

**Pre-service Middle School Teachers Reflecting on Instructional Practice through  
Technology**

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## Introduction

Engaging in reflective practice is essential for preservice teachers in their professional development (Richert, 1990; Russell, 1997). Structured thoughtful activities to help reflect on early teaching experiences are likely to produce beneficial results. Reflective preservice teachers may improve pedagogical practices (such as using multiple assessment methods, engaging students in higher order thinking, and incorporating technology tools into the classroom) and may hold more positive beliefs about teaching (such as greater self-efficacy, positive affect for teaching, and improved attitudes toward technology) (Ogberg & McCutcheon, 1987; Day, 1999).

In the University of New Hampshire's teacher education program, we provide at least two formal opportunities for preservice interns to reflect on their practice. University faculty supervise interns and conduct 6 formal observations each semester during the year-long internship. These observations follow the cyclical supervision model of: pre-conference, observation, post-conference, and identifying goals for future observation. In addition, as part of our program requirement, teaching interns must lead a colloquium session during their final semester. The purpose of the colloquium is to focus on a specific question, issue or problem that is then intern wants to investigate. After careful preparation, the intern leads a thoughtful discussion of his or her question with a group of colleagues (e.g., other interns, university supervisor, cooperating teacher, other university or school-based faculty) in a format that he or she determines. This process allows the intern to use a problem-solving approach that is based upon improving their instruction.

In prior years, students have used different formats for colloquia, including action research projects and case study methods. This year, the interns at one middle school site created an electronic Exhibit of Practice as their colloquium presentation. The Exhibit of Practice allowed the preservice teachers to: explore an important developing aspect of teaching, document a classroom pedagogical approach, and provide evidence of progress through written reflection, student work, and comments from colleagues.

Other colleagues at UNH have begun to gather evidence that creating and presenting a colloquium project is beneficial to our interns for improving teaching strategies and for providing a rite of passage into the professional community of teachers (Finkel & Fletcher, 2002). However, we have just begun to explore the benefits of different colloquia formats. As technology becomes more integrated into both K12 settings and university teacher education programs, it is important to explore the potential benefits of using technology as a reflective tool for teaching interns. This research project concentrated on describing the experiences and any change in beliefs and teaching practices the interns investigate and the interns' use of technology as a tool for reflection on their practices or as a method to engage their students in learning. Our specific research question was:

- How does self-reflection through developing an electronic exhibit of practice relate to novice teachers' beliefs and behaviors?

This question will be addressed through a series of sub-questions:

- Does the benefit of developing an electronic Exhibit of Practice extend the use of technology into classroom practice?
- Does developing an electronic Exhibit of Practice increase use of the teaching strategies examined?
- How do novice teachers' views of technology shift when developing an Exhibit of Practice?
- Do novice teachers' self-efficacy and motivation for teaching change from their participation in creating an electronic Exhibit of Practice?

## **Method**

### Participants

This research focused on four interns at one middle school in the Seacoast Region of New Hampshire. The interns were 3 females and one male ranging in age from 22 to 25 and they were teaching in a variety of content areas -- social studies (2), English and science. These interns have a Bachelors degree in their subject area, have taken the five core courses in education prior to entering the internship experience (Educational Psychology, Educational Philosophy, Educational Structure and Change, Methods, and Teaching Exceptional Learners) and were enrolled in a year-long internship under the guidance of a cooperating teacher and a university supervisor. All participants were offered the opportunity to participate in this project for the year. They were paid a stipend to participate in building an electronic exhibit of their practice, provide researchers with evidence of their reflection on practice (i.e., journals, supervision notes), and be interviewed 3 times during the year. They understood that their participation was voluntary and that they could withdraw from the project at any time with compensation being pro-rated for the amount of time they participated.

### Setting

The teacher education program at UNH requires certification candidates to complete an internship experience that emphasizes co-teaching with the cooperating teacher and includes 12 observations annually by the university supervisor. Capstone experiences of a colloquium presentation and a portfolio are required for all interns. The middle school cluster site in which the interns in this study were placed is in a middle income rural community and was recently designated as a model middle school by the New England League of Middle Schools.

All interns participated in a weekly seminar led by their university supervisor that serves as an orientation to the teaching profession, provides on-going support for interns, and allows the opportunity for working on the colloquium and portfolio. Interns also met regularly with their supervisor individually as part of the observation and conferencing cycle. Through the group and individual discussions, interns were guided in their choice of colloquium topics.

All participants had access to the ALI (Apple Learning Interchange) to view model exhibits of practice as presented by APPLE Inc. and their state affiliates. The participants' use of technology was supported by the UNH Department of Education's technology specialist, the cluster site mentor teacher, the researchers, and their fellow interns. The cluster site mentor was an experienced teacher who has successfully enacted

technology in his classroom. He mentored the interns in their knowledge of technology tools, the use of technology in the classroom, and the creation of an Exhibit of Practice. This mentor teacher attended relevant PT3 workshops on Exhibit production and worked with university faculty in the classrooms of the interns to model technology use and assisted the interns as they used technology with their own students. A technology specialist from the NH Department of Education also held three day-long workshops to guide interns in their electronic colloquium building.

The technology specialist, the mentor teacher, and the researchers attended the workshops on how to develop an Exhibit of Practice offered by the New Hampshire's Office of Technology.

### Colloquium

The colloquium provided an opportunity for each intern to take an in-depth look at a problem, issue, belief or instructional practice. The interns started thinking about the colloquium in the fall, worked on the project throughout their internship and led a conversation with their colleagues (including other teachers, interns, administration, and UNH faculty) about what they learned at the end of the year.

### Data Collection

Over the eight months of the students' internships, several data sources were used to gather information:

- *Three semi-structured interviews with each of the four interns on colloquium topics, instructional beliefs and practices about technology*

The three interviews concentrated on the following questions:

- What are the current views of the intern on the colloquium topic?
- What are the interns' views on the use of technology to help the reflection process?
- As a result of developing an Exhibit of Practice, has the interns' instructional practices on technology or the colloquium topic changed in the classroom?
- What are the obstacles the interns are encountering as they develop their Exhibit of Practice?
- Other questions of interest as they arise

The interviews were audio-taped and transcribed for analysis.

- *An exit interview with the university supervisor*

The exit interview collected information about the interns' progress. The interview focused on the interns' Exhibit of Practice, the interns' understanding on the colloquium topic. Any changes in the interns' instructional practice as a result of this experience were described. The interview was audio-taped and transcribed.

- *12 observations of each intern*

All the observations were conducted by the supervisor. The supervisor observed for teaching strategies, types of activities, student participation, questions asked, technology used. Running records of each observation were taken and summary notes compiled. Those summary notes included a description of the conferencing conversations held with

the intern and identified issues of concern or questions about improvement raised by both participants.

- *Interns' journal entries*

Interns were asked to keep a journal regarding their teaching. They described the events of the weeks, their reflections of their teaching, and ideas for improving their practice. Three of the four participants completed a journal.

- *Interns' Exhibit of Practice work*

Interns' exhibits of practice were collected as documentation of the question they posed, how they collected evidence to answer the questions, their conclusions and reflections on their own teaching.

### Data Analysis

All field notes, interview transcripts, journals, and student work were arranged in sequential order. Each researcher independently developed a case study for each of the four interns through repeated readings of the data sources. Potential themes of teaching and technology were informally noted and then grouped into larger related categories. The researchers met and discussed their cases and the themes that emerged from the data. The agreed upon themes were: technology beliefs, progression through the internship, self-efficacy beliefs, the colloquium process, exhibit building as reflective practice.

The process was repeated by modifying, combining and even discarding existing themes. Meetings were held to advance tentative explanations about the meaning of the data, to speculate about the relationships between ideas, and to tie empirical data in the data sources to larger concepts of teacher practice and perceptions (Miles & Huberman, 1994). The analysis process resulted in a series of assertions that explained what was happening for the four case studies. A systematic search through the data record was conducted for concrete examples (Erickson, 1986) for each assertion. Through interpretive analysis, emerging patterns in the data led to the formulation of the assertions that illustrated the ways these teachers taught with technology.

## **Results**

Our results fall into three categories: case studies, sub-question reports, and final conclusions about the major research question. Each of the case studies is contained in Appendix A. Examples of evidence from the data to support the case study and conclusions are presented in Appendix B.

### *Sub-question 1: Does the benefit of developing an electronic Exhibit of Practice extend the use of technology into classroom practice?*

. The interns integrated technology in the classroom in three out of the four cases because of the emphasis on technology inherent in development of an EEP. None of their cooperating teachers used technology extensively in their classrooms prior to this year in spite of being employed in a technology-rich school. However, the science teacher stated

it was one of her goals. The middle school has a mobile computer lab, computers in the classroom and in the library for students that are connected to the Internet. Through interacting with the supervisor, the evaluator, and the supporting mentor teacher, the interns realized that technology was important to try to integrate into the classroom. There were several opportunities to learn about Inspiration and PowerPoint and to see it integrated in the classroom. The mentor teacher taught two of the preservice teachers, Lynn and Sally, how to create web pages using Microsoft Front page. These opportunities are usually not offered at other preservice teaching sites.

It became very evident that the preservice interns used technology to support their emerging beliefs about instructional practices and their self-efficacy as teachers. In this section, we will discuss technology in relation their beliefs about instructional practices.

The interns were more technologically knowledgeable than their cooperating teachers even from the beginning. All preservice teachers professed feeling comfortable with word processing and Internet searches. They also had some familiarity with Excel and PowerPoint. We will show how each intern integrated technology differently to support their instructional goals.

Sue, an English intern, integrated some forms of technology into her classroom to support her teaching goals and objectives. In her colloquium project, the students used the mobile computer lab to research persuasive writing pieces. They also used the computers to write advertisements and persuasive pieces of writing. Her goal was to use technology as a way to motivate the students by having them research and create pieces of persuasive writing that would empower them to be able to make a change in the world.

Lyn, a social studies intern, and Sally, a science intern, extended their knowledge of technology and integrated effectively into the classroom. While Lynn's goal was similar to Sue's objective in that she wanted to students to be motivated to learn social studies through the use of debate. In pursuit of that goal, Lynn developed a web site that contained online resources on controversial and relevant Supreme Court Cases. She let the students research these cases for four days in preparation for a structured debate.

Sally's goal was to have students learn more about the scientific process by creating graphs with real data. She also created a web page with online data sources on the weather. The students needed to learn and present on different weather types using a graph that they created to support the presentation about the weather.

Tom integrated technology into the classroom in a very limited manner and it only supported his instructional beliefs in a limited manner. He believed in an inquiry-based, student-oriented classroom. However, he did not integrate technology into his colloquium project. He found the use of the Internet to find original source documents and visuals a very useful tool but did not structure opportunities for students to use technology in the classroom.

Integrating technology into the classroom did not to change interns' beliefs in their instructional practices. They came into the internship with the belief in inquiry-based, student-oriented classroom. However, technology did support 3 out of the four preservice teachers' instructional methodologies which can be crucial as preservice teachers struggle to implement their emerging beliefs in the face of experienced cooperating teachers.

Sub-question 2: Does developing an electronic Exhibit of Practice increase the use of teaching strategies examined?

The supervision aspect of our teacher education program revolves around the cycle of goal setting-observation-reflection. Throughout the year, the interns and their supervisor engaged in this process and identified teaching strategies which each intern could adopt in her or his classroom then evaluate the effectiveness of that approach. On-going reflection is key in this process since it is through this reflection that new goals are developed and the evaluation of prior goals is made. Feedback for reflection included observations by the supervisor, discussion during a weekly seminar, and the development of a portfolio and the electronic exhibit of practice.

Although many ideas for improving the interns' teaching were discussed during the year, certain key questions or themes emerged. The major questions interns raised were related to their concerns for student motivation and learning. In other words, they were less concerned with their own performance and more concerned with the ways in which students could be engaged in the classroom and could better understand content.

Overall, each intern identified between 2 and 4 significant areas of practice that they wished to improve during the year.

- Sue wanted to find ways to improve the mechanics of student writing, explore methods for writing conferences, engage students more in their readings, and design activities that were relevant and important to students.
- Tom wanted to use competition in his classroom to engage students, to develop guides for assisting students in projects, to develop alternative forms of formative and summative assessment in his classroom.
- Sally wanted to improve her students' ability to collect, use and interpret scientific facts and data, to encourage widespread participation among all students in her classroom, to integrate technology into her instruction, and to develop alternative formative and summative assessments.
- Lynn wanted to improve her classroom management, to enhance student discussions in her classroom, and to provide opportunities for students to develop research skills with primary resources.

The electronic exhibit led interns to develop a strategies or approaches to their teaching, primarily focused around questions or concerns identified. Therefore, the answer to this sub question is that all interns increased the teaching strategies examined because of their participation in the exhibit building.

- Sue's project used student choice and ideas to help them connect the features of persuasive writing into matters of importance in their own lives.
- Tom examined three different types of competition and analyzed which could be used successfully in his classroom and under what conditions they were effective for students.
- Sally assisted students in finding weather related data then analyzing that data by constructing and interpreting graphs.
- Lynn constructed a website that guided students' research of facts to support them in having a classroom debate.

The question remains whether the electronic exhibit format led to the enactment of new teaching strategies, or whether any exhibition format would have the same result.

In addition, a second aspect to the sub-question is whether the interns used the teaching strategies they've examined in their daily practice beyond their exhibit project. On the surface, it appears that all students will continue implementing some form of the strategies they tested.

The answer to this question is moderated by the students' general approach to reflection and by their beliefs about teaching. Two of the interns possessed a strong sense of self-efficacy for teaching from the beginning of the year. These students spent little time reflecting on their practice and used the exhibit as an opportunity to try something new which they already believed would work, such as Tom's use of competition in the classroom and Sue's encouraging students to use multiple forms of communication. Both of them already held strong beliefs that their approach would work and used the exhibit to confirm their existing beliefs. They stated that they would continue to use the strategies they examined in their exhibit. Sue did take the additional step of considering whether different lessons were effective in her classroom (engaging for students, produced artifacts to support student understanding). However, instead of considering the larger principles of why those lessons worked or not, she stated that she would remove the less effective lessons in the future. Evidence for their lack of reflection includes that they completed very few pre-observation reflection sheets and journal entries.

The students who were less confident in their teaching tended to address questions that they had discussed in the supervision. They were concerned with finding new strategies for improving their teaching. For example, Lynn wanted to create a classroom environment in which students engaged in thoughtful debate and discussion of important issues. An interesting finding is that both of these interns tried new strategies, examined their effectiveness, and then derived general principles to guide future practice. Their willingness to engage in reflective practice through the exhibit allowed them not only to test the current strategy but to understanding a larger pedagogical principle improved. Both interns suggested they would implement their understanding of strategy use from the exhibit in the future.

Interestingly, the interns addressed pedagogical questions closely aligned with International Society for Technology in Education's National Educational Technology Standards (NETS) II-V:

II. Teachers plan and design effective learning environments and experiences supported by technology.

III. Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.

IV. Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.

V. Teachers use technology to enhance their productivity and professional practice.

*Sub-question 3: How do novice teachers views of technology shift when developing an Exhibit of Practice?*

The interns started their internship with familiarity about some of the common types of technology software (i.e., Word, Internet, Excel) however they were timid about integrating it into the classroom. They wanted to use technology to support student

learning but were unsure about how to select appropriate technology and integrate it into the classroom. Their cooperating teachers were not helpful because they did not use much technology in the classroom.

Surprisingly the preservice teachers varied on how their views changed when it came to integrating technology into the classroom and the creation of their exhibit of practice. Lynn's and Sally's confidence and desire to integrate technology in the classroom increased over the year. They were successful about learning and integrating technology into the classroom and felt that their use of technologies enhanced student learning. Lynn and Sally were anxious about the time it will take to integrate technology into the curriculum as first year teachers but they hope are very motivated to do so.

The development of the exhibit of practice was a different situation. Lynn and Sally started out very positive about the experience. They saw the colloquium project as a method to improve their teaching but they were worried about the time it would take to develop an exhibit. Sally and Lynn were dedicated, organized, and deliberate about the implementation of the colloquium project. They were reflective in their planning, execution, and in thinking back on their project through their journals. They collected student work and shot videos. Up to this point, they were still very interested and motivated to create an exhibit of practice.

Their view of the creation of exhibits changed drastically at the time they started trying to input their information into the Exhibit Builder. The software was not reliable. Sally and Lynn could not access the web site at times, the web site would freeze, or the uploading procedures did not work. Since Sally and Lynn would often start their projects before the official work days, no assistance was available to them. Even on one of the days that help was available, the website would not upload their information correctly. Sally and Lynn developed negative feelings toward the project. They both thought that developing an exhibit of practice took too long and was tedious. The final nail in the coffin was when they finally did create the exhibit the school's Internet system was down at the time of their public presentation. All in all, they felt that the effort to create an EEP did not accrue in any benefit to their teaching and learning through reflection.

Tom and Sue had the opposite experience. Tom integrated very little technology into the classroom. His feelings about technology in the classroom did not change very much because his experience was limited. At the end of the year, his goal was to try to integrate technology next year. After the colloquium project, Tom did not take much time to organize his materials or reflect upon the colloquium project. He did not work on the creation of his exhibit of practice outside the required work periods. In response to prodding, Tom added videos, refined his reflections, and developed his exhibit. He did not experience the software problems that Sally and Lynn did. When a problem occurred, he just stopped until it was fixed. Tom felt the public presentation of his colloquium project went well since he never relied on his exhibit of practice as part of public presentation. In the end, Tom had a very positive experience developing the exhibit. He thought it would make a nice addition to his portfolio when he interviewed for jobs. His views on creating an exhibit raised his views about technology to a more slightly positive level.

Sue integrated technology that she was familiar with into the classroom. Her views on technology did not change much over the year. If she could do it easily and it would benefit her students, she would use it. She would not take a lot of time to learn

new technologies. Sue did not want to have any assistance in the development of her exhibit. She developed it home with the assistance of her boyfriend. Sue did not experience the software difficulties that Sally and Lynn encountered because the bugs she waited to work on her exhibit until after the problems were solved. In addition, she didn't scan documents or edit her videos. Therefore, they are not present in her exhibit. Sue thought the public presentation of her exhibit of practice was a positive experience and hoped to use her exhibit as part of her portfolio. This experience created a slightly more positive view about technology.

*Sub-question 4: Do novice teachers' self-efficacy and motivation for teaching change from their participation in creating an Electronic Exhibit of Practice?*

There is evidence that all four interns felt continued or improved efficacy for teaching and were motivated to teach next year after completing their exhibit of practice; however, the exhibit was only one aspect of their internship experience that may have contributed to their positive beliefs and plans. Two interns began the year with a strong sense of efficacy. By the end of the year, they both had confirmed their sense of efficacy and believed that they would do well in the following year. The other two interns (Sally and Lynn) began the year with a moderate sense of efficacy. The both believed that they could be successful at teaching but identified sources of concern. By the end of the year, they both described a strong sense of efficacy and had a strong belief that they would be successful next year. Both expected and hoped to find a teaching position next year but expressed some doubts about being and hired and would be satisfied with a related job (classroom aide) if the were unable to find a position. Although changes in efficacy can not be directly attributed to creating an exhibit of practice, the four interns were able to describe how the completion and presentation of the exhibit added to their teaching beliefs. Presenting their findings in front of professional colleagues and receiving positive feedback from those colleagues led them to feel more like a respected expert.

An important question that emerged instead of whether participation in exhibit building affected efficacy is "how did interns' beginning efficacy relate to their use of the electronic exhibit building as an opportunity for reflective practice." The exhibit was one aspect of a supportive program which also included frequent observation and feedback from a supervisor and cooperating teacher, peer support through a weekly seminar, a meeting each semester with a faculty member and other interns in their own content area, and participation in the professional development activities for the faculty in their school. Students tended to either use all of these program features for changing practice or to use none at all, depending on their beginning efficacy.

Overconfidence. The interns can be categorized into high and low efficacy pairs. The pair with high efficacy reported a strong sense of confidence from the beginning of the year. However, they differed in an important way. Tom seemed overconfident. He saw little reason for reflecting on his practice in any of the opportunities presented. Any questions or concerns raised about his teaching were either ignored or addressed just to minimize being hassled. Tom raised very few questions about his own teaching. He worked on the electronic exhibit since it was a program requirement but saw it as an opportunity to confirm his existing beliefs.

Pragmatism. Sue also reported high efficacy from the beginning of the year since she had been working as an aide in the school for two years and was familiar with the team on which she worked. However, she took a very pragmatic approach to reflective practice. She had the definite goal of getting a job next year. When questions or concerns were raised about her teaching, she dutifully incorporated the suggested changes but gave little apparent thought to why these changes were beneficial. She was able to raise questions about her own teaching, mainly in response to difficulties she faced in the classroom. Her response was to consider altering the lesson for the next year. Sue worked on her exhibit of practice but with little sense of reflection and more as a way to exhibit the good work she believed she was doing in her classroom.

Social learning. Lynn began the year with a moderate sense of efficacy and struggled in her first week to speak in front of her class. She quickly relied on the team of people around her -- cooperating teacher, team members, and university supervisor -- to gather support and suggestions for improvement. She was eager to improve her teaching and used every opportunity available, including supervision discussions and professional development. She developed a sense of how to ask critical questions about her own teaching and developed her exhibit of practice around one of those questions. The process of enacting and reflecting on her practice strengthened her sense of confidence.

Perfectionist. Sally began the year with a moderate sense of efficacy for teaching. She took early suggestions for improvement as signs of criticism not opportunities for improvement. She addressed the suggestions in order to strengthen her performance and her image as a good teacher. She was genuinely concerned with improvement but as a way of proving herself. Sally used the opportunities for reflection dutifully but was disappointed when she continued to face difficulties in her teaching. Her hope was to meet a standard of perfection. She slowly reached the realization that teaching is a continual process of reflection and improvement.

The conclusion that can be drawn is that creating an electronic exhibit of practice serves as one important means of improving interns' motivation and self-efficacy for teaching. However, the potential benefits of reflective practice are moderated by an intern's beginning sense of efficacy. High efficacy seems related to less use of reflective practice except for pragmatic reasons. Those interns with lower efficacy were more likely to develop reflective practice skills but with mixed results, depending on the reasons for improving their teaching.

*Conclusion: How does self-reflection through developing an Electronic Exhibit of Practice relate to novice teachers' beliefs and behaviors?*

The preservice teaching interns who participated in our study entered their internship year with strong pedagogical beliefs about good teaching. In addition, two of the four participants held very high personal efficacy beliefs regarding their own teaching ability. By engaging the interns in a year-long self-reflective activity, the Electronic Exhibit building, their pedagogical beliefs were supported but did not change. In general, the interns believed in instructional practices that actively involved students in gathering, discussing, and representing their understanding of content in different formats. By

reflecting on their classroom work and using technology tools that fit into these pedagogical beliefs, the interns' beliefs were strengthened.

However, participation in Exhibit building did affect interns' instructional practices. Each of them identified 2-4 aspects of their teaching that they wanted to examine and improve. By focusing on self-generated questions about their teaching, the interns altered their instructional practices in two different ways. The interns with a high sense of self-efficacy at the beginning of the year chose to focus on refining instructional strategies that they already believed would work. They increased their instructional experience, if not their expertise. The interns with moderate self-efficacy saw the exhibit building as a chance to question and improve instruction. They were able to formulate new strategies for instruction and to generate principles of practice that they could guide them in different settings in the future. Although we can state that participation in Exhibit Building did affect instructional practices, it is not clear whether the format of an online exhibit led to changes or whether any format for reflection would have led to similar results.

As expected, participation in Electronic Exhibit building did change the interns' views of technology. The three interns who used technology as part of their instruction for the Exhibit seemed more motivated to use technology in their classrooms next year. They all expressed strong views that certain technology tools could promote motivation and conceptual understanding in their students. However, all of them were concerned about the implementation of technology in their classroom. Their main concerns were lack of facility support, lack of technical support, managing technology without a co-teacher, and scarcity of resources. It was an important step in their professional development that they were able to be reflective on the role of technology in their teaching to identify possible benefits and obstacles.

An important finding has been the crucial role of support for interns in their reflective practice. Each of the interns who worked independently on their Exhibit of Practice found it necessary to have a knowledgeable supportive person for guidance. For two interns, this person was the designated technology mentor in their building; for another, it was a friend outside of our program. For the two interns who worked with the technology mentor, they received personal instruction on how to use certain technology tools within the context and needs of their own classroom. The interns also relied on the support of teachers and administrators in the building for logistical support, such as scheduling computer labs, acquiring new software, and coordinating the nature of academic work between classrooms. Finally, three of the interns relied on support from the internship group and supervisor to reflect and complete their online Exhibit. Although reflection is an individual activity, it seems to be more helpful to the interns' growth and improvement when undertaken in a supportive group with others struggling with the same task and with guidance from a supervisor.

Finally, our results show that technology can be helpful as a reflective tool for preservice teachers in developing their teaching strategies and in promoting positive beliefs. All our interns reported positive benefits to their participation in the project. However, those benefits depend largely upon individual differences that characterize the interns. Interns who enter their experience with very high levels of self-efficacy tend to choose performance-based goals to confirm their existing beliefs or to display evidence of their perceived competence. Intern with a moderate sense of efficacy focused on task

goals to promote improvement and development of their teaching and benefited by developing new strategies and general principles for good teaching practices. One of the interns seemed to possess both performance and task goals, and also showed the benefits of having the goals to improve.

## **Discussion**

Integrating technology tools into the curriculum is becoming an inseparable part of good teaching (Pierson, 2001). Experienced teachers who start to use technology shift their focus from whole group activities to those that were student centered (Hadley & Sheingold, 1993; Swan & Mittrani, 1993) with more independent work (Waxman & Huang, 1996). The interns in this study already held those beliefs from their education courses so they did not change significantly during the course of this project. However, cooperating teachers sometimes do not support the introduction of reform-based instructional techniques into the classroom and have been known to limit such attempts by interns (Beck & Kosnik, 2002). In this case, the use of technology might have encouraged the interns to test their emerging instructional beliefs in a context that the cooperating teachers were unfamiliar with but excited about. These successes solidified the interns' instructional practices and their ability to enact their beliefs in their classrooms.

While the cooperating teachers were not a source of technical support for the interns, the university supervisor, the teacher mentor, and the technology-rich school did support the interns taking their first steps in integrating technology into the classroom. It becomes clear that support is a necessary feature to integrating technology into the classroom (Becker, 1994; Hadley & Sheingold, 1993) particularly from an accessible knowledgeable person. This gives an exciting new role for the teacher supervisor and the school as a community. The old saying that takes a village to raise a child applies in this study. All the interns needed support to integrate technology into their classrooms.

Teacher education programs need to go beyond the belief that the cooperating teacher will serve as the primary conveyor of knowledge about teaching in the classroom to using mentor teachers specializing in various areas of expertise. If integrating technology into the classroom is a goal (NETS project, 2002), programs need to carefully consider supplementing the support that preservice teachers receive in the schools with trained supervisors and teacher mentors that are familiar with technology in the classroom. Without these additions, a teacher education program places a heavy burden on the cooperating teacher to "know-it-all" and devalues the expertise of the school as a whole and the role of the supervisors.

With the inclusion of required electronic portfolios and colloquia increasing in teacher education programs, we must reflect upon the task and the technology as potential vehicles to encourage preservice teachers to reflect. The colloquium supported the interns' reflections but at times for some students the technology was a poor vehicle to support that process. However, even if the technology worked perfectly, the interns thought the time it took to scan, upload, and organized their information into the required format took away from time needed to reflect. The process of technology can sometimes interfere with its purpose. However, some of the interns thought the final product was worth the process. The results suggest that as teacher educators we need to consider our

own use of technology as one of many pedagogical tools that require technical and personal support to be implemented effectively.

Our results confirm theories of self-regulation that the positive impact of self-regulated learning behavior depends on the type of goal learners set for themselves. Learners who formulate goals for learning and improvement seem to have better results than those who choose goals for performance or displaying their ability. The results also indicate that some learners may choose multiple goals, with mixed results of a quality product but negative affect.

Specifically, in the context of teacher education in which self-reflective practice is a prevalent form of self-regulation, pre-service teachers engaged in a program for self-reflection may need guidance in the types of goals they pursue. Teacher educators should take steps to promote environments that foster goals for learning and improvement and should help students identify learning oriented-goals in their reflective activities.

However, our results also indicate individual differences in pre-service teachers which may affect the type of goals they choose. Pre-service teachers with an inflated sense of self-efficacy seem to choose more performance-oriented goals which do not help them gain the benefits of reflective practice. Loughran (2002) makes a compelling argument for creating "contextual anchors" for reflective activities with pre-service teachers. We would agree with his argument and elaborate it to consider a model of "person within the context" since pre-service teachers individual differences in self-beliefs seem to play a strong role in how they benefit from reflective activities.

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## Appendix A – Case Studies

### Tom

#### Internship and Instructional Practices

Tom is a confident and self-assured intern. His self-efficacy was high and remained high throughout the internship. Tom's favorite phrase is he likes to go and do it. He believes that the most important thing is to build relationships with his students and thought that strong relationships would be the best solution to managing difficulties that present themselves in the classroom. This teaching philosophy has its strengths because he is not afraid to try new things. Tom has an ability to make decisions about what to focus on and follow through with them. He does not question his plans intensively.

Tom's weakness was that he is not always prepared and he will make mistakes that could have been avoided. He was aware that he needed to plan more. He did not learn from others and therefore is doomed to repeat their history--ironic for a social studies intern.

#### Technology

Tom came in with a confident attitude about his ability to master and use technology in the classroom. He was skilled at word processing and Internet searches and he had some knowledge of Excel. During the internship, Tom developed a PowerPoint presentation for his students. He uses the Internet frequently to access original source material and visuals for his lessons. Tom knew he should use more technology in the classroom and to let his students use technology as a way to show their learning. He did let the students research some information on the Internet but nothing more. In the end, Tom did not progress with his use of technology in the classroom even though he states that it remains one of his goals.

Tom was not concerned about the development of his exhibit of practice. He depended upon the mentor teacher, the technology specialists, the researchers, and the other interns to teach him how to use the technology. He did videotape his classroom, scanned some student work, and wrote several reflections to place in his exhibit.

#### Colloquium Topic and Exhibit Building

Tom's choice of colloquium topic mirrors his interest in coaching. He selected competition: group and self. From the interviews and the exhibit, Tom did not have a good definition of what competition is—except to try to beat whoever you are playing against. From the interview (2<sup>nd</sup>), he stated that he didn't realize how hard it would be to implement competition into the classroom because competition has the potential to hurt students' feelings. Tom also had not considered what to do with students "knocked out" of competition. While he thought that competition might be a motivating factor to try harder, he hadn't thought how it might impede the learning process. On the positive side, Tom did select two kinds of competition and learned some valuable lessons about how to implement both kinds in the classroom. Tom reported having positive feelings about the colloquium project as he developed it and believed it would help improve his teaching in the future. He also gained an understanding of the need for significant pre-planning.

Tom did not worry about developing his exhibit of practice. It was not central to his mission as a teacher. He worked on the exhibit during the only at required times. During the work days, he showed up late and needed someone to interact with at all times. He depended upon the mentor teacher, the university technology specialist, the researchers and the other interns to teach him how to use the technology. Tom did videotape his classroom, scanned some student work, and wrote several reflections to place in his exhibit but needed prodded to put those artifacts in his exhibit of practice. Because of this and his ability to allow others to help him, building the exhibit was a positive experience. In the end, his exhibit lacked the reflection that the Sally's and Lynn's exhibit contained.

## Sue

### Internship and Instructional Practices

Sue worked hard during her internship with very positive outcomes for her teaching. She was also ready to let people know how hard she was working and how much responsibility she was taking on. She held a pragmatic focus for getting things done and preparing for a job for next year.

From the beginning of the year, Sue was very confident in her teaching ability. She consistently rated her confidence at the highest level.

Her teaching practices were strong and she perceived few problems with her teaching. The difficulties she identified were often with structural and pedagogical issues, such as trying to find time to conference with all students about writing. When faced with such problems, Sue strategized, implemented solutions, and was often pleased with the results. Her problem solving was based on her underlying pedagogical beliefs and models of teaching she has observed.

Sue expressed being confident in her ability to be successful next year. She recognized that a new team and curriculum would present challenges but felt a strong sense of efficacy for her teaching.

In working with supervision, she was welcome to having a supervisor observe at any time. Her confidence was evident. However, she did not use observation as an opportunity to systematically reflect on her practice. She rarely complete pre-observation planning sheets but was open to suggesting and discussion after observations.

### Technology

Sue was somewhat indifferent to the use of technology in her classroom. She was able to discuss its potential benefits, but recognized the pragmatic problems in scheduling, learning new tools, and managing students. She hoped to include internet searches in her colloquium project; however, did not have the computer lab scheduled to do this. For day-to-day practice, she used technology such as television and music. She also learned how to produce web pages from the technology mentor but did not follow up with an extended tutorial. Sue was comfortable with technology, believed in its place in the classroom, and learned new tools and implemented them when they met her present needs.

### Colloquium and Exhibit Building

Sue's ideas for her colloquium shifted during the year. She eventually settled on the topic of how to relate classroom work to students' real lives. She believed that relevant work would be more motivating for her students. Her topic appealed to students' sense of conflict, argument, and idealism. She wanted to help them identify the power of persuasive arguments. She believed that the colloquium helped her reflect on her practice inasmuch as it allowed her to implement a pedagogical approach she already believed in. It was a stressful experience for her due to the timing, but she used outside help for guidance from a friend with the exhibit builder to overcome technical challenges.

## Lynn

### Internship and Instructional Practices

Lynn's confidence about her ability to teach was low at the beginning of the year. She doubted that she could manage a class of students and did not feel comfortable lecturing in front of her class. An experienced teacher questioned her competence in the beginning of the year and this event was a blow to her already low confidence. Lynn's confidence increased significantly over the year. Lynn worked hard to cultivate positive relationships with students. Her coping strategy was to spend a lot of time talking to her cooperating teacher, other teachers, the university supervisor, and fellow interns about what she should do in the classroom. She was very reflective in a social setting.

Like Sally, Lynn was proactive about her planning. She was organized, committed and dedicated. Lynn's instructional beliefs included a desire to motivate students to learn social studies by providing relevant, student-oriented curriculum.

### Technology

Lynn was comfortable using word processing Internet searchers, and Excel from the beginning of the year. Lynn's goals at the beginning of the year were to use PowerPoint and to have her students create brochures. Her cooperating teacher did not use technology extensively in the classroom. Lynn's colloquium topic involved motivating students to learn through the use of debate. She developed a website that contained online information on both sides of some controversial Supreme Court cases. Lynn booked the wireless computer lab and had the students research a side of a court case for several days as preparation for the debate. Lynn would like to use more technology in her class next year but worried about learning a new tool, structuring the activities, and planning the logistics. She stated that support would be critical to her ability to integrate technology into her classroom.

### Colloquium and Exhibit Building

Early on, Lynn saw the colloquium project as potentially helpful for improving her teaching but because of all her other responsibilities she also saw it as a requirement. In early interviews, she asked many questions of the researchers about the details, requirements and expectations for the colloquium. She was excited at the prospect of constructing an electronic exhibit and learning a new skill but concerned about the time commitment and assistance she would need. Lynn was very successful about basing her colloquium project on a piece of research on debate. She wanted her students to be knowledgeable, interested and prepared to debate. Lynn's unit was organized around those premises. She gave the students four days to become knowledgeable about their side of the debate, she used controversial cases that would interest her students (civil rights, student rights, and flag burning...), and she prepared the students by outlining the components of a formal debate which took a fair bit of preparation.

Lynn worked hard on the development of her exhibit of practice. She videotaped herself and her class and scanned relevant student work. Lynn spent time on her writing her reflections. After she had finished her unit, she tried to build her exhibit early.

However, the exhibit building software was not working properly and she had to spend hours redoing her work. Lynn was not afraid of asking for help but the experience of building the exhibit was not a positive one. Her final exhibit reflects her ability to plan, organize and reflect upon her teaching. However, she felt that she spent too much time redoing her work. In the end because of technical difficulties at the school site, Lynn did not feel prepared to present and her views of technology went down slightly.

## Sally

### Internship and Instructional Practices

In the beginning of the year, Sally struggled with her sense of confidence, especially around issues content. Her feelings of efficacy fluctuated early on in the year. From the beginning she was confident in her ability to build relationships with students but felt somewhat sure about handling problems as they came up in the classroom and asserting authority. Quickly, Sally became comfortable addressing behavior issues. She solved this problem by relying on her philosophy of respect for the student-teacher relationship and would talk with student after confronting them about behavior. Her early lack of confidence came through in team meetings where she was not always willing to speak up because she saw herself as “just an intern.” Her belief was that her confidence would grow with time and would not be a problem next year when she assumes the role of an established teacher, not an intern. Some of the lack of confidence was due to being around more accomplished colleagues. For example, with technology, she knew some basics but then lost confidence when seeing that someone else knew more. She had success with using excel early on but didn’t believe she really knew what she was doing even though her students thought she did. By the middle of the year, Sally was more confident as she developed a more realistic view of teaching including letting go of some perfectionist expectations.

When questioned about her efficacy for teaching next year, Sally believed “it will take a few years to feel that I’ve really got it.” Her efficacy for teaching next year increased during the year. By mid-year she saw her confidence as a 3/4 out of 5. She was realistic about the difficult of first year of teaching but confident she will do well.

In the beginning Sally had difficulty articulating her approach to solving classroom problems. However, over time, she developed a philosophy that helped her problem solve. She believes in an active, engaging classroom and a respect for the student-teacher relationship as ways to prevent many potential problems. Sally relied on the relationship with mentors – cooperating teacher, technology mentor, other members of her team-- for help with planning, teaching, management, and reflection through technology. She liked frequent feedback and assistance even though she was sensitive to criticism. Sally was very willing to observe other teachers to improve her own teaching, for example, watching the technology mentor using PowerPoint in his classroom. By the middle of the year, she had developed some strategies for handing problems in the classrooms and was more confident in facing difficulties.

Sally showed strong pedagogical practices from the beginning of the year. She was always well-prepared and knowledgeable. Sally guided student thinking in her classroom and focused on active, hands-on activities. Although sensitive to early suggestions for improvement, Sally began to focus on asking higher level thinking questions and exploring new ways to organize her classroom for efficiency. She developed approaches to teaching that involved students and had them doing higher level thinking and structured the classroom to encourage widespread participation and response.

## Technology

Sally was comfortable with technology from the beginning but not sure about how to implement it as a pedagogical tool. She could use inspiration, internet searches, and excel but hadn't used PowerPoint, constructed web pages or used video tools. In the beginning of the year, her class used excel and ph meters. Her cooperating teacher shared the goal of integrating more technology. Sally believes that it was good for students to learn how to use technology, improved the quality of products, and motivated students especially for students who are usually amotivated or inattentive. The colloquium process strengthened Sally's belief about integrating technology as a pedagogical tool. She observed students doing high quality work, assisting each other, and learning new skills. She also began looking for other opportunities to include technology such as making a PowerPoint presentation of slides from Africa to share with her students. She developed a sophisticated view of finding the right opportunity to use technology tools with attention to the standards and curriculum objectives she'd be meeting. She and her cooperating teacher worked together on technology integration with the guidance of other teachers.

## Colloquium and Exhibit Building

Sally had about focusing on motivation for her colloquium topic from early in the year. She identified her eventual topic of using Excel to promote motivation and understanding of graphing early in the year but didn't feel passionate about it. Her other idea was about encouraging widespread participation in the classroom. She believed the colloquium would help her become a better teacher if she picked a topic she felt strongly about. She was concerned about being overwhelmed by the technology aspect of producing an electronic exhibit for her colloquium. However, she also saw the powerful effect using Excel had on her students' motivation and work so she continued exploring that topic. She also selected content – the weather – that she thought would have some appeal to students. Problems that she encountered including organizing her data. She saw the colloquium not as an opportunity to become a better teacher but as the opportunity to make a positive impact on her students.

## Appendix B—Quotes from Participants

Table 1: Examples of evidence supporting preservice teacher profiles

	Tom: The Loner	Sue: The Pragmatist	Lynn: The Learner	Sally: The Perfectionist
Beliefs about Technology	I think you can use the Internet a lot. I use the Internet to find sources, primary sources, stuff like that. (1 <sup>st</sup> interview)	I feel comfortable with it. It's just now I'm realizing it's not always the easiest thing as far as accessibility because there's a big demand for it...I think it's important because for kids now, it's their lives. (2 <sup>nd</sup> interview)	I feel pretty comfortable as I've been writing papers all through college...when I get into the more advanced, but I've played around with a lot of programs like Excel and Inspiration but I really haven't used them that much. I'm comfortable and eager to learn. I feel like with some programs I would need more help. (1 <sup>st</sup> interview)  I think in some ways it can enhance but I wouldn't drown the kid in it and use it all the time because it's stressful at the same time. With the lap tops this web page might not be working or this lap top might be broken and there's always something wrong that could happen with any kind of tool that you use in the classroom. (3 <sup>rd</sup> interview)	I think the computer side is just, it's so applicable. I don't know how to do half the stuff and I've graduated from school. It's such a great tool....My kids that normally have attention problems or just behavior issues are almost like fascinated by it. They love it...I didn't anticipate it being such a, something I'd like so much. (1 <sup>st</sup> interview)  Definitely, now whenever I use technology now, I'm like all right, if I'm going to do a PowerPoint presentation I'm going to have all the slides printed up. So if it doesn't work I can hand them out to the kids instead because I think that (technology failure) happens more often than not. (3 <sup>rd</sup> interview)
Goals on Integrating Technology into the Classroom	Um, I would like the kids to do a PowerPoint presentation; I think that would be fun for them. I'm not really sure what's out there yet. (1 <sup>st</sup> interview)  I was very open when I got, at the beginning of the year, so what ever happens happens...I suppose I would like to use it more. (2 <sup>nd</sup> interview)	One thing that I would like to have them do is go on-line to some of these web sites and show them some of these web sites that I've look at that offer all these different types of persuasive pieces and after I introduce a bunch of fallacies in persuasion kind of dissection and critique the different, you know they can click on any essay that interests them... in the language arts	...our class is very project-based so I think there's a lot of, like we've done a colonial camp and we've done a couple of projects and because of that I was think we could do a project using PowerPoint. They're (the students) are very eager to use it anyway. (1 <sup>st</sup> interview)  Definitely I'll try some net research. I hope to be in a school	I like a lot of the computer programs that teach kids to use real data...The kids love to use the technology and they really have to know the material they put in their presentation. (1 <sup>st</sup> interview)

		<p>classrooms should extend far beyond the reaches of my classroom....I haven't used it much but now I'm realizing that it's very important, and a really good tool and it's really worth it. (2<sup>nd</sup> interview)</p> <p>I definitely use them (the wireless laptops) in the classroom...I just was so pleasantly surprised that aspect worked out because I just pictured chaos...and not really trusting the kids that they wouldn't break them or they wouldn't use them, like look up stuff that wasn't appropriate.</p>	<p>that's as well off as Oyster River that has a lab for research. That was key...I would definitely create a web page...I think I would need help. (3<sup>rd</sup> interview)</p>	
Engagement in Reflective Practice	<p>I think the colloquium will be useful. (1<sup>st</sup> interview)</p> <p>Yeah, the planning is mainly up to me what we're going to do for all four classes. So as I come up with ideas (related to his EEP) I put them right in. (2<sup>nd</sup> interview)</p> <p>Competition (his EEP project) is hard to put in. I didn't want to hurt anyone's feelings. And that can be difficult with competition (3<sup>rd</sup> interview)</p>	<p>I think it's (the EEP) definitely positive but it doesn't mean it's not stressful or difficult...this is something I'll have that I never would have done on my own. (2<sup>nd</sup> interview)</p> <p>Some of the positives were just being able to have something that's such a product that really shows something in such an organized way all the work that the kids did in my unit and all the planning that went into it and being able to reflect on it...I am a person who is reflective by nature except maybe for doing the research. That is something I would not have done on my own.</p>	<p>I do see the purpose in a sense (of the EEP)...I think it's just one of those things that the U is just laying on us. Everyday is a learning experience. I think the internship is enough. But I understand why. (1<sup>st</sup> interview)</p> <p>I think it's a positive experience because it's forcing me to take action and forcing me to think about how can social studies be exciting. (2<sup>nd</sup> interview)</p> <p>It was really stressful and time consuming...The lesson plan went awesome...the exhibit builder alone was the stressful part...I could have planned everything and thought more deeply about my colloquium project without that. (3<sup>rd</sup> interview)</p>	<p>I think it (EEP) will be helpful as long as I really pick something....But as long as I pick something...I feel strongly about that and it would help me next year and years to come with how to run my classroom. (1<sup>st</sup> interview)</p> <p>It was tedious. It really was. Looking back on it I am glad I did it because I learned, I gained some skills technologically...But in retrospect it did take away a lot of time from my classroom. (3<sup>rd</sup> interview)</p>
Self-efficacy	"The year's gone well and has been	"I'm a little anxious..but excited. I	"It was hard in the beginning to	"I had a couple of down weeks.

	<p>fun....I have a good rapport with kids and being in front of them has gone well.”</p> <p>“I feel pretty confident... I’m more excited to have my own classroom than anything.”</p>	<p>feel like I’m doing a lot and accomplishing a lot, so it’s good work.”</p> <p>On a confidence scale of 1 to 5: “I’m definitely five.”</p>	<p>get over the nerves.”</p> <p>Later in the year: “It’s a huge improvement from a couple of months ago. I’m more comfortable.”</p> <p>“I have some jitters about next year .. but I’m so excited and feel comfortable about it.”</p>	<p>Confidence was the biggest thing.”</p> <p>“I feel a little leery about sharing problems in team meetings.”</p> <p>“I don’t think I’ll have problems next year. I like how I deal with them. I know when kids are involved, they love it.”</p> <p>“It will take a few years to feel that I’ve really got it.”</p>
Goal Setting	<p>“I think I’ll be able to look back on my colloquium and use it, modify it throughout my career.”</p> <p>“I chose competition for my colloquium topic. I use it in coaching to help develop skills, so I figured the same form of competition could be used in the classroom.”</p> <p>“I want to increase using gimmicks more in the class to draw kids in and bring more humor into the class.”</p>	<p>“My colloquium topic has to do with making my lessons have real world implications in students’ lives.”</p> <p>“The colloquium has been a bit of problem because I’m trying to get my stuff together to interview... It was a positive thing.. something I might never have gotten around to do.”</p> <p>“Having my colloquium is a tremendous asset.”</p>	<p>“The colloquium is something the U makes us do...It’s a process of learning an makes me pick a topic to think about.”</p> <p>“My colloquium is kind of an experiment. We’ve done bits and pieces but never the whole thing.”</p> <p>“In my research I found what gets kids talking, what they’re interested in, and to help them get the knowledge to be confident.”</p>	<p>“I’ve thought about studying motivation...I’ve heard that graphing is something kids struggle with.. Maybe I can do something on how we can help kids learn how to make and explain graphs.”</p>
Self-regulation	<p>“I like to jump in and do it.. see what happens and learn from what I did wrong and what I did right.”</p> <p>“I don’t really talk to anyone but look through my books and think about past experiences on how to be successful.”</p>	<p>“When I face a problem, I try to find the root of the problem and solve it.”</p>	<p>“I feel comfortable approaching other people rather than just doing it on my own.”</p> <p>“I go home, think about it come in the next day and talk about it with my coop teacher to process.”</p>	<p>“My colloquium will be helpful as long as I pick something that I have questions about it... I feel strongly about and will help me next year.”</p>
Teaching Strategies	<p>“There are definitely different ways to bring (competition) in. I’d like to come up with a way for students to <b>compete against themselves</b>.”</p> <p>“Next time, I’d set up rewards for each student. Once the first place students finished, other students had trouble trying to be motivated.”</p> <p>Supervisor i/v: “In the beginning of the year, Tom and I discussed how he could assist his students in</p>	<p>“What we used to do is to get (writing) conferencing done within a couple of days, but it didn’t work....Now I print out a schedule with 15 min blocks of time for students to sign up. It’s been really helpful”</p> <p>“A problem that comes up is kids getting resources offline and not realizing it is not legitimate...I have to work with the library to see what resources they have to help me.”</p>	<p>“I’ve discovered that what gets kids talking is when they are interested. Also, they’ll talk if they feel confident with enough time to prepare, so I’m giving them extra time to get ready.”</p> <p>“It’s challenged me to acknowledge that kids can learn from each other, but it’s easier said than done. I’ve tried different things like giving kids time to talk about their homework. It’s forced</p>	<p>“I feel like I’ve worked on this same thing a lot... on the type of questions that I ask, checking to make sure kids are getting it without using a formal assessments. There are little strategies I use for that.”</p> <p>“It’s simple to give them a note card to write down one thing they learned that day or to start our class with a bell ringer question.”</p>

	successful completion of projects by not simply giving an assignment but by providing smaller steps, feedback, and models.”		me to think about what else I can do to make this more structured.”	
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