was that some of the contextual pitfalls were more critical than others, particularly when the students planned to teach a different subject than that of the modeling session. However, more research is needed to set up any kind of hierarchical taxonomy of which aspects of a student’s context are most critical.

3. Are there other contextual breakdowns besides the ones I have proposed? Are the ones I have proposed valid?

In my data collection and analysis, I identified other factors that seemed to
be significant for some students, but were less supported in the data set as a whole. It is very possible that by interviewing more people, I could add other potential contextual breakdowns to my list of five, or that one or more of the five that I have proposed may not be as strongly supported.

4. Why are some students who do not share the same personal context as the modeling sessions still able to profit from the experience? What characteristics, dispositions, actions, and attitudes may help a preservice teacher to learn from a situated experience, like live modeling, that is different from her own?

It was fascinating for me to interview some students that were able to learn and apply principles from modeling sessions that were very different from their own teaching contexts. I have a few feelings, based on my interviews, as to why these students succeeded when others could not. For example, it seems that if they have had any other educational classes, they are able to reflect and apply the modeling sessions more effectively. The personalities, agency, and dispositions of the students were also, of course, very important.

5. Does live modeling provide advantages beyond those afforded by problem-based learning? In other words, does the benefit of live modeling exist in the modeling of an effective example, or in the completing of a project?

Some of the students I interviewed struggled to differentiate between the modeling aspect of the modeling sessions, and the completion of projects. For this thesis, I considered both to be part of my definition of a “modeling session.” It would be interesting to investigate further which aspects of a modeling session is most valuable—the modeling or the completion of projects.
6. How do group dynamics influence how effective live modeling may be for any particular student? What can teachers do to structure the group work in a way that is most effective?

Some students had very negative experiences working with their groups, and this obviously impacted their perceptions of the course and of the modeling sessions. One example is Susie, whom I featured in a case study in the beginning of the Findings section of this thesis. It would be useful, I feel, to become well-read in the literature on collaborative learning and apply this lens to the group work performed in IP&T 286.
REFERENCES


Cognition and Technology Group at Vanderbilt. (1992). The Jasper series as an example


Merrill, P. (2003). Entering skills of students enrolling in an educational technology


APPENDIX A

PROTOCOL FOR INTRODUCTORY INTERVIEWS WITH FORMER STUDENTS

To keep from getting burdensome, don’t ask the student these questions for every modeling session. Rather, ask each student about 1-2 modeling sessions, and attempt to interview enough students to get some preliminary feedback about all five modeling sessions.

PART A — INTRODUCTION

• Explain the project and Explain informed consent and request participation

If consent is given, then proceed to Part B.

PART B — CLASS EXPERIENCE

• Which activities in the course were most helpful? Why?

PART C — MODELING EXPERIENCE

If they don’t mention modeling in Part B, ask them specifically if they remember any in-class activities where the instructor demonstrated how to use technology in school lessons. Pay attention to the language they use to describe the modeling activities.

• What do you REMEMBER about the activity?
• Explain to me what you did in class.
• What did you THINK AT THE TIME?
• How much TIME did it take?
• When, where, and how did you meet as a group?
• Describe your meeting as a group and what you each contributed.
• What did you LIKE about the modeling activity?
• What did you DISLIKE about the modeling activity?

PART D — WHAT IMPACTS DID THE MODELING HAVE ON THE STUDENT?

I’m now going to ask you some questions about how the modeling impacted what you learned.

• What did it TEACH you about technology integration?

• How did you FEEL about technology integration after participating in the activity?

• Did you feel MORE or LESS excited to use technology in your own teaching after the activity? Why or why not?

• After the activity, did you feel MORE or LESS confident in your abilities to use technology effectively as a teacher? Why or why not?

• If you have since had your student teaching experience, did you use technology in your teaching?

• Did the modeling activity change your attitude towards technology integration in any way?

• Was the modeling activity an effective way of teaching technology integration?

If appropriate, ask the student if you can ask him about a different modeling activity, and repeat Part C and Part D

PART E — SUGGESTIONS FOR EFFECTIVE MODELING

• What could have made the modeling BETTER?

• How could the instructors improve the in-class EXPERIENCE, INSTRUCTION, HOMEWORK, or any other part of the activity?
INITIAL ANALYSIS OF FIRST SEVEN INTERVIEWS

After I had conducted the first seven interviews, I read through my notes and jotted down several patterns I had seen. At this stage, I defined a pattern or theme as a point of emphasis within at least one interview. Some of these themes were stronger than others obviously, but at this point I didn’t want to throw out any emerging themes just because it was a major point to one person, because I didn’t know if future interviews might not support this. I wrote these out to try and see what I could learn so far, and perhaps what ideas I should be on the lookout for in the rest of the interviews. I shared these with Graham, and he helped me question and ponder what each might mean and what kinds of questions I could ask to explore these thoughts more deeply in the interviews. The document I shared with Graham follows.

Theme — Students mostly remember, and find most useful, learning technologies, not integration principles

Some quotes to support this idea are:

1. “I love technology. I wasn’t familiar with these programs. . . .”

2. It (the class) was “practical and showed me how to do it. The other things we did, I knew how to do, Excel, PowerPoint, It was mostly review.”

Theme — Students seemed to also learn integration principles, even though their focus in memory was on the technologies
Theme — Students who were already technology literate seemed to prefer individual work. Students struggling to learn the technology preferred collaboration.

A theme that would be included within this category is that sometimes students with good technology skills still found collaborative work useful because they perceived there was something they could learn or gain from their teammates (such as writing skills, other skills).

Theme — Transfer was not difficult during role reversal (students acting the role of elementary students). It was difficult, however, to make the transfer from one subject to another, or from elementary education situations to secondary education contexts.

Some quotes to support this idea are:

1. “Even though we know all about the different kinds of trees, it gave me the experience” of being a third grader.

2. It was helpful that “the way he presented it to us was a way we could present it to the students”

3. “This is something I can use. I’m being the students, doing the hands-on. I felt like the ed student doing the project.”

4. “At times it’s good to go, ‘wait a minute. This is what the students would do.’”

5. “Although I don’t feel like I’m an elementary student, I like the ideas for application. I like modeling lessons.”
Theme — those who collaborated in group work often seemed to have better dispositions towards the modeling activities and towards using technology in their own teaching.

One exception was SL, whose experience was not favorable because of the lack of scaffolding and because their group effort was not rewarded – the grades were on performance, not effort.

Theme — Positive outcomes were sometimes countered by frustrating experiences trying to learn a new technology.

Theme — However, sometimes the frustration of learning a new technology was remembered more favorably afterwards and there was a sense of overcoming

A quote to support this idea is:

1. “It’s not as hard as I thought. You feel good after you figure it out”

Theme — When students didn’t transfer the knowledge to their own future teaching, the modeling activities were perceived as busy work. Applicable activities were key.

A quote to support this idea was a student who said, “Yeah right, I’m never going to use this (what they learned in a modeling session).”

Theme — group work must allow for all students to use the technology

A quote to support this idea comes from a student who, in frustration about there not being enough computers during the balloon rockets modeling session, described her role in the activity: “I held the string.”

Theme — Role reversal was sometimes perceived as positive, at other times as unnecessary and distracting

A theme that is included in this major category is that some students didn’t really play the role, mentally, of elementary students, but they still were helped by playing the
role of students. One student said, “When you experience what you’re going to teach, you learn better. It was good for us to see.”

*Theme 11* — *It was helpful to have exploratory, problem based projects,*

A theme that is included in this major category is that more support (time and lab/TA assistants) is needed as students struggle to learn new technologies. For example, one student said, “Everyone had to be involved. You learn by doing. That’s one of the advantages of the technology.”

*Theme* — *Most groups didn’t collaborate, didn’t because of scheduling issues; also because it would take more time to complete the work.*

One student said that “because there is limited class time, by the time you finish the experiment, there’s limited time to explain the basic assignment. Now you’ve seen the modeling, what do you do next?”

*Theme* — *Some students felt focusing on minute details in the modeling assignments hindered transfer and “big picture” thinking; other students disagreed.*

Two quotes to describe this idea are:

1. “a lot of the projects were tight on time.”
2. “(It was frustrating because) It never looked the way we wanted to.”

*Theme* — *The use of PowerPoint was overkill*

*Theme* — *Live modeling is excellent for learning technology in context.*

A few quotes to describe this idea are:

1. “You’re learning the technology and getting an idea of how to use it.”
2. “It forced you to figure out how to use whatever.”
3. “I had never used excel, it was helpful to take it from a student side first.”
Theme — Live modeling helped students to think about new ways of teaching with technology. However, to maximize transfer and brainstorming of ideas, video modeling should be blended with live modeling.

A few quotes to support this idea are:

1. The modeling “opened up a lot of possibilities. I know better how to use technology.”
2. “It (the modeling) started me thinking more on how would I apply this.”
3. “You’re learning the technology and getting an idea of how to use it.”
4. “I learned how to use them as a resource as a teacher.”
5. “It (video modeling) was about real life experiences and awesome things students are doing. I saw the kind of interactions I want to have with my students. This is so cool!”
6. (About visiting real classes) “You can see it happening and it helps you learn.”
7. “Even young children could go out and make that part of the lesson.”

Theme — Students’ memory of modeling session specifics faded after about a year, but the feelings and attitudes towards using technology remained.

One student, for example, couldn’t remember specifics about the modeling but remains excited to use technology. She said, “I was very excited about using technology in the classroom. I believe it makes for more effective lessons. I use the skills I gained in the class frequently in hopes that they will still be sharp when I am teaching.”

Theme — meeting for a two-hour block made it difficult if you had questions midweek
Theme — It’s sometimes hard to focus on learning the technology AND think of the subject matter or application to their own teaching. Many students had no trouble reflecting DURING THE modeling, but others struggled

One student said about this idea that “Do you want to focus on students’ aspect of the rocket, or on their learning the computer? I don’t know that they would absorb it all at once.”

Theme — Dividing up group work instead of F2F collaboration meant a less full experience

One student said that when students collaborated from a distance, “You only learn your part, you didn’t understand the other parts.”

Theme — It would be beneficial to implement and directly apply knowledge by doing, possibly by making lesson plans and then teaching them to each other

One student said about this that “the class I took only had one activity where we taught the rest of the class. It would be great to prepare a technology enhanced lesson in collaboration with an actual high school teacher, then give the lesson at the high school.”
APPENDIX C
PRELIMINARY INTERVIEW ANALYSIS

The preliminary interviews were very exploratory in nature and unstructured. The purpose of the interviews was to understand the students’ experiences in the course, and how modeling helped shaped that experience. Because of the exploratory format of the interviews, the participants were allowed to reflect on many things that at first may not have seemed pertinent to the study because I was trying to understand what aspects of the course were most remembered and most useful, and whether modeling was a major or minor impact on their learning. From these interviews, several themes emerged, some more strongly than others. At first these themes seemed to be sporadic and detached from one another, but on closer inspection it appeared that many of the major themes were included in one core theme that embodied much of the students’ thoughts about the class and about the modeling. This core theme was about relevance, particularly how relevant the students perceived the activities to be to their future careers. A unique characteristic of IP&T 286 is that the makeup of a class could include students from a dozen to two dozen different teaching majors. These students wanted class activities, including modeling, to be relevant to their particular major and teaching emphasis. Trying to make class activities relevant to students from all of these majors has been a struggle for IP&T 286 instructors, but the interviews from the students gave some guidance on what tactics seem to be working better than others.

Following is a description of some of the major themes found in the interviews and how they tied to the core theme of relevance, along with supporting quotes from the
interviews. This knowledge was used to create the items for the survey, which was the next phase of this research project.

*Students mostly remember, and find most useful, learning technologies, not integration principles*

Many students enter the class not feeling prepared to use technology as teachers. Every semester students participate in a course survey at the beginning of the course. In Fall 2004, the students entering IP&T 286 indicated that they were not at all comfortable at using half of the technologies listed by the instructors in a pre-course survey. Many students in the preliminary interviews indicated that the part of the course they remembered most was learning a new technology they didn’t know before. They also frequently commented that this was the most valuable aspect of the course for them.

Because students enter with poor technology skills and with anxiety about what they don’t know, it appears that the students believed that simply learning how to work different programs and technologies was one of the most relevant aspects of the course. This counters the feelings of many of the IP&T 286 instructors, who feel that learning appropriate methods for integrating technology—any technology—will be the most relevant thing a student can learn in the course (Graham, et. al, 2004). When students in the interviews were asked about technology integration principles, they often remembered learning these as well, and felt that this instruction was useful, but not as useful as learning a new technology.

Typical quotes to support this idea are:

1. “I love technology. I wasn’t familiar with these programs.”
2. It was “practical and showed me how to do it. The other things we did, I knew how to do, Excel, PowerPoint, It was mostly review.”

3. “I had never had experience with websites or PowerPoint, so actually both of those came in very handy for me.”

4. “That’s part of the reason why I liked the project is because I learned so much about the program.”

5. “Just like making my own website I learned a lot. The other things we learned about like PowerPoint and Excel and things like that I was already familiar with.”

6. “I don’t think we really did lesson plans in that class. It was more technology based.”

7. “I was brand new to PowerPoint, and just learning the basics was amazing and how to make a template so that our students could use it, so we go through and make something and say, “this is what I want” and then they do it, and it’s so easy for them and they get introduced to technology and they learn how to present information in a clear and concise way. That was really good.”

Role reversal was usually perceived as helpful, but only if it wasn’t taken too literally.

One characteristic of the modeling sessions is that the instructor plays the role of a K-12 teacher, while the preservice teachers reverse roles and play the part of K-12 students. Some teachers take this role reversal more literally than others, asking students to actually play along as if they were students, and involving the students in typical K-12 activities such as reading books and singing songs. Most students indicated that this role reversal was helpful to some degree because they felt it could make them better teachers by understanding the students’ perspective. However, the benefit gained wasn’t enough
to warrant extra time spent acting out the roles, and they felt that taking the role reversal too literally caused the activity to lose some of its relevance to their learning because the time could be better spent doing something else (i.e. learning a technology or completing the project).

Typical quotes to support this idea are:

1. “Even though we know all about the different kinds of trees, it gave me the experience” of being a third grader.

2. It was helpful that “the way he presented it to us was a way we could present it to the students”

3. “This is something I can use. I’m being the students, doing the hands-on. I felt like the el ed student doing the project.”

4. “At times it’s good to go, ‘wait a minute. This is what the students would do.’”

5. “Although I don’t feel like I’m an elementary student, I like the ideas for application. I like modeling lessons.”

6. “When you experience what you’re going to teach, you learn better. It was good for us to see.”

Relevance of subject matter in modeling sessions was perceived as very important—more important than the intended age for the modeling lessons

Because a modeling session can’t be all things to all of the students, there were two main ways that a modeling session could be perceived as irrelevant to their own teaching careers: first, when the modeling lesson was intended for an age level different from that of the preservice teacher, and second, when the modeling lesson subject
material was different from what the preservice teacher intended to teach. Some students indicated that it was difficult to transfer the learning from the modeling sessions to their own situations when there was an age difference, but the majority said that this was not a major impediment to their learning. Rather, they felt it was most difficult to transfer the learning when the subject matter was different from their own teaching emphasis (i.e. the lesson being modeled is for English and the preservice teacher intends to teach science). The students wanted more opportunities to see lessons modeled that pertained to their own teaching majors, and those that did were perceived as more relevant.

Typical quotes to support this idea are:

1. “The storybook one I was like, yeah right, Like I’m ever going to use this because I want to be a science teacher and I don’t take the English very seriously.”
2. “I think more of it was just frustration with okay, how do I make this work and how do I get this to fit in with this and as a speech pathology, it’s like I’m not a teacher, I’m not teaching kids how do I cram that into what fits in my context. I think it’s more a frustration of contextually it didn’t always fit. So, I’d stretch it.”
3. “I think that the things we did we were in there, and especially with secondary [education], the things that the people [taught] were so focused, like either a biology teacher or a science teacher or a history teacher, and so some of the lessons had nothing to do with social studies. There were even some elementary people in there, so none of the activities or things that we did in there I would even remotely come close to doing [in] an activity in my class. I didn’t think, ‘hey this is a really good idea’ because I was studying to be a history teacher and it was a science or a physics activity.”
4. “And it was also hard because this particular class was … apparently, it was supposed to be just for ed people and there were secondary ed and special ed people in it. That was a concern that people were always talking about, [was] how it was so difficult … and it was hard … too because she [the professor] wants to be able to say things that are relevant to the majors but it’s hard to accommodate to everybody when you’re all in different majors.”

There was too much emphasis on Microsoft PowerPoint in modeling sessions

In the modeling sessions, usually two technologies were taught and used. PowerPoint was one of these technologies in three of the modeling sessions for several semesters. The instructors knew this was overkill for one technology, and recent changes to the course have begun to de-emphasize PowerPoint as the only tool for presenting completed projects. The students were not always aware of these changes and could only reflect on their own experiences. They usually felt that it was not necessary to learn PowerPoint or to use it as often as they did in the modeling sessions. Instead, they wanted to learn how to use other technologies. This attitude probably stemmed from the fact that PowerPoint is one of the few technologies most students felt comfortable using before starting the course (63% in the Fall 2004 introductory survey indicated they were quite or extremely comfortable with presentation software), and they thought the modeling sessions could be more relevant and useful if they taught other technologies.

Typical quotes to support this idea are:

1. “I felt like all of them were PowerPoints or that they were all the same sort of thing. It was, do this and then make a PowerPoint presentation.”

2. “I think PowerPoint was a little overused. Every project had an accompanying
PowerPoint, which to be fair, was one of the only ways he had to assess if we had everything done. So I understand it in that light. But I was a little PowerPoint-ed out.”

3. “The other things we learned about like PowerPoint and Excel and things like that I was already familiar with.”

Live modeling was perceived as an excellent method for learning a new technology in a relevant context.

While students frequently felt the most relevant thing they could learn in the course was new technology skills, they believed that learning these skills through the projects required by the modeling activities to be superior to other methods, such as tutorials, workshops, etc. Students liked that the professor would first demonstrate how to use the technology to complete a project, and that their homework was project-based, forcing them to figure out how to learn the technology so they could complete the project. They also appreciated learning how to use the technology while at the same time learning a method for applying it to a lesson plan—this made the process of learning the technology more relevant and meaningful to them.

Typical quotes to support this idea are:

1. “You’re learning the technology and getting an idea of how to use it.”

2. “It forced you to figure out how to use whatever.”

3. “I had never used excel, it was helpful to take it from a student side first.”

4. “I think I like modeling, I’m not sure if I can see a better way to do that because
the same time you are modeling you are learning the technology. You get an idea for how to use it, they give you a sample lesson plan for using that technology, integrating it into your lesson.”

5. “The pseudo lesson is really important because you learn how to do the technology while you’re doing the lesson. I think that that’s one of the ways that they have to help us learn how to use it.”

6. “I think, mostly just the hands on doing project after project, each project they would learn more and more about what they could do. By the end of the semester, we were pretty much together on some of the programs.”

7. “I learned all of these things and I learned how to use them as a resource for when I’m a teacher, which is really a key thing because, so what, you know how to make a PowerPoint presentation but can it be effective to your teaching?”

*Students who were already technology literate seemed to prefer individual work. Students struggling to learn the technology preferred collaboration.*

A major component of the modeling sessions was that students worked together in groups. There appeared to be three main ways that students performed this group work: (a) they met and collaborated face-to-face on the project, helping each other out as needed; (b) they split up the assignments, completed them individually, and emailed them to a member of the group who put the pieces together; and (c) they split up the assignments and worked individually, but then met face-to-face to finish the individual pieces and put them together. It appears that there were some trends among the students regarding how they did their group work. The main one was that students who already knew how to use the technology seemed to prefer individual work because it was quicker
and easier for them; however, students who struggled with the technology preferred to collaborate face-to-face so their group partners could help them. Once again, the issue seemed to be how relevant the group work was to the student. If the student already knew the technology, he or she perceived working face-to-face to be irrelevant and useless to their education, while struggling students found collaboration very useful and relevant. Even when a student who knew the technology indicated that he or she liked working in groups, it was usually because something in the group work made the student’s effort worthwhile. For example, one student was the technology expert in her group but enjoyed the group work because her group mates helped her overcome some of her social discomforts.

Typical quotes to support this idea are:

1. “Because then I could have done it my way and ensured that the quality was my standard rather than a conglomeration of everyone’s.”
2. “I’m one of those people where I prefer to do everything by myself.”
3. “That we would kind of show each other what we knew about each program. There were things that I learned from other people as well that I had no idea the program could even do even though I had been using the program for years. I think group collaboration is definitely one of the best ways to learn about any subject but technology, for example in this class.”
4. “There were people that didn’t even know how to turn the computer on. But I went out of my way not to put myself in one of those groups. We did pretty well, but when it came down to it, I would be the one that would put it all together because I was just faster at it.”
5. “I think the fact that we were able to share our abilities with each other helped to create a better project than if I were just on my own trying to do it and got stuck trying to do something I wasn’t sure of.”

6. “I found it beneficial, I liked it. We each had different things that we were better at and we could help everyone get accustomed to it. Like with Excel, I had no idea, so I watched the girl whose husband is the PowerPoint girl, … and I watched her and then figured out how to do it on mine own and that helped being able to have more than one person trying it out within your group.”

7. “There were things that they knew that I didn’t know so we kind of drew on each other’s strengths.”

*It would be helpful to directly apply knowledge by making lesson plans and then teaching them to each other*

Some students indicated that a more relevant class activity would be to either have the students actually create lesson plans or practice teaching each other using technology. These students believed the modeling sessions were useful, but that the knowledge didn’t transfer as well to actual teaching situations because they never practiced what they were learning.

Typical quotes to support this idea are:

1. “The class I took only had one activity where we taught the rest of the class. It would be great to prepare a technology-enhanced lesson in collaboration with an actual high school teacher, then give the lesson at the high school.”

2. “In all of your other education classes you have to come up with all of these
lesson plans and stuff. So actually creating your first lesson plan, or your first
introduction to you as a teacher on PowerPoint, would have been awesome.
Something you can actually use but make it easy and fun still so you’re not, ok,
what’s my objective, what’s my participatory? Something fun you could actually use
with your students and you could just pop it in. Totally. Because you have so much
going when you start, technology’s the backburner.”
3. “I think what would be useful is where I create an activity that I would use in my
class. So, somebody that was a science teacher would create a science activity and for
me I would create a social studies activity. Completing the assignment but it was
applicable to our content area.”

When students didn’t transfer the knowledge to their own future teaching, the modeling
activities were perceived as busy work.

Tying into the core theme of relevance, when the students didn’t perceive the
modeling activities to be relevant to their own teaching, whether because the subject
matter was different, the age level was different, the group work was unhelpful, the
knowledge wasn’t implemented into practice, or whatever, then the students believed the
modeling activities were busy work. A typical interview with a student would find that
the student thought some modeling activities were useful while others were just busy
work because the student would never use that type of technology in her own teaching.

Typical quotes to support this idea are:
1. “Yeah right, I’m never going to use this.”
2. “I talked to one student that was going to be a chemistry teacher, and he was like,
okay, doing shapes and colors isn’t going to cut it for me. To him it was more just busy work.”

3. “I can remember being frustrated at times doing that and I think part of it was for me, learning, if I don’t have a context in which it will be applied later, I won’t remember it, retain it or care. Which we all go through and I think a lot of it has more to do with the fact that we’re learning so much and we’re so overwhelmed that if it’s not worth us retaining then we’re not going to retain it.”

Live modeling helped students to think about new ways of teaching with technology.

Many students reflected on how to apply the technology being learned to their own teaching while they participated in the modeling session, and they believed that one of the greatest impacts of the modeling was that it helped them understand new ways that educational technologies can be used in K-12 contexts that they hadn’t thought about before.

Typical quotes to support this idea are:

1. “I would say that it opened up a lot of possibilities.”

2. “Before, it was more I wasn’t really aware of the technology that I could use. I just thought in elementary schools you went to computers and did keyboarding and just basic stuff, the Oregon Trail. Whatever you did during computer time. I wasn’t really aware that it was so versatile.”

3. “I kind of already knew how to do PowerPoint but what it did for me was helped me to discover different ways of incorporating PowerPoint into a lesson plan. I think that’s what one of the biggest focuses of the class was. It was not … and that’s what Dr. Pratt said at the very beginning. It is to teach us how to use the programs, but
more importantly it’s to teach us how to incorporate them into the classroom setting. I think by giving us the scenarios, it gave us some examples so we could identify situations where those programs would be useful to the students in our own class.”

4. “More because it makes me more familiar with the way … even if I’m not using it as a speech pathologist, it makes me more familiar with how teachers are using it.”

5. “Afterward she would show us the lesson plan. See, this is what we did and this is how we integrated technology into the classroom. Okay, we see how that’s being done, blah, blah, blah. I was impressed with that.”

*Video modeling should be blended with live modeling.*

Most students felt the live modeling activities were at least as useful if not more so than watching videos of other teachers using technologies. However, they felt that they learned some things from the videos that they didn’t learn from the live modeling, such as how the students reacted, how to manage class discipline while using technology, etc. They sometimes felt that the videos were more realistic because they were real teachers teaching real students. Most students felt a combination of video and live modeling methods should be used.

Typical quotes to support this idea are:

1. The modeling “opened up a lot of possibilities. I know better how to use technology.”

2. “It started me thinking more on how would I apply this”

3. “You’re learning the technology and getting an idea of how to use it.”

4. “I learned how to use them as a resource as a teacher.”

5. (Video Modeling) “It was about real life experiences and awesome things
students are doing. I saw the kind of interactions I want to have with my students.

This is so cool!”

6. (Visiting real classes) “You can see it happening and it helps you learn.”

7. “Even young children could go out and make that part of the lesson.”

Other, less-developed themes

These other themes were not supported by as many interviews as the ones previously mentioned, but they were stressed by at least one participant. These themes were also used to guide the creation of survey items and choices to test whether the themes would be supported by more students.

1. Positive outcomes were sometimes countered by frustrating experiences trying to learn a new technology.

2. Many groups that didn’t collaborate, didn’t do so because of scheduling issues

3. Students’ memories of modeling session specifics faded after about a year, but the feelings and attitudes towards using technology remained.

4. The modeling sessions were less effective because of a lack of trained TAs, lab assistants to help answer student questions

5. It was sometimes difficult to focus on learning the technology and technology integration principles along with the subject matter required to complete a modeling project

6. Sometimes the modeling activities felt forced or artificial

7. Some students thought the modeling activities were fun and enjoyable

8. Some students experienced so much frustration learning the technology during the week that they struggled to complete assignments
9. Some students experienced a strong feeling of accomplishment after completing projects

10. Sometimes students wanted to use technology as student teachers but were discouraged by their cooperating teacher. Other times students were confused why technology was stressed in IP&T 286 but apparently de-emphasized by their methods teachers

11. It was important to some students to work in groups where everyone had access to the technology and at least one person knew how to use the technology

12. At least one student wanted to switch up groups after every activity

13. Sometimes students felt they needed more explanation by the professor about what exactly they needed to know and do to complete a project

14. Some students wanted more freedom to complete the projects as they wished without following specific rubrics, while others liked the rubrics
APPENDIX D
SURVEY INSTRUMENT

Survey Page 1 — Informed Consent

1. This research study is being conducted by Rick West, a graduate student in Instructional Psychology and Technology at Brigham Young University. The purpose is to investigate how well the modeling sessions used in IP&T 286 helped prepare you to use technology effectively as a teacher. You are not obligated to participate in this study, but if you choose to do so your answers will be used to further the understanding of what methods can most effectively be used to train preservice teachers. Your identity will be kept anonymous in any publications stemming from this research.

   This survey should only take you about 15 minutes to complete.

   a. Yes, I consent to participate in this research by completing this survey.
   b. No, I do not want to participate.

Survey Page 2 — Demographics

2. When did you take IP&T 286?

3. Who was your instructor?

4. What was your major when you took IP&T 286?

5. Have you yet or are you currently student teaching or employed as a teacher?

6. In general, did you feel that when you were in IP&T 286 you were:

   a) VERY MUCH ABOVE average in my knowledge and ability to use technology
   b) SOMEWHAT ABOVE average in my knowledge and ability to use technology
   c) AVERAGE in my knowledge and ability to use technology
   d) SOMEWHAT BELOW average in my knowledge and ability to use technology
   e) VERY MUCH BELOW average in my knowledge and ability to use technology
Survey Page 3 — Description of Terms

In this survey, some of the questions will ask you about some terms that you may or may not remember.

A Modeling Session is an activity where the teacher taught a sample lesson plan to you using technology. The teacher to some degree played the role of a secondary/elementary teacher, and you played the role, to some degree, of secondary/elementary students. A Modeling Session had four parts: (a) in-class presentation by the instructor; (b) in-class group work; (c) out-of-class group work; and (d) Assessment.

Technology Integration means the effective use of educational technologies to teach a subject. It means much more than simply using technology as a teacher; it means using technology effectively and appropriately to enhance your teaching.

Survey Page 4 — Items related to my first research question: What was their experience?

7. Please rank the following IP&T 286 activities from MOST helpful in preparing you to use technology effectively to LEAST helpful. (1 represents MOST helpful, 6 represents LEAST helpful). Please remember you are RANKING these items so only one answer can be put as #1, only one can be put as #2, etc. The computer will not let you rank two answers the same.

a) Workshop days when the professor taught us how to use a new technology
b) Class discussion about technology integration
c) Watching videos of teachers using technology
d) Reflection/writing activities
e) Creating a lesson plan that would use technology
f) Modeling lessons (where the instructor taught a sample lesson as an example)
8. If there was another class activity that you thought was very helpful in preparing you to use technology effectively, please explain.

9. In the modeling sessions, your instructor would teach a sample lesson plan to you as if he/she were an elementary/secondary teacher, and you were asked to participate as if you were elementary/secondary students. Please indicate whether learning from this perspective

   a) Helped me to better understand how to use technology effectively as a teacher
   b) Made it more difficult to think about using technology as a teacher
   c) It didn't matter; I didn't really feel like a K-12 student anyway

10. Please rate each of these answers according to HOW WELL the statement described your experience during the IN-CLASS presentation of the modeling session by your instructor and the IN-CLASS group work.

   a) I struggled to focus on both the subject matter and the technology
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree

   b) I struggled because there were too many students with questions and not enough teachers/TAs
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree

   c) During the activity, I started thinking how I could change this lesson so it could work in my own teaching
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree

   d) I enjoyed it because I was doing something hands-on
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree

   e) I felt the activity was fun and useful
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree

   f) I felt the activity was forced and artificial
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree

11. What other feelings/thoughts did you have during the in-class activity?

12. When working in groups during the week, did you prefer to:
a. Meet together during the week and work through the assignments together
b. Split up the different parts of the assignment, do the work individually, and email the pieces to one person to put together
c. Split up the different parts of the assignment, do the work individually, and meet together to put on the “finishing touches”

13. This question is to help us understand your feelings about the OUT-OF-CLASS work associated with the modeling sessions. For each answer, please rate HOW WELL the statement described your experience with the modeling session homework.

   a) It was frustrating because we had problems with the technology
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree
   b) It was frustrating because it felt like busy work
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree
   c) It was frustrating at first, but then it felt good to have a completed project
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree
   d) It was fun because the projects were enjoyable
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree
   e) It was useful because it applied to my future teaching
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree
   f) It was useful because I learned a new technology
      Completely Agree  Generally Agree  Completely Disagree  Generally Disagree

14. What other feelings do you have about the out-of-class part of the modeling sessions?

Survey Page 5 — Items related to my second research question: How did the modeling experience impact students’ knowledge, attitudes/disposition, and action (transfer)!

15. What did the modeling lessons teach you that was MOST helpful?

   a) New technology skills I didn't know before
   b) Principles for how to use technologies effectively in my teaching
   c) Ideas for how to use technologies as a teacher
   d) Other (please specify)
16. This question is about how well the modeling sessions transferred to real-life teaching experiences.

Please rate how easy, overall, it was to APPLY or TRANSFER what you learned from the modeling sessions to your own future teaching. If you are not yet teaching in a school setting, please answer according to what you anticipate will be true once you start teaching.

   a) Extremely easy to apply what I learned
   b) Somewhat easy to apply what I learned
   c) Not very easy to apply what I learned
   d) Not at all easy to apply what I learned

17. Please rate HOW DIFFICULT it was to apply what you learned in the modeling sessions to your own future teaching in each of the following situations:

   a) When the example lesson activity in the modeling session was for students of a different age than I would teach (for example, you plan to teach high school, and the modeling sessions were for elementary school)
      Extremely Difficult   Very Difficult   Somewhat Difficult   Not At All Difficult

   b) When I had to learn a new technology as well as learn the subject matter of the modeling lessons
      Extremely Difficult   Very Difficult   Somewhat Difficult   Not At All Difficult

   c) When I had to think like a student when I'm really going to be a teacher
      Extremely Difficult   Very Difficult   Somewhat Difficult   Not At All Difficult

   d) When the subject matter of the modeling sessions was different from the subject I will teach
      Extremely Difficult   Very Difficult   Somewhat Difficult   Not At All Difficult

18. After most of the modeling lesson activities, I felt:

   a) Very excited to use technology as a teacher
   b) Somewhat more excited to use technology as a teacher
   c) Somewhat less excited to use technology as a teacher
   d) Not excited at all to use technology as a teacher
19. After most of the modeling lesson activities, I felt

   a) Very confident in my ability to use technology as a teacher
   b) Somewhat more confident in my ability to use technology as a teacher
   c) Somewhat less confident in my ability to use technology as a teacher
   d) Not confident at all in my ability to use technology as a teacher

20. When working on class projects or when teaching, HOW FREQUENTLY do you use technology to help you accomplish each of these purposes?

   a) To improve your presentation to the students
      Always (Nearly 100% of the time)
      Most of the time (About 75% of the time)
      Often (About 50% of the time)
      Not very often (About 25% of the time)
      Never (Almost 0% of the time)

   b) To help your students learn more effectively
      Always (Nearly 100% of the time)
      Most of the time (About 75% of the time)
      Often (About 50% of the time)
      Not very often (About 25% of the time)
      Never (Almost 0% of the time)

   c) To help your students learn in new ways
      Always (Nearly 100% of the time)
      Most of the time (About 75% of the time)
      Often (About 50% of the time)
      Not very often (About 25% of the time)
      Never (Almost 0% of the time)

   d) To add variety to your instruction
      Always (Nearly 100% of the time)
      Most of the time (About 75% of the time)
      Often (About 50% of the time)
      Not very often (About 25% of the time)
      Never (Almost 0% of the time)

   e) To help your students complete projects
      Always ( Nearly 100% of the time)
      Most of the time (About 75% of the time)
      Often (About 50% of the time)
      Not very often (About 25% of the time)
      Never (Almost 0% of the time)
f) To make yourself more efficient
Always (Nearly 100% of the time)
Most of the time (About 75% of the time)
Often (About 50% of the time)
Not very often (About 25% of the time)
Never (Almost 0% of the time)

21. The previous question asked you how you use technology in your current teaching, this time we'd like to know how you PLAN to use technology in your FUTURE teaching. Please rate each of these according to HOW FREQUENTLY you plan to use technology for each of these purposes.

a) To improve your presentation to the students
Always (Nearly 100% of the time)
Most of the time (About 75% of the time)
Often (About 50% of the time)
Not very often (About 25% of the time)
Never (Almost 0% of the time)

b) To help your students learn more effectively
Always (Nearly 100% of the time)
Most of the time (About 75% of the time)
Often (About 50% of the time)
Not very often (About 25% of the time)
Never (Almost 0% of the time)

c) To help your students learn in new ways
Always (Nearly 100% of the time)
Most of the time (About 75% of the time)
Often (About 50% of the time)
Not very often (About 25% of the time)
Never (Almost 0% of the time)

d) To add variety to your instruction
Always (Nearly 100% of the time)
Most of the time (About 75% of the time)
Often (About 50% of the time)
Not very often (About 25% of the time)
Never (Almost 0% of the time)

e) To help your students complete projects
Always (Nearly 100% of the time)
Most of the time (About 75% of the time)
Often (About 50% of the time)  
Not very often (About 25% of the time)  
Never (Almost 0% of the time)  

f) To make yourself more efficient  
Always (Nearly 100% of the time)  
Most of the time (About 75% of the time)  
Often (About 50% of the time)  
Not very often (About 25% of the time)  
Never (Almost 0% of the time)  

22. This question is about why you do not use technology in your teaching when otherwise you would.

Please RANK the following items according to how much of a challenge they present for you as you try to use technology. Rank these from 1 - MOST CHALLENGING to 4 - LEAST CHALLENGING. Please remember you are RANKING these items so only one answer can be put as #1, only one can be put as #2, etc. The computer will not let you rank two answers the same. If there is a major challenge to your using technology that is not here, please list it as "other."

   a) There is a lack of technology at my school  
   b) I'm not sure how to use technology and handle class management issues  
   c) There is a lack of administrator/cooperating teacher support  
   d) I'm not sure how to use technology in my specific discipline  

23. If you answered "other" to the previous question, please explain the challenge you have that keeps you from using technology as much as you would like.

24. Please rank how well each answer represented your experience in the modeling sessions. Rank these items from MOST representative of your experience to LEAST representative. (1 represents MOST and 7 represents LEAST). Please remember you are RANKING these items so only one answer can be put as #1, only one can be put as #2, etc. The computer will not let you rank two answers the same.
a) Modeling sessions helped me brainstorm new ways of using technology in my teaching
b) Modeling sessions helped me learn a new technology in the context of a lesson plan
c) Modeling sessions helped me understand the students’ perspectives using technology
d) Modeling sessions helped me learn a technology through hands-on projects
e) Modeling sessions helped me want to use technology in my own teaching
f) Modeling sessions helped me understand how using technology in schools really works
g) Modeling sessions helped me see how students react to using technology

Survey Page 6 — Items related to my third research question: What strategies could lead to effective modeling?

25. Whether you collaborated on assignments or split up the work to do on your own, why did your group choose to work together the way you did? (Select the answer that is MOST true of you).

a) Took less time
b) It was easier to help each other out when we got stuck
c) I learned more
d) Hard to coordinate schedules
e) I already knew technology well
f) It was more enjoyable
g) We created better projects
h) Other (please specify)

26. Please rate each of these options according to HOW IMPORTANT they could be for improving the modeling sessions.

a) Have more time in class for helping us learn the technology
Very important Somewhat important Not very important Not at all Important

b) Have better trained lab assistants/TAs who can help us during the week
Very important Somewhat important Not very important Not at all Important

c) Have smaller class sizes or more TAs to help us during class
Very important Somewhat important Not very important Not at all Important

d) Meet twice a week for an hour instead of once a week for two hours
<table>
<thead>
<tr>
<th></th>
<th>Very important</th>
<th>Somewhat important</th>
<th>Not very important</th>
<th>Not at all Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>e)</td>
<td>Put us in groups where there is someone who knows the technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>Have more individual accountability in the group work so lazy students don't get the same credit as industrious students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g)</td>
<td>Have more reflection/discussion activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h)</td>
<td>Have less focus on specific, minute details that need to be accomplished to get a good grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Use a wider variety of technologies in the modeling sessions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j)</td>
<td>Connect the modeling activities more closely with methods classes in my major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k)</td>
<td>Have times during the week when teacher/teaching assistants could provide assistance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l)</td>
<td>Teach more challenging technologies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m)</td>
<td>Switch up the groups after each activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n)</td>
<td>Take less time in class on subject material and more time working on the project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o)</td>
<td>While we are in class, explain better the skills needed for each assignment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p)</td>
<td>Give a general purpose for each activity and allow students to be creative in finding ways to complete the activity (i.e. don't require everyone to do exactly the same thing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q)</td>
<td>Do less modeling sessions and more activities where we see videos of teachers using technology</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
27. What aspects of the modeling sessions worked well (remember that the term “modeling session” includes the in-class presentation and activity, out-of-class work, and assessment). WHY?

28. What aspects of the modeling session did not work well? How could they be improved?

29. Did you watch videos in class of teachers using technology? If you did, please explain the difference between the video models and the modeling sessions that you participated in. What aspects of each were useful? Why?

Survey Page 7 — Thank you and request for an interview

30. Thank you for participating in this survey! Your answers will help me in my own personal research, as well as make significant contributions to the continuing development of the IP&T 286/287 course.

   Could I interview you at your convenience to clarify my understanding of your answers and your experience in IP&T 286? The interview would take about 20 minutes, and I will contact you to set up a time that's easy for you. Participation in this interview is voluntary, but would very helpful for my research.

   a) Yes, you may interview me for your research
   b) No, I would rather not participate
Modeling 140
APPENDIX E

SURVEY ANALYSIS AND RESULTS

The survey was designed to test many of the themes gleaned from the preliminary interviews and determine whether these patterns could be sustained across a wider sample. The entire survey is available in Appendix D. The survey contained six demographical questions, eight questions aimed at answering the first research question of this study (What was the students’ experiences?), 10 questions designed to answer the second research question (What impacts did the modeling have on the students’ learning?), and four questions created to answer the third research question (What strategies can guide effective modeling?). The survey also included a request for further participation in follow-up interviews, to which 42 students answered positively.

The following is my analysis of the patterns I identified in the survey results. I compared these findings to what I learned in the preliminary interviews, and used this knowledge to structure the protocol for my final interviews.

*Demographic Questions*

There was a potential population of about 1,280 former students of the course, and 159 suitable respondents completed the survey, or about 12.4% of the entire population. This number was lower than what I had hoped, and the response rate was probably negatively affected by the fact that the survey was sent out the first week of December, as final projects and test began to press down upon students. There were also a few difficulties in administering the survey, including the fact that many students have changed their emails and thus did not receive the survey.
Despite the low response rate, the respondents were more or less evenly disbursed among the major demographical areas. Because they were evenly distributed, it was not necessary to resample any major part of the population. Of the respondents, four took the class in fall 2002, 25 in winter 2003, zero in spring/summer of 2003, 47 in fall 2003, 60 in winter 2004, and 22 in spring/summer of 2004. While none responded from the spring summer semester, the population was low for this semester anyway so it was not too surprising. It is believed that the low response from students taking the class in fall 2002 is due to the fact that most of these students have graduated and no longer have/use their BYU email addresses.

Seven instructors have taught IP&T 286 from fall 2002 to spring/summer of 2004, and all were represented well considering that some taught for more semesters than others. Twenty-two students reported being taught by Dr. Charles Graham, 19 by Dr. Mitch Pratt, 21 by Suzy Cox (graduate teaching assistant, or GTA), 35 by Richard Culatta (GTA), 11 by Dr. Stephanie Allen, and 31 by Rick West (GTA). The respondents also represented 15 different teaching emphases, 73 studied early childhood education/elementary education, while 55 studied secondary education and 16 were studying special education. These proportions are relatively consistent with class enrollments.

One question asked whether students were yet teaching, and 26 students reported they were currently student teaching or employed full or part time as a teacher. Eighteen reported having changed their majors from education and 115 were education majors not yet teaching. When asked how they self-evaluated their technology skills against other students in their IP&T 286 class, the result was more or less bell-shaped with 18 feeling
they were very much above average, 55 above average, 70 about average, 11 somewhat below average, and five very much below average.

Questions About Their Experience

When asked to rank IP&T 286 activities according to how helpful they were in preparing them to use technology effectively, students indicated that creating lesson plans was most helpful, followed by workshop days when the instructor taught a new technology, modeling lessons, class discussions, viewing video models, and reflection/writing activities. When asked whether reversing roles and playing the role of a K-12 student was helpful or not, 57.3% indicated that it helped them while only 5.3% said it made learning more difficult and 37.4% said it didn’t matter.

When given different statements about their experience and asked if the statement described their own personal experience, 84% agreed that they enjoyed the hands-on aspects of modeling, and 71% said they reflected during the activity about how to transfer the learning to their own teaching. Only 39% felt they struggled because of a poor TA-to-student ratio, 28% struggled because they needed to learn both a technology and some subject material to complete a project, and 35% felt the activity was forced or artificial. Seventy-three percent agreed that the modeling activities were fun and useful.

One question asked about how the students completed their group work, and 24.6% said they did the work individually and emailed the pieces to one team member, while 23.1% said they collaborated together on the projects. The majority, 52.3%, did a mixture of both. When asked about their out-of-class experience completing the homework associated with modeling activities, students strongly responded that the assignment was useful and enjoyable, though often frustrating at first.
There were two open-ended questions about the students’ modeling experiences, one about their in-class experience, and one about their out-of-class experience working in groups on the assignments. About one third of the respondents (57 to 60) also answered the open-ended questions. The top theme present in the students’ descriptions of their in-class experiences was that the experience was not useful or not relevant. One of the main reasons why students felt this way was because there was such a diverse range of technological abilities in the class that students more experienced with technology felt they were not really learning anything because the instruction catered to beginners. Meanwhile, less proficient students felt the instruction was too rapid and that there were too many students with questions and not enough teaching assistants to assist them. One student explained the situation by saying, “I felt like our range of technological abilities were so diverse, that it made the in class activities relatively pointless for me. There were those in the class who did not even know what a PC was, and then there were a bunch of us who had already worked extensively with most of the programs and found class time pointless because it was spent working on the basics, which we already knew.” Another student said that “I felt it would have been a more helpful class if they gave the option for an ‘advance use of technology’ or a ‘beginner use of technology.’” Another major reason why the students felt the modeling activities were not relevant was because they modeled a different teaching emphasis, or a different grade level, from that they intended to teach themselves. One student typified this theme by saying, “I think it would be helpful to offer a variety of activities ranging in various grade ranges. Also grouping the students in groups of grade level they wanted to teach would be helpful.”
The in-class experiences with the modeling was not all negative, however. There were also many students who indicated that the activities were useful, instructional, and helpful to their future careers, although they did not usually explain why or how they modeling sessions were useful. It seems that some students had a great experience with the modeling sessions and others did not, and it is not immediately clear why the students felt one way or the other or what other factors caused this division.

When asked about their out-of-class experience working in groups on the assignments, the main theme mentioned by students was that it was difficult to schedule a time to meet as students and the assignments took too much time. There was also another strong division between students proficient with technology who felt that they were wasting their time, that they were not learning anything new, that the teachers expected too much without explaining it properly, and that they (the students) were doing an unfair proportion of the workload in their group. On the other hand, students not as proficient with technology were grateful for the group experience and felt frustrated that there were not more experienced lab assistants to help them when they had problems with the technology during the week.

Questions About the Impacts of the Modeling Sessions

Students indicated that the most helpful aspect of the modeling sessions were learning ideas for how to use technologies as a teacher (42.6%), and teaching new technology skills they didn’t know before (36.1%). Only 18.9% felt the most helpful aspect of the modeling sessions were learning principles for effectively integrating technology into their teaching. Seventy-nine percent of the respondents said it was easy to transfer what they learned in the modeling sessions to their own future teaching. The
students did not feel that it was too difficult to make this transfer when the subject matter or intended age level of the modeling lessons was different from what they were planning to teach, nor did they perceive it to be too difficult when they were learning a new technology or playing the role of a K-12 student. It seems that the students felt that it was usually easy to transfer the learning from the IP&T 286 situation to their own future teaching contexts.

The modeling activities appeared to have had a positive impact on the students’ attitudes and confidence levels. Over 87% indicated that they were somewhat or very excited to use technology as a teacher after the modeling activities, and 92.5% said they felt somewhat or very confident in their abilities to use technology after the activities. When asked how they use technology in their current teaching or class projects, or how they intended to use technology in the future, the top rated answers were: (a) to increase teacher efficiency, (b) to improve teacher presentation of material, and (c) to help students complete projects and learn more effectively or creatively.

The top challenges to using technology that the students perceived to exist were a lack of technology at their school, followed by a lack of knowledge about how to handle class management issues while using technology. When asked to rank different statements about their experience with the modeling sessions, most students felt the modeling helped them learn a technology through hands-on projects and helped them to brainstorm new ways of using technology in their teaching. Many students also felt that modeling sessions motivated them to want to use technology in their own teaching, but most students did not feel that the modeling sessions helped them understand the
students’ perspective of using technology, or understand how using technology in schools really works.

Questions About Strategies for Effective Modeling

A question on the survey asked students what motivated their group work and their decisions about whether to work more collaboratively than individually. Almost 59% indicated that the primary motivation was convenience and time-saving concerns. Only 25.9% said they chose to work together the way that they did so they could learn more or perform better. This question existed on the survey to help us understand whether the current structure for the group work is succeeding, and it appears that it may not be, and that students are not seeking better learning from their collaborations.

The main question in this section of the survey asked students to rate different options for improving the modeling activities. These options were derived from comments made by students in the preliminary interviews, as well as from instructor perceptions and experiences. Those suggestions that were rated at least a two (at least somewhat important) on a four-point Likert scale were:

1. Have more time in class for helping us learn the technology (1.81)
2. (tie) Connect the modeling activities more closely with methods classes in my major (1.81)
3. Give a general purpose for each activity and allow students to complete the activity (1.83)
4. While we are in class, explain better the skills needed for each assignment (1.86)
5. Have times during the week when teacher/teaching assistants could provide assistance (1.87)
6. Have smaller class sizes or more TAs to help us during class (1.94)

7. Take less time in class on subject material and more time working on the projects (2.00)

8. Have better trained lab assistants/TAs who can help us during the week (2.01)

9. (tie) Have more individual accountability in the group work (2.01)

The majority of these seem to tie into a general theme of students feeling ill-prepared to use the technology to complete projects. The majority of the students, it appears, feel the best way to improve the modeling is to provide more, and more effective, training on how to use the technologies required for the projects.

There were two main open-ended questions in this part of the survey. One asked what aspects of the modeling sessions worked well, and the second asked what improvements could be made. In the first question, the biggest theme was about how the modeling sessions were hands-on. The students felt this was the best way to learn the technology, and how to integrate it into lessons. For example, one student commented that “I liked the out of class work because it gave me an opportunity to apply the ways I could use technology in my teaching in my group. This way I was able to see if I could really do it.” Another student commented that “It gave us a hands-on opportunity to do what we might actually teach our students.” A parallel theme was that some students felt it was helpful that the modeling sessions “forced” them to learn a technology so they could complete a project, and it was effective for them to learn technology skills by trial and error and practice. One student commented that “I learned a lot playing around with the software on my own. I think this is a really helpful way to figure out where students
may have questions—by diving in to the technology myself and seeing where things weren't clear or where I struggled, as well as what things I thought were new and exciting and fun.”

Another group of students felt the modeling was useful because it helped them visualize how to use technology in actual teaching situations, as well as gave them ideas about how to apply these skills in their own teaching. One student said that “I could see how the teacher would go about actually teaching the lesson. This helped me see the steps that made the lesson flow the easiest,” while another student remarked that “It really helped us to see what could be done with the technology.” A smaller pattern among a few students was that the group work was helpful for them in learning how to use a new technology.

The top suggestion given for improving the modeling sessions was to have more time in class to work on the projects, learn the technology, and understand what the expectations were for the project. Many students indicated that they were confused about what was expected of them, as this student explained it: “I also did not like it when things were explained so fast (because of the time limit) that we had no real clue how to do it.” Another student said that “I just wanted more time to be able to work on things in class with the teacher right there,” indicating a trend that students felt frustrated when they couldn’t complete projects because of technical problems that they felt they needed the teacher’s help to solve. A similar theme in some ways was indicated by some students who felt that the instruction itself was poor and needed to be improved. This was sometimes because the teacher moved too fast, leaving students with questions (“Vague explanations of specific expectations”) and sometimes because the instruction was not
engaging (“The lecturing (excluding the demonstrations) was not very enjoyable, thus it was not engaging and it was hard to stay attentive”). Another group of students felt the group work was not useful because the workload was uneven (“I felt like I had to pick up the slack”). Some students also felt that the projects were not very applicable to their careers. One student described these feelings by saying, “We felt like we were forcing technology on projects that didn't require it and didn't really make it helpful. Do more realistic and applicable projects.”

A final question on the survey asked students to reflect on any video models that they saw in class, and to consider the usefulness of viewing video examples in contrast to live modeling sessions. Students were divided fairly evenly in their preference for these two methods. Most students who believed the modeling sessions were more useful thought so because they were hands-on and helped them actually learn a technology. However, many students considered the video models to be more realistic because they were “real” teachers teaching “real” students and they gave ideas for “real” uses of technology in teaching, perhaps reflecting that this was more applicable than the role playing required for the modeling sessions. However, an equal number also thought the videos were boring, and usually an invitation to doze off.
APPENDIX F

THEMATIC ANALYSIS OF INTERVIEWS AND SURVEY

After I collected the survey data and analyzed it, looking inductively for themes and patterns, I compared the patterns that emerged from the interviews to those that were found in the survey data. Granted, these were very similar because the survey items were created based on my initial analysis of the interviews. However, there were some themes that seemed strong in the interviews that were not supported by the survey data, and a few new ideas were apparent in the survey data that I had not noticed the first time that I read through my interview transcripts, but on reflection, were ideas that had been present there all along. As I compared the ideas I had learned from the interviews to those from the survey, I discarded, at least for now, those themes that seemed weaker or less important. I also tried to organize my thoughts towards what kinds of strategies or improvements to the current modeling methodology could be extracted from the data. This analysis and reflection led to this list of conclusions and suggestions, which I then shared with Graham and he helped me reason through this list even more, narrowing it down to the single idea of transfer and application, that I then explored in the follow-up interviews. He suggested, and on reflection I felt he was right, that some of these ideas are not really that practically significant; in other words, they didn’t lend themselves to any suggested action that could improve the situation. I agreed, but still feel that some of these ideas that were discarded could be elements of something bigger, that in future research studies, perhaps, could have also proven to be significant.

What follows is the document that I created to present to Graham, showing the
findings supported through the first two rounds of the research project (preliminary interviews and survey).

**Experiences**

1. Students expect to learn new technology skills in the class and in the modeling sessions. This was evident in beginning students to older students. All wanted to be challenged and to learn new skills

2. Students (usually those more comfortable with technology) often liked the opportunity to learn and work on their own, but students wanted support when they got stuck, whether it was better trained LAs, more TAs or TA office hours, or longer class periods.

3. The biggest impediment to group work is conflicting schedules

4. Second biggest problem to group work is uneven abilities

5. Students had little patience for projects geared towards other contexts different from their own. It was difficult for them to make the transfer from different contexts, particularly when it was the subject matter that was different

6. Students liked being actively engaged in using the technology, and felt this was very important

7. Students felt modeling sessions helped them learn technology, but to go the next step, learn how to integrate technology in their teaching, they felt the modeling sessions were not sufficient, and they wanted to do something more directly applicable to teaching, such as creating lesson plans and activities.

**Impacts**

1. Modeling had the following impacts on students:
2. Helped them learn ideas for using technology
3. Gain new technology skills
4. Improved confidence/desire to use technology
5. Did not help them understand how to integrate technology in actual teaching
6. Did not help them understand how it would be for real teachers and real students to use technology

*Strategies*

1. More options, including sections/activities geared for specific teaching disciplines, and sections/activities geared towards different levels of technology expertise.
2. Make the class a one or two hour instruction with one hour lab with students required to come work as groups where TAs/Las helped.
3. Allow for both individual and group assessment
4. Allow more creativity/flexibility for students to create projects relevant to their majors and interests
5. Connect the class more closely with methods sections
6. Provide more support for struggling students
7. Have clearer expectations
8. More TAs, LAs who do more than grading but help with teaching
9. Blend more video modeling with the f2f modeling – if possible create video case studies of the same modeling sessions the students create projects for?
APPENDIX G

FINAL INTERVIEW PROTOCOL

The final interviews were designed to test some of the major themes identified in
the first two phases of the research, particularly those themes related to students
expectations for the course (whether they expected to learn technology skills, teaching
methodology, or both), and what kinds of issues, if any, made it difficult for them to
transfer the learning from the modeled context to their own.

*Interview Protocol for Final Interviews*

Purpose: Investigate the reasons for the following patterns related to
EXPECTATIONS and TRANSFER

Pattern: Students expect to learn new technology skills in the class and in the
modeling sessions. This was evident in beginning students to older students. All wanted
to be challenged and to learn new skills

Pattern: Students had little patience for projects geared towards other contexts
different from their own. It was difficult for them to make the transfer from different
contexts, particularly when it was the subject matter that was different

Pattern: The modeling sessions did not always help them to understand how to
integrate technology in actual teaching situations, and to understand how it would be for
real teachers and real students to use technology

*Expectations*

What was the purpose of IP&T 286 in your mind?

Many students have indicated that they felt the class purpose was to help them learn
technology skills. However, the instructors say this is only one of two purposes: the other
being to teach skills for using technology in actual teaching situations, skills that will
apply to many different types of technology. Explain what "technology integration"
means.

1. Are students aware that this is also a purpose of IP&T 286?

2. Why do students expect the class to teach them technology skills?
3. What perpetuates this expectation? Former students? Programs? The IP&T 286 teachers themselves? Class structure and organization?

4. Why do students feel this is so important?

5. Why don’t students value learning general technology integration principles as much?

6. Did the modeling sessions teach integration principles as well as they taught technology skills? Why or why not?

7. What could be done to better emphasize how to learn integration principles?

**Transfer**

Explain the term "modeling sessions" and "transfer"

1. Did you feel the modeling sessions were easily transferable from the IP&T 286 context to your own teaching context? Why or why not?

Some students indicated that some of the modeling sessions did not transfer very well. This was often because these students were preparing to teach a different subject, or age level, than the modeling sessions.

1. Was this also true of your situation? Explain why the transfer was difficult for you.

2. Why was this such a barrier?

3. Why was it difficult to transfer to your own context?

4. What could be done to ease this transfer?

5. Some students indicated they didn't feel the modeling sessions showed them how to use technology with "real" students in "real" teaching situations.

6. Did you also feel this way? Why?

7. Why didn’t the modeling sessions seem more “real”?

8. What could be done to make them seem more realistic?

9. Even though the modeling sessions simulate real teaching situations, do they help you think about real teaching situations and how things would work?

10. If modeling sessions do not seem very realistic, what is the value in doing the modeling? What did you learn from them?
APPENDIX H
RESEARCHER PARADIGMS, ASSUMPTIONS, AND VALUES

How Assumptions Guided This Research

By acknowledging what belief structure guided a particular study, the readers can then more accurately evaluate the effectiveness of the research within that belief structure. My own view of reality falls most closely within the postpositivist paradigm as described by Hatch (p. 14-15). I conducted this thesis research knowing that individuals can have very different experiences while participating in the same activity, but I believed that a reality existed that could describe in broader, more general terms students’ experiences as a whole in modeling sessions. I believed that if this reality could be learned, then it could be studied and explained to some degree, and I believed I could best study this reality through triangulation of both quantitative and qualitative data. I believed that I would better understand this reality by being as objective as possible in my collection and analysis of data, but I realized that I was necessarily laden with values concerning the subject since I am an instructor in the class and use the modeling methods under investigation in this thesis. Thus, I have included a statement exploring my biases and values and how I attempted to minimize how much these tainted my analysis.

My value set and goals in conducting this research also aligned somewhat with those commonly identified in action research studies. In other words, I believed that there was some correlation between what the instructors did in the class and how well the students learned, and this project was designed to help generate ideas to improve the teacher pedagogy in the class so students could learn better. My main hope for this
project was to identify and create theories, principles, and ideas that might improve how teachers are trained to use technology both at BYU and at other institutions.

**Researcher’s Role With IP&T 286**

As indicated above in my discussion of the design of this research study, I feel it is important to indicate to the reader and to myself what my prior biases and opinions were regarding IP&T 286 and the modeling sessions. I began teaching IP&T 286 in the fall of 2003 and continued through fall semester of 2005. During this time I was actively involved in the continual redesign of the course, including the redesign of the modeling sessions. I have always felt that the modeling sessions were a useful method for teaching students how to use a new technology in the context of a learning activity, as well as believed that the modeling sessions helped students understand new ways for integrating technology into their own teaching. I also felt that most of the students enjoyed the activities, but that they probably did not always enjoy the group collaboration or the difficulties usually present in learning a new technology. I also believe that project-based learning, situated learning, and constructivist pedagogical styles of teaching are often appropriate, and the modeling session activities were designed following some of these theories.

However, most of these ideas and feelings that I had for the modeling lessons were general and vague, and I did not know specifically what the students’ experiences were like in the modeling sessions nor what kinds of specific impacts the modeling lessons were having on their learning. For example, we felt that the principles learned in the modeling lessons might be more easily remembered by the students because they were kinesthetically involved in the learning, but we were not sure if this was the case or
why. We also wondered whether having the students switch roles and play the part of K-12 students was useful, and if so, to what degree should the roles be played out?

In our continual discussion about how to improve the course, we were also not sure what kinds of strategies could improve the implementation of the modeling activities. I believe that while overall I had a positive impression of the modeling session and some ideas personally about how to effectively implement them, I did not have very established theories regarding the research aims of this study. Because of my experience in the class, perhaps I cannot say that the conclusions of this research were wholly emergent from the data and independent of the researcher, but I do believe that to some degree this is the case because I did not have firmly established ideas and theories before beginning the research. Instead of attempting too much researcher objectivity, I have tried to use my experience in the class to provide theoretical sensitivity that helped me identify patterns and themes in the data that I recognized would be valuable in answering the research questions.