The Teacher Educators' Journal

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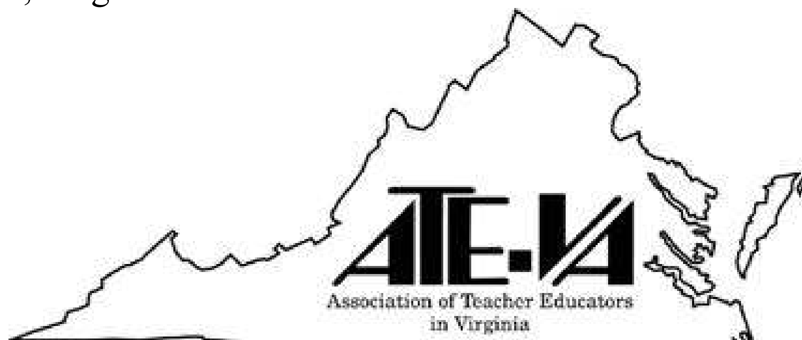

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Portrait of a Class: A Case Study of One Teacher Educator's Practice

Thomas B. Smith, Ph.D, - Northwest Missouri State University

Abstract: The field of teacher education needs rigorous, detailed descriptions of the theory and practice used in teacher education classrooms. This case study depicts one teacher educator as she employs a theory-based practice that uses discussions, modeling, and community to help students form theories and imagine those theories in practice.

In 2004, Cochran-Smith issued a challenge to all teacher educators to begin "taking our own professional work as educators as a research site and learning by systematically investigating our own practice and interpretive frameworks in ways that are critical, rigorous, and intended to generate both local knowledge and knowledge that is useful in more public spheres" (p. xxi). This call echoes the calls of others who urge us as teacher educators to open our practice in thorough and systematic ways that can stand up to public scrutiny (Zeichner, 2005; Ducharme & Ducharme, 1996). Research that attempts to dig into what is done in teacher education classrooms and why it is done is needed. These questions are fundamental to making our practice public and defensible.

There are at least three reasons behind these calls and this focus on our own practice. First, there is relatively little known about what goes on inside these classes. If we as a profession are going to call for those we work with (prospective and pre-service teachers) to make their practice transparent to improve it, we must be willing to do the same. Second, there have lately been several calls from prominent researchers to revitalize and reorient teacher education programs so that the teachers coming out are more fully prepared to teach a changing school-age population (Darling-Hammond, 2005; Nieto, 2005). It will be difficult to do so unless we understand not just the need, but the specific actions inside teacher education classrooms that maintain the status quo of teachers and foster the development of the kinds of teachers demanded. Finally, teacher education programs are under fire across the United States. To answer the accusations of bias the field of teacher education needs a body of research that rigorously examines what happens inside of teacher education classrooms and how those actions impact the growth and development of practicing and pre-service teachers.

What We Know about Teacher Education Classes

The first consistent finding in teacher education classrooms is that there is very little consistency among approaches (Lanier & Little, 2001). In a basic sense, Kim, Andrews, & Carr (2004) make a distinction between traditional approach programs that are driven by individual courses and integrated programs– generally standards-based– which focus all classes on an overall attempt to develop skills listed in standards. While each approach speaks to some underlying theoretical positioning, without an understanding of how each approach is enacted in the classrooms these theoretical claims ring hollow. After all, many teachers teach in institutions with which they have philosophical disagreements.

Consequently, the theoretical underpinnings of the teachers serve as

more accurate barometers of what goes on in the class than institutional mandates do.

Research that does look at practices in individual classrooms generally focuses on specific strategies or innovations and not at the larger pictures of what theories lay behind teacher educator's practices (Leat, 1995; Richards, 1998). These studies may give us information about the efficacy of the innovations studied, suggestions to improve the use of these specific approaches, or even insights into the change process; however, the focus is on the learning and change of the class members and not on the teacher educator and her beliefs and practices. To accurately begin to understand what is happening in the field of teacher education, what is needed is research that focuses on painting a picture of the inner workings of teacher education classrooms as observed and as envisioned by the teacher educator herself. What should be sought is what Anderson & Holt-Reynolds (1995) call a "practical theory," that is what approaches and strategies find their way into the everyday, practical life of a teacher educator.

Methodology

In response to the lack of clear information in the literature, this study asks what happens inside one teacher education class and attempts to construct one teacher educator's practical theory as she lives it in her work with this class. More immediately this paper began as a part of a doctoral course in teacher education. As part of this class, I was paired with an "exemplary" teacher educator as identified by the graduate faculty at my institution. For one semester, I was to observe the planning for and teaching of one teacher education course. From these observations and resulting conversations, this paper emerged.

Case Study Research

Based on the purposes both of my course and my research aims, a case study methodology was chosen. Case study research aims to construct rich descriptions of the events and understandings of the subject in order to begin to make sense of the "messy complexity of human experience" and "to see what some phenomenon means as it is socially enacted within a particular case" (Dyson & Genishi, 2005, p. 3, 10). Case studies such as these "detail developmental paths that ... illuminate facets of life as members of those groups [being studied]" (Bickmore, Smagorinsky, & O'Donnell-Allen, 2005 p. 26-27). Case study research here is focused on uncovering discovery, innovation, and application.

More specifically, the case that serves as the center of this paper is what Stake (2003) would call an "intrinsic" case. This refers to the fact that the interest in this case is in the particulars of this case. While being interpretive, the ultimate goal of this study is to illuminate the practice of one teacher educator so that, in conjunction with the work of other teacher educators in a myriad of contexts, a constellation of understanding will begin to emerge.

Data Analysis

In this study, three types of data were collected: observational notes, pre- and post-interviews, and course materials including the syllabus and other materials prepared for the class. Each of these data sources connect explicitly with my purpose

of understanding the practical theory of one teacher educator in one teaching context.

Data analysis began early in the process, before data collection was complete. After the early observations, I read over the material I had collected to familiarize myself with the contents. Then, I began coding. From these codes, I constructed themes relating to Dr. Paulsen's "practical theory." At the same time, I began writing memos, which served as a way to help prepare and flesh out the initial codes and observations (Charmaz, 2003). Both the coding and the memo-writing were ongoing aspects of the data collection and analysis. These aspects of the data collection pushed me to a more focused examination of current data as well as of future classroom observations (Spradley, 1980). These more focused examinations helped me construct observations and patterns into broader themes as well as explore more closely embedded elements of the model (Yin, 1989; Creswell, 1998). The result was an examination of how Dr. Paulsen's words, actions, and materials worked together to create a model of her "practical theory" of learning, teaching, and teacher education.

Context of the Study

Dr. Jane Paulsen is an experienced teacher educator who is nearing retirement. In her time at the university, Dr. Paulsen has earned the respect of her colleagues in the department for her thoughtful approach to her teaching and scholarship and her interest in the students in her class. Consequently, Dr. Paulsen was identified by her colleagues as an "exemplary" teacher educator in response to the need for a participant in this study.

Dr. Paulsen is a bright, cheerful woman who put me at ease immediately. Because I was to be shadowing her in the fall, we made an appointment to meet at the end of the spring semester. When I arrived at our first meeting, Dr. Paulsen was speaking on the phone; she motioned me to sit down and returned to finish her call. She wore a bright blue shirt and her glasses hung about her neck on a simple cord necklace. She was smiling and laughing. Her voice was animated and even though she was on the phone her hands made small gestures to emphasize a point.

She quickly finished and turned back to me with a broad smile that helped ease my worries. In a slight Texas drawl, she introduced herself and said that I must be Tom. Her familiarity was, I would learn, to be the norm. She treated everyone with respect and attention.

That first meeting we spent about 20 minutes together. During that time, we talked about our families, my program of study, her professional background, teaching and students in general, and our mutual love of literature. The time together was packed, but it did not feel rushed or crammed full. The pace was focused but easy. Her manner has come from years of experience. Dr. Paulsen has been working in the field of teacher education for a number of years. While a teacher in Texas she became the Director of Language Arts in her school district and was in charge of all the in-service provided to the English teachers in her district. While serving in this position, her district received an NCTE award honoring it as having the best in-service program in the country. Dr. Paulsen credits this experience with being one of the

motivating factors in her move to Teacher Education.

The Class

The class studied here was a methods course for English and Drama students, taken in the semester before their student teaching, concurrently with a practicum that required students to spend six hours a week in a local classroom.

According to Dr. Paulsen, the class usually numbered between fifteen and twenty students; however, this semester there were 34 students. Dr. Paulsen said the large class size was, "the biggest barrier [to achieving her goals] by far" (I2). For example, because of the large number of students, certain assignments became too bulky or time consuming. The initial course outline called for the students to have a microteaching experience (10-15 minutes in front of the class with time for feedback). With 34 students, though, this assignment was going to take up too much time. Dr. Paulsen considered splitting the class and having me take ½ of the students into a different room and conducting the microteaching there. In the end she worried about having two of us grading separate students for the same assignment and she dropped the assignment from the syllabus. Other course modifications were implemented as well. In every case, of which I was aware, Dr. Paulsen followed a similar pattern of looking for alternatives that both benefited the students educationally and honored them as individuals as well.

Despite the fact that this class was designed to be taken right before a student completed his or her student teaching, there were at least two exceptions to this. There was one practicing teacher enrolled in the course. She had moved in from another state to accept a local teaching position and the state granted her a provisional teaching license which required her to complete this course for full licensure. In another case, a student was going through a fast track program and actually held a position in a local middle school teaching seventh grade reading. The experience that these two brought to the class provided the other class members with a valuable voice of experience on a number of occasions.

Findings

A brief overview

From the data, a pattern emerged of what Dr. Paulsen saw as happening in her classroom, or at least what she aimed towards when working with pre-service teachers (see Figure 1). The resulting model, Dr. Paulsen's "practical theory," is complex in that it is made up of multiple parts that Dr. Paulsen sought to use in concert to help these students prepare for their future work in the classroom.

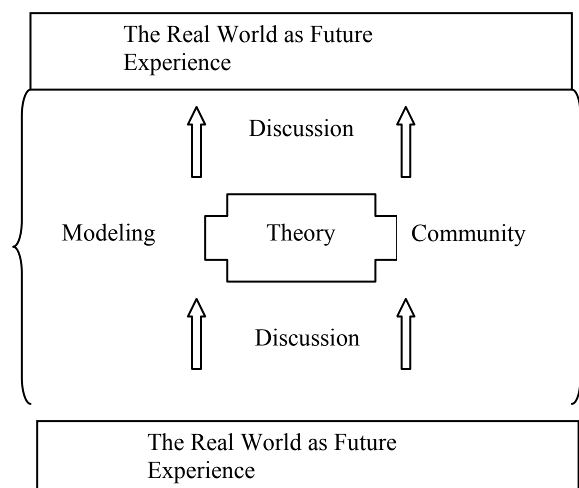

Figure 1: Model of Dr. Paulsen's approach to teaching pre-service teachers.

The most notable aspect of this model was that Dr. Paulsen began and

ended with the real world. Dr. Paulsen began by explaining her experience, presenting a case from published teacher accounts, and/or eliciting feedback from the students that brought their experiences to the forefront. Based on these real world situations, she led them in a discussion of their ideas about what course of action should have been taken by the teacher and why. After the discussion had led the class to posit a 'theory' about the underlying ideas that should guide a teacher in cases like the one under discussion, Dr. Paulsen then asked the students for explanations of what this would mean in their own future classroom. She asked them to project the ideas they have into the future—in real world contexts.

The thrust of this movement from past to future experience was driven by discussion. The entire time Dr. Paulsen was working with the students she modeled effective teaching strategies that could be used to re-enforce the ideas being discussed or serve as an example of how things should go in the classroom. Also, steps were taken throughout to build community within and between the students as well as the students and Dr. Paulsen herself.

Theory as a frame

Dr. Paulsen believes that, "basing our practices on theory is always important" (I1). In this case theory refers to the grander theories that are extant in the literature—capital T "Theory," if you will. In the class itself, Dr. Paulsen spent time in each class on this type of theory. A class did not go by without Dr. Paulsen bringing up one of these Theories. However, I never heard her preface her comments by saying something like, "now it's time to talk theory." Instead, she engaged the students in dialogue that worked itself toward theory, and when the class had arrived at something that approached a theory, Dr. Paulsen would draw it together by explaining that now the students could use their conclusions in planning, teaching, and/or assessing their classes in the real world.

An example of this happened during the second class of the semester as Dr. Paulsen brought up the question of whether certain items or texts should be required reading for all students in all schools, an issue that was a matter of heated discussion in the community at the time and an obvious reference to the Back to Basics movement. The class was quickly engaged in a debate with a number of students arguing that certainly there were pieces of literature that simply must be read by every American. Furthermore, issues arose in which some students said that all students needed to adopt certain values simply because these values were right and necessary to life in America.

After gently guiding the discussion and drawing out the idea that certain pieces of knowledge were or were not markers of belonging to America and such knowledge was obvious, Dr. Paulsen passed out a list of cultural literacy terms that one expert said everyone should know. Of the 100 terms listed, the author said that anything below 85 was simply unacceptable. The students were allowed to work in groups in order to identify the items on the list. One group had 64 items. All of the other groups were lower. All of a sudden, the students understood how difficult it is to declare certain information sacrosanct, and Dr. Paulsen led a brief discussion on what implications this held in the classroom.

The 'real' world

In every case, Dr. Paulsen took these discussions back to the 'real' world. It is obvious that for Dr. Paulsen, theory has not only its expression but also its value in the real world of teaching. Dr. Paulsen got at this intersection when discussing what a teacher educator's job requires. "I think today's teacher educator needs to be able to instill into students the 'real' world of teaching and hopefully help them understand the theory behind how students learn" (I1). In other words, the job of a teacher educator is to prepare pre-service teachers to be successful in the 'real' world, but also to give them tools to help them understand how learning occurs. Furthermore, Dr. Paulsen acknowledges this same intersection in her own teaching, "Not only have I read lots of theory, but I have a firm and clear context for that theory." In other words, Dr. Paulsen is helping her students to approach teaching with the same types of tools as she does.

In the situation mentioned above, Dr. Paulsen pushed the students to apply their realization about knowledge to their future classroom by asking them again what acceptable literature for the classroom was. While many of the students still held to certain pieces of literature as being necessary for their teaching, the reason behind the insistence seemed to change from the notion that everyone living in the United States needed to have certain pre-determined cultural touchstones to the feeling that these were works that for various reasons held special value for the students themselves. Asking the students to consider their new stance in terms of the real world helped Dr. Paulsen to make her point in a more concrete way.

A more subtle result of asking her students to project their ideas into the classroom is that Dr. Paulsen is supporting a particular vision of teaching. By asking her students to project their thoughts into a future "real" world, Dr. Paulsen is showing them that teaching is a field that is based on both reflection and intellectual knowledge. Such a vision of teaching stands in stark contrast to the image commonly put forth in some areas of society that teaching is a mechanical rote event (or series of events) requiring little thought or education (Darling-Hammond, 2005; Zeichner, 2005).

Dr. Paulsen's tools of choice.

As evidenced above, for Dr. Paulsen, discussion is where it all starts. The basic procedure in her class is for the students to, "discuss certain aspects of the text (or their other reading) and then apply their knowledge through some kind of interactive learning activity" (I1). This is exemplified in the example used above. Furthermore, the example above shows one purpose that Dr. Paulsen used discussion for—theory development. In a constructivist mode, Dr. Paulsen feels that "students create their own learning," and this learning begins with discussion.

A second purpose (and related to the first) of discussion in this class was to give students a chance to reflect on their beliefs and prejudices. According to Dr. Paulsen any student learning is, "based on their own backgrounds and values." She wants her students "to reflect and try to see a wide variety of doing things." Therefore, discussion as a tool for reflection was an integral part of Dr. Paulsen's class. According to Dr. Paulsen, "reflection

practices are not just important; they are essential" (I2).

Perhaps the best example of discussion being used as both a tool for theory development and a tool for reflection was our interaction with Sam. Sam felt that every grammar and spelling mistake on every paper must be marked and pointed out on any student work. Dr. Paulsen and I tried engaging him in class with discussion centered on issues of assessment and student learning. We felt like maybe he was softening some of his views. Then, however, he posted some comments on the class' on-line discussion board that suggested perhaps we had been mistaken. Several other students interjected comments pointing out many of the things that Dr. Paulsen and I had pointed out in class. A few days later as I was meeting with Dr. Paulsen, Sam stopped by. Naturally, the discussion ended up back on the same issue. Sam began by defending his original proposition. As we talked, though, several times he made references to comments either posted by the other students or made by Dr. Paulsen or me in class. Also, he admitted his own hang-ups in grammar and spelling—problems that seemed immune to correction by simple identification. Finally, his comments suggested that what everyone was reacting to was mostly a result of a misunderstanding on Sam's part of something said in class. The discussion seemed in this case to not only help Sam understand the other side of the argument, but also it brought out his own beliefs and it helped to set the stage for Sam's position to relax. Here, discussion was effective as a means of reflection and a way to develop (or alter) a theory.

The next tool Dr. Paulsen uses to help her students is community. Her classroom is organized so that the students sit in assigned groups all of the time. This requires a conscious effort, as students have to spend time pushing the tables together and rearranging the seating left by previous classes. Dr. Paulsen says that her students use "lots" of cooperative learning. Indeed, beyond the regular seating arrangement and group work activities in each class period, the class itself is set up to encourage collaborative work outside of class through group projects and presentations. Dr. Paulsen feels community formation is important and that effective communities can aid in learning. This concept is further supported by her comment that a successful strategy to use when working with students who are failing is to have them work with another student. In Dr. Paulsen's eyes, an effective learning community can help all students achieve success.

It is important to note, that not all of the efforts at community worked as Dr. Paulsen hopes. She observed, "This class did not come together as well as most" (I2). The reason for this was not completely clear, but Dr. Paulsen thought that it was mostly due to numbers. Numbers kept Dr. Paulsen from integrating herself as much as she would have liked into the classroom community. For example, Dr. Paulsen felt that a valuable part of this class would be for her to visit each student in the school where they were completing their practicum. Due to the number of students, the number of schools they were in, and the large area these schools covered, though, this was impossible. While Dr. Paulsen fell short of what she was aiming for, the class organization and physical set-up demonstrated planning for and thinking about these issues.

The final tool Dr. Paulsen used in helping her students was modeling. "I try to project a model for them of how I would like to see English taught—at whatever level" (I2). Dr. Paulsen consistently modeled effective teaching practices. Her comments about her assessment tools were enlightening in this regard. "I try to assess in a wide variety of ways. They will discuss on WebCT; take written tests, do self-evaluations, write lesson plans, and present group projects. I hope to model that all students have strengths and we [as teachers] should try to find them" (I1, italics mine). I witnessed similar modeling in her use of questions during discussions and her dealing with students.

This ability to model was not something that happened automatically. According to Dr. Paulsen, this was something she had developed over time. In the past Dr. Paulsen "did some of the things [she] hope[s] they won't do" (I2). In fact, she still did not consider herself a perfect teacher at the time of this study. She indicated on a number of occasions that she was continuing to change her approach to class and refine her practice. Always though the goal was to "provide [her] students with knowledge of the best practices of exemplary teachers" (I1).

This goal, then, involved helping her students to build a framework of theory that gave meaning to their real world experiences in that it will allowed them a way to see and understand what they experienced and allowed them to find solutions to problems that arise in the real world. It is this real world experience that gave value to the theory so Dr. Paulsen revisited and used real world examples—hers and those of her students—to demonstrate how these ideas were important and useful. In order to demonstrate these things Dr. Paulsen consciously made an effort to use discussion as a means of reflection and theory development, to create meaningful communities inside the classroom of which she is a part, and to model the best practices for her students in all aspects of her teaching.

Discussion

While this study underscores many of the things that made Dr. Paulsen an "exemplary teacher educator," two things in particular stood out. First was the ideal of reflection that Dr. Paulsen was teaching her students. Through her practice of beginning with her, or the students', prior classroom experiences, discussing the ideas and theories behind those experiences, and pushing her students to use their conclusions to imagine future teaching situations, Dr. Paulsen provided multiple, scaffolded opportunities for her students to practice reflection. Second, the community that she sought for her students was impressive. While she may not have been as successful with this class as she would have hoped, Dr. Paulsen aimed high. She did not seek to simply create a community of students; she sought a community of teachers—reflective teachers—that saw themselves and each others as resources personally and professionally. At a time, when multiple forces in society work to isolate teachers and create disunity in our ranks, we must find ways to reestablish the idea that teachers (including pre-service teachers) are a community that can provide strength, support, and creative and intellectual energy (Cochran-Smith, 2004).

Perhaps most importantly, though, the process of completing this paper brought to light an aspect of teacher

educators' work that is lacking. After completing this study and writing up a rough draft of this paper, I sent it to Dr. Paulsen in order to gain her insight on how my findings matched her understandings of her practice (Creswell, 1998). After reading the paper, she responded warmly. She indicated that the model was accurate, but then made the comment that she had never really thought of her practice in that way. In her typical way, she wrote, "it's always nice to see how much you actually do. ☺" (personal communication). The fact that Dr. Paulsen did not envision her work in this way should not be construed as either a shortcoming on her part or a fault in the research. Instead, as Anderson and Holt-Reynolds (1995) point out such theory explication requires time and support that are not built into most teacher educator's lives. Instead, it takes some outside force to help a teacher do this. In both Dr. Paulsen and Holt-Reynolds' cases, this support and time came about because of their work being studied.

Both spoke of the value of this experience. Dr. Paulsen in particular expressed that not only was it a boost to her morale to see the complexity of the work she did through new eyes, but also having a different perspective from which to view her work provided her with a new sense of how to improve her own practice. It would seem, then, that if Cochran-Smith and the others are right that we need to take our own practice as sites of research and improvement, we need to find ways to build the necessary time and support into our classes. One way to provide this time and support is for us to open our own classrooms up to others for their research purposes. While this may be intimidating for some, there must be ways to overcome this intimidation and open up our practice. Another option might be to include structural elements in our jobs that provide for opportunities to unpack our practice in search of our own practical theories.

Some might argue that the ability to verbalize a concise view of one's practical theory of learning and teaching may not be essential to teacher educator's practice. It is though a highly valuable exercise in that it allows teacher educators to more completely understand what they are doing and why. Furthermore, it allows them to make public what they are doing in their classes and present in thoughtful, rational ways vivid pictures of the complexity of teacher education. In a time when there are pervasive, politically powerful movements to discredit colleges of education everywhere this may be the most important reason we take on this work. Consequently, I invite others to join in the examination of the practical theories under girding all our work.

This study attempts to be a rich description of what goes on in one teacher education class. However, it is just that—a picture of one classroom, one teacher educator's practice. Many more such pictures are needed to begin to understand what is happening in teacher education classrooms across the country. Moving beyond single cases will entail looking across classes for themes and movement—both within and between institutions. Additionally, future research will need to tie these classroom pictures to student learning in a multitude of ways. This study aims to move us in the right direction.

Conclusion

The idea behind this paper was two-fold: one, to address the call for more qualitative research examining the teacher

education classroom and what went on in there and two, to address the lack of such work in the literature. As a result, through observations of class time and interviews, I theorized a model of what learning and teaching look like in one teacher educator's classroom. The model presented demonstrates that learning does not happen in a vacuum either of content in the classroom or of prior beliefs and stands as an example of how theory is developed and enacted over time and as an argument for the need of pedagogy in teacher education programs.

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“This is the Real World!”: The Use of a Webquest as a Performance Assessment in an Undergraduate Teacher Education program

Rebecca Faulkner, Ed.D., Cecilia Toole, Ph.D., Laura Kaufmann, M.A., Judy Beck, Ph.D. - University of South Carolina Upstate

Abstract: *This paper presents a culminating activity used as an integrated assessment tool in an Elementary Education Teacher preparation program. The assignment was for the teacher candidates to create a WebQuest which integrates technology into lessons. Examples of the product and feedback received from the teacher candidates are given.*

With the dawning of the 21st century, phenomenal advancements in technology have fundamentally changed the way we work, play and live. These advancements are no more evident than in the field of education. Educators have been forced to examine their instructional strategies and resources in order to keep up with these changes. Near the end of the 20th century, Papert (1993) visualized the computer as the ultimate tool for children to use to create their own knowledge and to introduce them to the process of intellectual inquiry. Technological resources are not new to classroom teachers, but incorporating them into instruction has become extremely important particularly since current research indicates that in order to prepare students for the future they need more developed technological skills.

Teacher educators are constantly looking for ways to improve their programs and to make them as much like “the real world” as possible. The professors and instructors at the University of South Carolina Upstate, Greenville campus, designed a WebQuest project as the culminating assignment for elementary teacher education candidates in the second semester of their junior year. The WebQuest task was developed to allow the teacher candidates to apply inquiry skills and integrate the curriculum and technology seamlessly. The basic philosophies of the School of Education at the University of South Carolina Upstate reflect the Constructivist Philosophy which allows candidates to create their own meaningful experiences and to place emphasis on the candidates’ abilities to think critically.

Background

Susan Berg (1998) and others asked technology coordinators to identify teachers in their schools who were exemplary in using computers effectively in the classroom. The identified teachers used technology in their classrooms to be more creative in designing assignments, to tailor curriculum to students’ individual needs, to motivate students, and to move away from a traditional classroom. Technology was also used by these teachers to enhance communication with parents and to computerize grades. Teachers that participated in this study reported that they learned to use technology through participation in a variety of technology staff development opportunities and many reported that they “learned on their own through reading, videos and individual help” (Berg p.5). This study provided a clear image of the classroom that is needed in the future and served as a model for future classroom development.

However, other studies show that it is still apparent in some classrooms that teachers teach in the same way that they were taught (Wilson, 2003). According to Wilson and others, teachers are using computers primarily for desk organization and very little if any classroom instruction. The teachers that participated in the Wilson study indicated that lack of knowledge and lack of experience contributed to their lack of use of technology. Therefore, the way our students in elementary level classrooms are being taught has not changed significantly over the years. If parents and business leaders feel that our current educational practices are not preparing students to succeed in the technological society, and classroom teachers are not yet implementing technology in their classrooms because of lack of knowledge, than it is imperative that teacher education programs provide experiences that will enable our future teachers to change this trend.

Since 2002, the United States has spent over $38 billion to bring technology and internet access to our schools. The National Center for Education Statistics (NCES) reports that in 2007, 99% of public elementary schools have access to computers and the internet. However, NCES also reported that only one third of elementary teachers in the United States felt well prepared or very well prepared to use computers and the internet for classroom instruction and that less experienced teachers felt better prepared to use technology than their more experienced colleagues (Franklin, 2007, p. 268). Using this information Cheryl Franklin, a teacher educator at Boise State University, examined the ways elementary teachers use computer technology for instructional purposes and the factors that influenced their use of computers. These factors were access and availability, preparation and training, and leadership and time. Survey responses indicated that the key factor for the pedagogical use of computers in the classroom was preparation and training. Therefore, Franklin concluded that as teacher educators continue to prepare teachers to teach with technology, the integration of technology into all facets of a teacher preparation program is important.

Peggy Ertmer (2005) argued that just use of technology is not enough to meet the future technological needs of our students. She stated that although teacher education programs were preparing pre-service teachers to integrate technology into instruction, the integration or use of technology was low level and associated with teacher-centered practices and not the high-level uses that are associated with student-centered practices. Ertmer believed that the ultimate goal was to facilitate uses of technology that led to increased student learning and not just use of packaged programs such as Excel, Word and PowerPoint.

One example of a high level use of technology in the classroom is a teaching tool called a WebQuest. A WebQuest is "a computer-based teaching and learning model in which learners are actively involved in an activity or situation and use the internet as a resource" (Halat, 2008, p.109). Lamb and Teclehaimanot (2004) assert that WebQuests are a student centered and project based approach to teaching and learning which is supported by a variety of learning strategies including constructivism, inquiry-based learning, and cooperative learning. WebQuests were created by Dr. Bernie Dodge (1995) at San

Diego State University. Like many educators in higher education today, Dr. Dodge could foresee the need for new teacher candidates to be prepared for the inevitable surge in the use of the worldwide web in the near future and the cost-effectiveness of highly sophisticated classroom technologies unprecedented in the most recent history of K-12 education. Since its development, the WebQuest has become prominent in many education areas and has received considerable attention from teachers and educators.

Therefore, in our teacher preparation program, our goal was to facilitate the integration of technology in our classes in the form of high-level student centered practice. The challenge was to create an assignment that was indicative of the courses that made up the Junior Block for our elementary education teacher candidates (Social Studies Methods, Literacy Methods, The Fine Arts Methods, Curriculum, and Assessment). It was important for them to not only integrate all of these areas of study through the use of technology, but to show their understanding of how collaboration and integration could be used to encourage their future students to grow as learners. In order to achieve our vision for a shared assessment, we had to combine the most important concepts of our courses in a fluid yet concrete manner. The ultimate result of these efforts was for the elementary teacher candidates to create their own WebQuest.

The Assignment

The students were challenged to create an interactive WebQuest that demonstrated their understanding of technology as a teaching tool. For this assignment, elementary teacher candidates chose appropriate grade level state standards from Social Studies and Language Arts. As such, the use of cooperative learning skills was to be an integral part of the WebQuest unit design. They were also asked to integrate components of the fine arts to include visual arts, music, dance, drama, or literacy. As part of the fine arts methods course, elementary teacher candidates learned the importance of using the fine arts to enhance student engagement, motivation, and retention. Therefore, they were encouraged to incorporate them in meaningful ways throughout the WebQuest.

Cooperative learning was a primary concept presented as part of the curriculum course. The WebQuest assignment required teacher candidates to utilize this strategy effectively. This required the students to construct the WebQuest so that students needed to rely on each other in order to complete the task (interdependence), promoted face-to-face interaction, incorporated group as well as individual accountability, encourage interpersonal and small group skills, and provided the opportunity for the group to process their work together. Finally, the students were to design an authentic assessment intended to deepen their understanding of the concepts from their Curriculum and Assessment courses. All of these expectations were to connect naturally and flow smoothly within the framework of the WebQuest. The students were to present their WebQuest to their peers and to the course instructors for feedback and evaluation. All instructors were in attendance as the students presented their final projects which facilitated a collaborative grading process.

One teacher candidate's WebQuest allowed 3rd grade students to imagine they were moving to South Carolina and encouraged them to explore geographic regions and various places in the state to determine which region best fit their family. Students were placed in groups of three in which each student researched one of the three geographic regions in South Carolina using teacher selected websites. They then created an informational brochure and wrote a friendly letter to a friend or relative back home about the region based on the rubric provided by the teacher. These items were shared during a group presentation to the class which was also assessed via a rubric.

Another teacher candidate created a WebQuest entitled, Wanted: Explorer Assistants. This webquest was based on the South Carolina Social Studies standards for 3rd grade related to the exploration of South Carolina. This WebQuest allowed the students to form cooperative groups and research the accomplishments and trade routes of major explorers who journeyed to South Carolina. The WebQuest was designed to extend over six class periods and involved the students completing a series of tasks. The first task for each group was to complete research about their teacher-assigned explorer. Each student in the group was to choose a role (recorder, computer operator or communications director), disallowing one student from completing all of the work. Using their research, the group created a journal that expressed the adventure as if they were truly there with the explorer. The group needed to include visual representations of the important locations that they would have encountered on their travels which were displayed on a poster-board. As a class, a map of the land and sea routes of all the explorer's expeditions were drawn and used by all groups as part of their presentation. Each group presented their information as a skit to their fellow classmates. The students were then evaluated as a group as well as individually.

Teacher Candidate feedback

Overall, the teacher candidates enjoyed the assignment. They mentioned being able to pull together and integrate all that they had learned as one of the key reasons. "I definitely think it was a great way to measure everything we learned. It even made it easier for me to see how everything comes together!" "Once I finished the project, I was able to look at it and see all the concepts I had learned wrapped into one project *created by me*!! What a great feeling it was!" One of their favorite parts to the assignment was completing the research necessary on the topic they chose and finding good websites to utilize within the WebQuest. Not having enough time for either the creation or the sharing of the projects was cited as a weakness of the assignment. One student did comment, however that "that is the real world!"

> "I enjoyed the assignment because it gave me a chance to integrate all that we had learned that semester. It's a great relief to be able to say "I learned about it and look- here is what I created!!" rather than "I learned how to do it but never actually did it". It was such an ego boost to see that I could do what I was taught instead of just regurgitating theories on an exam."

Conclusion

Advancements in technology have mandated a new direction in teaching. Teachers need to be exposed to using technological resources as part of their unit and lesson planning not just for administrative duties. Therefore, teacher preparation programs must provide experiences that allow teacher candidates opportunities to explore all of the resources available to them and expose them to strategies that connect curriculum and technology. The WebQuest assignment included in this paper is our attempt at meeting the technological challenges and advancements that have changed the world. Exposing our teacher candidates to this instructional tool provides an opportunity for them to experience exactly how technology can be an integral part of the daily operations of the classroom.

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Enhancing Retention in Urban Schools: Cross-age Mentoring and Achievement of At-Risk Minority Middle School Students

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Abstract: Virginia Commonwealth University in collaboration with the Richmond Public Schools, designed Project BEST (Basic Educational Skills and Training), a cross-age mentor/tutorial dropout prevention program which utilizes college students to improve the academic skills and self-esteem of middle school students at risk of dropping out of school. Data collected show a positive impact on both academic achievement and achievement responsibility compared to their levels of self-esteem.

Introduction

The exceedingly high dropout rate, particularly among poor and minority students, is cause for national and local alarm. Orfield (2004) posits that a dangerously high percentage of our youth disappear from the educational pipeline before completing high school and that the implications of high dropout rates in America are devastating for the individuals, our communities, and the economic vitality of the country. On the national level, about two-thirds of all students—and only half of all African Americans, Latinos, and Native Americans—who enter ninth grade will graduate with regular diplomas in four years. Orfield further notes that "dropping out leads to economic and social tragedy as high school dropouts are more likely than graduates to be unemployed, in prison, unmarried, divorced, and living in poverty" (Orfield, 2004, p.1). One approach to combat this growing problem is to provide at-risk students with opportunities and experiences that will engage them more deeply in the learning process and will allow them to make individual connections with a peer and/or caring adult (Rumberger, 2004). Although we are currently engaged in a national conversation about the dropout crisis, immediate local action is necessary to stem the increasing dropout rates for current at-risk students.

A Snapshot of the Local Problem

The Richmond Public Schools is an urban school division located in Richmond, Virginia. The school division's average student enrollment for the period 2003 to 2006 was 23,000. Eighty-five percent of the students in the school division are African American, ten percent are White and the remaining five percent are Hispanic, Asian, or American Indian. Seventy percent of the school division's students are on free or reduced lunch. From 2003-2006, there were approximately 4,500 graduates of the Richmond Public Schools. During that same period, the school division's dropout rate was reported as 15%. This figure represents 3,500 students. Orfield (2004) posits that most Americans mistakenly believe that if one were to add the number of students who drop out of schools to the number of students who graduate, the sum would be 100% of the students (Orfield, 2004). It is assumed that missing students must have moved, transferred to other schools, or enrolled somewhere else. Consequently, the dropout figures that are publicly released may not necessarily be accurate and the real number may in fact

be higher than what is reported. During the three-year period mentioned above, the number of students attending a two-or-four year college was 2,470 and accounts for only 54% of the graduates (Virginia Department of Education website). According to the Virginia Department of Education, 26% of the graduates (1,200) did not have any plans after high school. These numbers are especially troubling in that they suggest a future for many young people that is unknown, directionless, and may ultimately have negative ramifications on our society. Sadly, Richmond's current status mirrors that of many other large urban cities serving predominately poor and minority student populations.

Virginia Commonwealth University (VCU) is a large, public research institution located in metropolitan Richmond—the capital of Virginia. As espoused in the mission of both the University and our School of Education, we are committed to collaboration with the local community and more specifically the local schools, to address issues of mutual concern. Dropping out of school has been a critical concern for educators in the Richmond Public Schools as well as VCU. In collaboration with our colleagues in the Richmond Public Schools, we designed Project BEST (Basic Educational Skills and Training), a cross-age mentor/tutorial dropout prevention program which utilizes college students to improve the academic skills and self-esteem of middle school students at risk of dropping out of school. The basic philosophy underlying Project BEST is that a close, mutually respectful relationship between a college mentor/tutor and an "at-risk" middle school student will provide the child with a positive role model, encourage intellectual and personal growth, and provide a vision of what the middle school student's future might be.

Cross-age Mentoring of At-Risk Students

Programs designed to reduce the number of students who dropout of school must creatively address some of the issues which contribute to the phenomenon of dropping out of school. There is a critical need to help adolescents at-risk of dropping out acquire durable self-esteem, foster close human relationships, and achieve academic success (Karcher, 2005). Numerous studies have found that poor academic achievement as well as absenteeism and student discipline problems are predictors of dropping out (Ekstrom, Goertz, Pollack, & Rock, l986; Rumberger, 1995).

In cross-age mentoring, the focus is on the relationship, which is viewed as the main mechanism by which mentees develop in the areas of self-esteem, connectedness, identity and academic attitudes. Through regularly scheduled meetings between a child and an older person who provides the child with guidance, support, attention, and caring over an extended period, mentoring can have a direct effect on the social skills, self-discipline and self-esteem of students who are mentored (Karcher, 2005) Further, research indicates that cross-age mentoring programs can have a positive impact on academic achievement, reduced absenteeism, and lowering dropout rates among secondary (6-12) students (Gensemer, 1988).

Some of the best practices of successful mentoring programs include monitoring program implementation, providing on-going training for mentors, structuring activities for mentors and mentees, involving parents, and clarifying expectations about frequency of meetings found that the presence of all five of these

components doubled the effectiveness of mentoring programs (DuBois, Holloway, Valentine& Harris, 2005). While not a panacea, mentoring programs, such as the one we have described, provide at-risk students with opportunities to grow academically, take responsibility for their intellectual achievement, enhance self-esteem and ultimately, have an opportunity to fulfill our nation's promise of equity and access to higher education.

Overview of the Intervention Program

Project BEST goes beyond the scope of many traditional tutorial programs that focus on academic achievement. This program incorporates a mentoring component which emphasizes the development of academic skills and participation in experiences to encourage affective growth and positive self-esteem. College students who serve as mentor/tutors are role models who help students cope with and overcome some of their academic/school or home-related personal problems. Project BEST seeks to strengthen the academic and affective skills of middle school students in preparation for success in an academic high school track in preparation for college admission.

Selected Site for Intervention Program

Thompson Middle School (TMS), the target school for the intervention program, presents an interesting dichotomy. While the school is located in the heart of one of the most affluent areas of the city of Richmond, 95% of the student population is bussed to the school from housing projects and other low income neighborhoods in another area of the city. Thompson's student population is 99% African American and 85% of the students receive free or reduced lunch.

Criteria for Selection

Middle school students selected for the program must be considered at risk for dropping out of school based on academic, attendance and discipline concerns. Students who are academically capable but who have been determined to be at-risk because of discipline problems and frequent absences were also considered for the program. Further, math and science teachers recommended students who they believed would benefit from having a college role model and tutor and additional academic support.

College students selected as mentor/tutors for the program were required to have at least a 2.5 cumulative grade point average and prior experience working with children. Students completed a written application, participated in a formal interview with the Project Coordinator, and were recommended by the faculty. Eight mentor/tutors were selected to participate in the program. The students selected majored in Science Education, Mathematics Education, Engineering, Physics and Mathematics. Students were expected to participate in the after-school tutorial program two days per week and were paid $16.00 per hour.

Program Components

The mentor/tutorial program focuses on academic content in mathematics and science. The teachers monitor the tutorial program, maintain portfolios with class materials to direct the students in the tutorials, and set up online tutorial programs in labs. At least one teacher is present to provide assistance and

direction to the mentors during the tutorial sessions. Under the direction of the On-Site Coordinator, the mentor/tutors provide intense assistance to mentees in mathematics by using a research based online program. This one-on-one assistance affords the mentee the opportunity to interact with his/her mentee while increasing his/her mathematic acumen.

The three-tiered mentorship program currently utilizes Thompson Middle School teachers and VCU faculty and administrators who serve as role models for the VCU students on an informal basis. They also serve as professional role models and as resources for information on teaching careers. The college students, in turn, serve as mentors to middle school students and encourage them to aspire to attend college.

The Saturday mathematics and science enrichment seminars for the middle school students in Project BEST were implemented to review the concepts included on Virginia's Standards of Learning sub-tests in science and to enhance academic skills. The seminars were conducted by VCU faculty. The Project BEST mentor/tutors and the RPS coordinator attend and assisted VCU faculty at all seminars. The first seminar, "Nature of Science", guided students through a scientific investigation. The second seminar on "Detective Science" allowed students to "solve the crime" utilizing forensics concepts by investigating blood samples and patterns of blood spatters, fingerprints and footprints.

The week-long Mathematics and Science Summer Camp was held on the VCU campus. The Project BEST students were bussed from Thompson to the VCU campus each day and college mentors and the Thompson Coordinator assisted faculty with the summer camp. This was important as relationships were beginning to form between the mentor and mentees. The theme of the Camp was "Global Citizenship: Think Globally, Act Locally. Each day of the camp, students participated in a variety of hands-on activities, used technology to create reports and presentations, and participated in field trips. On the first day of Camp, all Project BEST students were given the book, *Nickeled and Dimed* by Barbara Ehrenreich, which all entering VCU freshmen were encouraged to read during the Summer 2007. The book helps students to understand that education and preparation for a career are essential to earn a salary that is not "nickels and dimes." Each day after lunch, the students were engaged in discussions of different chapters of the book. Each day, speakers from five related professions discussed their academic preparation, expectations for level of educational attainment required to work in the respective field, a typical day on the job, and what they find most exciting about their work. The speakers included a meteorologist, mathematician, physician, engineer and chemist.

The eighth grade students who participated in Project BEST will be tracked through high school (2007-2010). These students will be offered weekend seminars twice each year through their senior year in high school. They will be provided assistance with college selection, applications, and admissions as well as SAT preparation workshops with a continued focus on achievement in math and science.

Impact of the Program

The intervention program was implemented over one semester and one week in a summer program. Issues examined in the intervention program include the effect of cross-age mentoring on the academic achievement, self-esteem and locus of control of urban middle school students.

Methods

Student Sample

A total of 60 eighth-grade students from Thompson Middle School were selected to participate in the mentoring program if they were considered to be at-risk of dropping out of school based on academic, attendance, and discipline concerns. Thirty were randomly assigned to the treatment and control groups. Of the participating students, 15 in the experimental and 12 in the control group completed pre- and post-intervention data collection forms on all of the outcome measures and as such are the focus on the statistical analyses. These students account for 45 percent of the total number involved in the study. Students in Project BEST were given the post-tests on the last day of the summer camp. A number of students who had participated in the Project during the school year, and had indicated they would attend the BEST summer camp, opted to attend an eight week summer program offered by the school division which provided a summer long enrichment opportunity. It was difficult for Project BEST to compete with this extended program which parents preferred because of the longer time frame and the need for constructive activity for their children for a longer period of time during the summer. One female student who attended the summer camp brought her baby with her to camp on the third day, explaining that she really wanted to participate but did not have a baby sitter or family member who could keep the child. She did not attend the last two days of the camp because of child care concerns. The control group was tested the last week of school and a number of students were absent that day while others did not report to take the test

Table 1 shows the basic characteristics of the experimental and control groups. Both groups were similar with regard to race/ethnicity composition; however the experimental group was comprised of a greater percentage of female students (73.3%) compared to the control group (33.3%). Alternatively, twice as many male students were in the control compared to the experimental group (66.7% v. 26.7% respectively). With regard to the home environment, students in the control group were more likely to report being raised by both their mother and father (66.7%) compared to those in the experimental group (26.7%). These students were more likely to be in a home setting in which there are being raised by a single parent or a parent and step-parent than were their control group counterparts.

Table 1. Sample Characteristics

Characteristics		Experimental Group (N =15)	Control Group (N=12)
Gender	Male	26.7% (4)	66.7% (8)
	Female	73.3 % (11)	33.3 % (4)
Race	Black	93.3% (14)	100% (12)
	Other	6.7% (1)	0% (0)
Parenting/ Home Structure	Mother & Father	26.7% (4)	66.7% (8)
	Mother only	13.3% (2)	8.3% (1)
	Father only	13.3% (2)	0% (0)
	Mother & Stepfather	20.0% (3)	0% (0)
	Father & Stepmother	13.3% (2)	0% (0)
	Other relatives	13.3% (2)	8.3% (1)
	Guardian(s	0% (0)	16.7% (2)

Measures

Background Questionnaire. A background questionnaire was administered to students in the experimental and control groups. The questionnaire was developed to gather demographic information from students. They were asked to indicate their gender, race, grade level, age and whether they were being raised by their biological parents, a single parent, a stepparent, or other relative or guardian.

Academic Achievement. The Virginia Standards of Learning (SOL) mathematics and science 2007 test scores were collected for students in the experimental and control groups. These tests are administered each spring as part of the state testing program; there is not a pre-measure on which the spring test scores could be compared. Consequently, the 2006 SOL mathematics scores were obtained to serve as a pre-measure or predictor of student test performance for the subsequent academic year. In addition, to SOL test scores, end-of-the-year grades were collected for both science and mathematics courses for 2006 and 2007.

Achievement Attributions. The Intellectual Achievement Responsibility Questionnaire (Crandall, Katkovsky & Crandall, 1965) was used to assess the participants' achievement attributions by assessing their locus of responsibility -- either internal versus external reinforcement. The measure consists of 34 items describing either a positive or negative achievement experience followed by two responses (e.g. When you do well on a test at school, is it more likely to be (a) because you studied for it, or (b) because the test was especially easy) and includes an equal number of positive and negative events. The scale allows one to produce a total responsibility score as well as separate sub-scores for internal responsibility for success and for failures. Based on a 2-month test-retest interval reliability coefficient for the IAR were .69 for the total scale (I), .66 for the success (I+) sub-scale, and .74 for the failure (I-) sub-scale.

Self-Esteem. The Rosenberg Self-Esteem Scale (Rosenberg, 1965) was used to measure students' general perceptions of self-esteem. The scale consists of ten items (half reflect satisfaction with one's self and the other half reflect dissatisfaction) on which subjects were asked to indicate their extent of agreement using a four-point Likert scale ranging from strongly agree to strongly disagree.

Scores on the scale range from 0 to 30; with higher scores indicating a more positive self-esteem. This scale has been found to have satisfactory internal reliability (based on the reproducibility and scalability coefficients of .92 and .72 respectively), test re-test reliability of .85 to .88, as well as convergent and discriminant validity evidence (Rosenberg, 1965).

Absences and Discipline Referrals. The total number of absences and discipline referrals for the 2006-2007 academic year was collected from student records.

Career Interests. The Self-Directed Search (SDS) Career Explorer was administered to identify participants' career interests. The measure was designed specifically for use with junior high or middle school students in the early stages of vocational and educational planning (Gottfredson, 1992). A scientific classification of vocational personalities and occupations based on the schema developed by Holland (1985) underpins the scale. Holland's schema identified six vocational personalities – realistic, investigative, artistic, social, enterprising, and conventional. Each personality is correlated to specific type of vocational characteristics, for example someone with an *Investigative* personality may be predisposed to activities and occupations that involve "exploring and understanding things and events" whereas someone with an *Enterprising* personality may like work in a situation that involves "persuading or directing others". The scale includes an inventory of activities, skills, careers, and abilities that students assess and circle a "yes" or "no" response indicating their interest or competency in a particular area. Total scores can be derived for each of the six vocational personalities from which a two-letter Holland code can be determined. These codes can then be used to identify careers and vocations based on the combination of interests and skills.

Results

This experimental study incorporated a variety of measures to capture the possible impact of participation in the cross-age mentoring program. To examine the program effects, a series of statistical analyses were conducted to determine if differences related to achievement, achievement attributions, self-esteem, and career interests existed between the experimental and control groups at the completion of the program. Independent-samples t-tests were conducted to identify differences between the experimental and control groups and paired-samples t-tests were used to identify pre- and post-differences in the outcome variables for the experimental group in an effort to target growth or change that resulted from the mentoring experience.

Achievement

As shown in Table 2, the experimental group outperformed the control group on both the SOL Mathematics and Science tests that were administered in the spring of 2007. The test administration coincided with the completion of the mentoring program components implemented during the school year. The average scaled score of the experimental group ($\bar{x}$ = 538.1) was significantly higher than that of the comparison group ($\bar{x}$ = 392.7) at p <.001. In addition, the average scale score on the SOL Science score was also significantly higher in the experimental group ($\bar{x}$ = 469.6) compared to the control group ($\bar{x}$ = 399.3) at p <.05. Because the SOL tests

are administered only once during the academic year, it was not possible to implement an identical pre-measure that would allow for an assessment of academic achievement gains made over the year. However, 2006 SOL Mathematics scores were obtained to provide a proxy pre-measure or baseline for math performance for both the experimental and control groups. As shown in Table 2, students in both groups performed similarly on the 2006 exam. Based on the 2006 results, it was reasonable to expect that the average test score of students in the experimental and control groups would be comparable in the treatment year. However, the significant difference in achievement results suggests, that participation in the mentoring program had a powerful influence on student academic achievement in these areas. It is significant to note that the passing score on the mathematics and science SOL tests is 400. For the 2007 administration, the Project BEST students' passing scores significantly exceeded the state's cut-off score while the non-Project BEST students' scores were below the cut-off score for both mathematics and science.

Table 2. 2006 and 2007 SOL Mathematics and Science Test Scores

SOL Test	Experimental Group (N=15) Average(SD)	Control Group (N=12) Average(SD)
SOL Math Score 2006 (7th Grade)	369.5 (71.8)	378.8 (48.2)
SOL Math Score 2007 (8th Grade)	538.1 (53.8)**	392.7 (76.7)
SOL Science Score 2007 (8th Grade)	469.6 (33.7)*	399.3 (94.8)

* $p < .05$; ** $p < .001$

Although students in the experimental group outperformed their control group counterparts on the state mathematics and science exams, these gains in achievement did not translate to higher end-of-year grades. Even though, a greater percentage of students in the experimental group earned end-of-year grades in the A (27% vs. 8%) or B (40% v. 25%) range in Mathematics and Science (A 20% v. 0%; B 33.3% v. 25%) classes compared to those in the control group, these grade distributions were similar to those earned in Mathematics and Science classes the previous academic year. Consequently, students in both the experimental and control groups earned grades that were expected based on academic performance in the previous year.

Academic Attribution.

The Intellectual Achievement Responsibility (IAR) Questionnaire was used to provide a measure of responsibility held by students for their academic performance, successes, and failures. The results of the pre- and post-administration of the IAR are shown in Table 3. The total scale ranges from 0 to 34 with higher values indicating a greater degree of personal responsibility attributed to successes or failure rather than giving credit or placing blame on external factors. Similarly, the sub-scale scores range from 0 to 17; again higher scale means suggest higher levels of internal responsibility. As shown (see Table 3), there were no pre- or post-IAR differences between the experimental and the control group. However, the post-success scale average was significantly greater than the pre-success scale score for the experimental group (post $\bar{x} = 15.08$; pre $\bar{x} = 13.10$) at $p < .10$. These results suggest that the

mentoring program may have empowered students in the experimental group by encouraging them to take ownership of and responsibility for their own academic successes.

Table 3. Experimental and Control Group Intellectual Achievement Responsibility Scale Scores

IAR Scale	Test	Experimental Group (N=15) Mean (SD)	Control Group (N=12) Mean (SD)
Total Responsibility Scale (I)	Pre	24.8 (4.2)	26.3 (2.1)
	Post	27.3 (3.7)	24.8 (4.8)
Responsibility for Success (I+)	Pre	13.1 (2.6)*	14.7 (1.6)
	Post	15.1 (1.9)	13.8 (2.9)
Responsibility for Failure (I-)	Pre	11.7 (2.1)	11.5 (1.4)
	Post	12.1 (2.2)	11.0 (2.4)

* Pre and post differences are significant at $p < .10$

Self-Esteem.

Scores on the Rosenberg Self Esteem scale range from 0-30 with higher scores reflecting more positive perceptions of self-esteem. An independent samples t-test indicated that there was no difference in the pre- and post-SES total score for the experimental and the control groups. This is not surprising since the average pre-SES scores were fairly high for both groups (experimental $\bar{x} = 25.27$; control $\bar{x} = 25.45$). However, a paired-samples t-test revealed pre- and post-differences for the experimental group at the item-level. Students in the experimental group reported a significant increase in positive self perceptions. For example, fewer students at the post-test agreed with the statement "At times I think that I am no good at all" while a greater percentage indicated agreement with the sentence "I take a positive attitude toward myself."

Absences and Discipline Referrals.

Data on student absences and discipline referrals were obtained through student records to provide additional insight into the extent to which students were engaged at school. There were no pre- and post-differences for the experimental group with regard to the number of student absences; the group average was about 3 absences in the fall and spring of 2007. On average, however, the students in the control group were more likely to be absent from school during both semesters, with an average of about 10 days respectively. Further, there were no pre- and post-intervention differences for the experimental group with regard to the number of times students received discipline referrals; the group average was about 1 referral in the fall and spring of 2007. Also, the average rate of referrals was the same for both the experimental and control groups during the fall and spring of 2007.

Career Interests.

Students in the experimental and control groups completed the SDS Career Explorer Inventory as a pre- and post-measure. All six career categories were represented in both groups in the pre- and post-administrations. In both groups, the *Social* classification was identified by 30 percent; this career orientation requires skills in teaching, treating, or healing of

others. In addition, the *Conventional* and *Enterprising* classifications were identified by the fewest number of students in both groups at the post test. Pre and post-test changes in career orientation were evident in the experimental group. At the pre-measure one student reported a predisposition toward *Investigative* oriented careers while at the post-test this number had increased to four. The SDS Career Explorer also asks respondents to "list the careers or job you have thought about" and provides space for four responses. Table 4 provides a summary of students' pre and post narrative responses. The responses were coded and organized into ten different categories. As shown in Table 4, the greatest gains among the experimental group were related to careers in medicine, the fashion industry, legal as well as science careers. Compared to the control group, students in the experimental group were more likely to express an interest in careers that required skills and competencies in mathematics and science on the post-measure. These results suggest that the mentoring program, and perhaps more importantly, the summer workshop series may have had an influence on student career aspirations.

Table 4. Summary of Pre and Post Narrative Career Interests[1]

Career Areas	Test	Experimental Group	Control Group
Medical	Pre	18.3% (11)	16.7% (8)
	Post	25.0% (15)	10.4% (5)
Entertain-ment	Pre	18.3% (11)	10.4% (5)
	Post	10.0% (6)	10.4% (5)
Fashion Industry	Pre	13.3% (8)	14.6% (7)
	Post	20.0% (12)	6.3% (3)
Sports	Pre	11.7% (7)	10.4% (5)
	Post	1.7% (1)	0% (0)
Education	Pre	8.3% (5)	10.4% (5)
	Post	8.3% (5)	4.2% (2)
Writer/Artist	Pre	8.3% (5)	4.2% (2)
	Post	3.3% (2)	8.3% (4)
Legal	Pre	6.7% (4)	6.3% (3)
	Post	11.7% (7)	6.3% (3)
Business	Pre	5.0% (3)	2.1% (1)
	Post	3.3% (2)	2.1% (1)
Science	Pre	3.3% (2)	4.2% (2)
	Post	8.3% (5)	4.2% (2)
Architecture /Engineering /Computers	Pre	0	2.1% (1)
	Post	3.3% (2)	4.2% (2)

1. In Table #4 - Note that each respondent was provided with space to write in four careers or jobs in which they had some interest. The percentages reflect the percentage of the total number of possible responses not the percentage of subjects in the experimental or control groups (Experimental group N=60; Control group N =48). The total number of responses was derived by multiplying the experimental and control group membership by four.

Lessons Learned

The outcomes of the mentoring program suggest that it had a significant impact on Project BEST students' academic achievement and achievement responsibility compared to their levels of self-esteem. Further, students in the Project were more likely than their peers

not in the program, to express an interest in careers that required skills and competencies in mathematics and science. These results suggest that participation in the mentoring program provided students with learning experiences that not only contributed to their greater understanding of mathematics and science concepts but also made connections to their interests and aspirations related to long-term career goals.

Educators considering developing a collaborative dropout prevention program might consider the following recommendations:

1. It may be that over a short period, mentoring programs directly influence students' academic achievement as evidenced by mastery of content on comprehensive exams and students experiencing a feeling of empowerment to take ownership of and responsibility for their own academic successes. The fact that the gains in achievement did not translate into higher end of year grades indicates that either the middle school students are not applying themselves in classes or teacher evaluations may be subjective. Mentors should challenge their mentees to master the content, and work hard to earn high grades in classes.
2. During several sessions with mentors, they reported that their mentees often commented that doing well in school was not always viewed by their peers as positive. Mentors reported that mentees stated that it was sometimes easier to pretend they did not know something and not stand out. Mentoring programs should provide training to mentors so that they are able to dispel negative ideas about high achievers and guide mentees to understand that they can be both popular and intelligent. Mentor training should be on-going so that the mentors learn strategies to help their middle school mentees build durable self esteem.
3. Comments from students in the Project indicated that they saw the future as high school life and in many instances they did not think of the future beyond that. Strategies to introduce at-risk students to careers in mathematics and science should include younger role models (professionals who are within five years of completing college) working in mathematics and science professions so that a vision of the mentee's future would appear to be attainable in a few years. Contact with these professionals should be on-going throughout the year, rather than confined to a summer program.
4. The data indicate positive intellectual achievement responsibility and external locus of control for the mentored students than for their non-mentored peers. Having a mentor may have encouraged students to take responsibility for their own academic success and failure.
5. The basic components of Project BEST may be easily replicated. The mentor/tutorial program should be coordinated by a teacher who serves as an on-site coordinator with the support of content area teachers who closely monitor the program. The college mentors must work with the teachers to ensure that the course content and appropriate subject specific pedagogy is used in the tutorials.
6. There is a critical teacher shortage in the Commonwealth of Virginia as well as the rest of the country. College students who work as mentor/tutors in

dropout prevention programs may be recruited into the teacher preparation programs.

Conclusion

During a period of increased school violence, gang warfare, drug abuse and dysfunctional families, dropout prevention programs are critical. These programs positively impact the quality of life of all people in our society in that they help create an educated citizenry. The full complement of program components, i.e. paid mentor/tutorial program, support for workshops/training for mentor, Saturday seminars and summer programs, and participation in cultural activities, will provide academic and human support for the children in our society who desperately need assistance to gain access to opportunities in higher education.

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Directly from Pedagogy to Practice: Incorporating Virtual Manipulatives in the Elementary Mathematics Classroom

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Abstract: This study examined the effectiveness of using virtual manipulatives to increase the cognitive understanding of fractions of 4th grade students. Although the study was limited to one classroom results showed positive gains in student achievement.

Mathematical representation and the comprehension of mathematical knowledge occur on three levels: concrete, semi-concrete, and abstract. These three levels provide a paradigm for sequential instruction and logical course of action for remediation. The concrete level includes the use of physical models, such as hands-on manipulatives and realia, to comprehend a specific content, task, or skill. The semi-concrete level utilizes pictorial images like drawings, pictures, photographs, charts, and graphs. The abstract level incorporates numbers, symbols, and mental math. Virtual manipulatives are essentially replicas of physical manipulatives placed on the World Wide Web in the form of Java applets with additional features (Moyer, Bolyard, and Spikell, 2002).

Moyer, Bolyard, and Spikell (2002) define a virtual manipulative as "an interactive, web-based representation of a dynamic object that presents opportunities for constructing mathematical knowledge." Virtual manipulatives are a unique in that they do not fit neatly into any one of these three categories. Virtual manipulatives can be maneuvered like objects at the concrete level, deliver a visual image like those at the semi-concrete level, and some have the capacity to simultaneously integrate numbers and symbols from the abstract level.

Virtual manipulatives are available (at no cost) via the World Wide Web, and can capture and store users' movements and other work tasks (Cannon, Heal, and Wellman, 2000). They also foster much more engagement than physical manipulatives. Their Web availability affords free access for schools that are online. With a Web connection, these interactive sites are available at school, but parents and students alike can use these virtual manipulatives from their public library and/or home computers. Teachers who may be reluctant to send home concrete manipulatives for students' use may be more likely to give assignments to students who have access to virtual manipulatives through their home computers. Availability is just one of several factors that teachers might consider when they determine the effectiveness of using virtual manipulatives in their classrooms.

In an age of budget cuts and other cost savings measures, virtual manipulatives can be a solution. Teachers often express concern that they either do not have or do not have enough concrete manipulatives for all students in their classes. With virtual manipulatives, students control the number of blocks available with the click of a computer mouse.

I have been teaching a math methods course for pre-kindergarten

through sixth grade teachers at the graduate level for several years. Typically, the class roster consists of pre-service teachers seeking initial certification and a handful of practicing teachers seeking additional licensures. Upon the fourth week of the semester, I introduce "dynamic virtual manipulatives" as an instructional technology tool. The overwhelming response from the classes has always been "Wow! I never saw that before!" One of the assignments for this methods course requires the college students to create a lesson plan that incorporates a dynamic virtual manipulative which will actively engage the elementary student in their learning. This engagement must be presented in a meaningful way just as we would require of hands-on manipulative usage. Typically the university students' excitement level soars for something novel to them in math education. The ability to try something they have never seen before is motivation itself.

I purposely introduce the tool with three objectives in mind. First, the graduate students must complete a math education course with comprehension of the most current pedagogy and instructional tools available. Secondly, if virtual manipulatives are so highly engaging and motivating to my university students, this excitement will translate directly to their future elementary students. Thirdly, within this newfound interest in mathematics education, the possibility for my students to complete some sort of action research project utilizing virtual manipulatives increases significantly, thus adding more research to the body of knowledge related to virtual manipulatives.

Students learn best when teachers use multiple instructional strategies that combine "see-hear-do" activities. Since students learn in different ways, manipulatives can increase the exploration possibilities to develop concepts and test hypotheses for students at all levels of ability. Virtual manipulatives are meaningful to the learner, provide control and flexibility, have characteristics that mirror or are consistent with cognitive and mathematics structures, and assist in making connections between various types of knowledge.

Given the intense national focus on student achievement and accountability, educational technology can provide a powerful "arsenal" of tools to help improve student achievement and to create accountability frameworks based on continuous improvement. Technology can be quite influential when integrated with curriculum and assessment. In a review of studies, the CEO Forum (2001) concluded that "technology can have the greatest impact when integrated into the curriculum to achieve clear, measurable educational objectives." Technology transforms the learning environment so that it is student-centered, problem- and project-centered, collaborative, communicative, and productive. As a result of innovations in technology, the availability of the Internet, and the increasing use of computers in classrooms, an enhanced approach for teaching and learning mathematics using computer-based manipulatives is emerging.

Theory to Practice

A recent graduate of our program and former member my methods course was motivated to conduct the following action research project in her own 4th grade classroom. A multi-subject study was conducted to test whether the use

virtual manipulatives resulted in an increase in conceptual knowledge of fractions for the 4th grade students.

The participants in her study were 20 fourth-grade students. Eighteen out of twenty students participating in this study receive partial or total meal subsidies. The demographics of the 20 children in the class included one Caucasian, thirteen Hispanic, two African-American, one Asian, and three Middle-Eastern students. Three children had special needs, fifteen were receiving ESOL support (one of whom was new to the country and spoke no English), and one was receiving gifted and talented services.

The physical environment of the classroom was organized for cooperative learning, with desks placed in groups of four or five students. A mobile laptop computer laboratory was brought into the classroom and the experimental group used the laptops at their desks, interacting with the virtual manipulatives for nine days. Students worked independently with the manipulative activities.

The research was conducted for a two-week period during the fourth quarter of the school year. Three assessments, a pre-test and post-test, and one quiz, were administered. Subjects were grouped using a very deliberate method based on pre-test scores and rank ordering, with the goal of having the two groups of approximately equal ability. All twenty students were given the same pre-test on fractions prior to group selection. The scores were then calculated and the students were rank ordered one through twenty. From the rank ordering, the control group was comprised of all the odd numbers and the experimental group was comprised of all even numbers.

During a two-week (ten day) unit on fractions, the experimental group interacted with concrete and virtual manipulative applets. The control group used only concrete manipulatives and traditional worksheets during independent practice. Both groups of students had the opportunity to ask for assistance from the teacher at any time during the class. The same focus lessons were taught to the control group and the experimental group.

The daily 55-minute class was structured as follows. The teacher taught a daily, whole group focus lesson on fractions followed by a question and answer discussion with students. Fraction concepts in this unit included: parts of a whole, parts of a group, equivalent and non-equivalent fractions, as well as some abstract questions. When appropriate, each lesson began with a review of the prior day's lesson. Students were then divided in their assigned groups for independent practice that lasted twenty-five minutes. The control group was given concrete manipulatives, such as base ten blocks and fraction strips, along with teacher-developed worksheets. The experimental group worked on applets located on the National Library of Virtual Manipulative website (http://nlvm.usu.edu/en/nav/vlibrary.html). Based on the day's lesson, the teacher had previewed and selected the appropriate practice application. Examples included were: fraction bars, fraction pieces, fraction adding and subtracting with like and unlike denominators, parts of a whole, equivalents, and naming fractions. The entire class congregated at the end of the period for discussion and closure. All students were given nightly homework that consisted of a practice worksheet reinforcing the concepts learned.

Figure 1. Students Ranked by Test Gains

Quiz			Post-Test	
Student No.	Test Gains		Student No.	Test Gains
3	14		3	11
4	13		18	11
13	12		20	11
2	12		13	10
12	12		15	9
20	12		4	9
10	11		8	9
18	11		10	9
5	10		12	9
19	10		5	8
6	10		7	8
7	9		2	8
8	9		9	7
11	8		19	7
1	7		11	6
15	7		6	6
17	6		14	6
14	6		16	6
9	5		1	5
16	5		17	4

The Pre-Test, the Quiz and the Post-Test each consisted of 20 open-ended questions (i.e., there were no true-false or multiple-choice), that were designed to capture the degree to which the students had mastered the unit of instruction. No partial credit was given. Each student's score (on a scale of 0 to 20) for each evaluation instrument was recorded.

Findings

Figure 1 shows the improvement for each student on both the Quiz and the Post-Test as compared with student performance on the Pre-Test. The figure is ordered by the improvement in the number of correct responses. The test gains ranged from 5 to14 points on the Quiz and from 4 to 11 points for the Post-Test. In Figure 1, students identified with odd numbers were part of the Control Group and students identified with even numbers were part of the Experimental Group. While somewhat more apparent in the case of the Quiz than the Post-Test, in both cases the preponderance the Experimental Group (the even numbers) are toward the top showing greater test gains, and the Control Group (the odd numbers) are toward the bottom, showing less test gains.

Next, the average improvement of student scores from the Pre-Test to the Quiz and from the Pre-Test to the Post-Test, were calculated. The scores of students in the Experimental Group improved an average of 1.3 points above those in the Control Group for the Quiz, and they improved an average of 0.9 points more than the Control group for the Post-Test. If these scores were converted to a 0 to 100 scale, this would represent a difference of 4.5 and 6.5 percentage points respectively, or approximately one-half a letter grade.

Next, a brief question analysis was performed. Questions 17 through 20 were "word problems" that tend to give the students the most difficulty. As expected, the use of virtual manipulatives did not seem to make a difference here. The difference in improvement between the two groups on Question 11 is the most striking—there were four wrong answers out of the ten members of the Control Group and none in the Experimental Group. Question 11 marked a transition from one type of question to another. These students frequently do not do well on such transitions. Although it cannot be stated with certainty, the added focus that comes with the use of virtual manipulatives might have had a bearing on

the fact that the Experimental Group had no mistakes.

There was a maximum difference of two wrong answers on any particular question between the two groups. This seems to indicate that although the use of virtual manipulatives did result in an overall improvement in scores, there was not a dramatic effect on most questions.

Discussion

These results indicated that there was a noticeable increase by the experimental group in conceptual knowledge. In fact, the amount of increase correlated to approximately a half of a letter grade on math tests for fourth grade students. This is consistent with the results that other researchers have obtained in a similar experiment. These results align themselves with the two studies discussed earlier in this report: The Educational Testing Service study that showed students gaining a one-third grade level increase (Weglinsky, Harold, 1998) as well as the Mann, et al (1999) study where every student exposed to the mathematics technology showed an increase in post-test assessment score.
The data, however, does not indicate any increase in comprehension of word problems.

However, two unanticipated results, perhaps of greater significance, the economy of teacher time and independence of students, seemed to occur. Although the teacher did not set out to examine the results of cooperative learning in the classroom, an interesting observation was made. The students in the experimental group never sought the assistance of the teacher during any part of their independent practice time on the computers. Instead, they, without any prompting from the teacher, were eager to rely on one another for assistance and help, thus demonstrating a proactive approach to learning. The vast majority of the research comparing student-to-student interaction patterns indicates that students learn more effectively when they work cooperatively.

The students in the experimental group seemed to become more positive about each other, regardless of differences in ability, ethnic background, or handicap, as they learned cooperatively, when compared with those working alone or with the assistance of the teacher. There developed a reliance on one another and a spirit of helpfulness toward one another that carried over into other parts of their day. The experimental group practiced effective interpersonal skills by working cooperatively, while the control group did not. While working alongside one another, the students began to apply the ideas and concepts taught during the focus lesson. This independence stimulates students to progress in their use of statistical methods, modes of thinking, and reflection. They become aware of the wide variety of investigation.

With the experimental group engaging and collaborating in group cooperative learning and not requesting assistance from the teacher, more time was available to provide higher quality assistance to the control group. One might perceive this as losing some control over the activities of the experimental group; that is, the teacher did not monitor every detail of their actions. However, the teacher found that as students embraced their roles as critical thinkers and analysts, they became aware of their tasks and succeeded in valuing their time spent in practice activities. In addition, even

though the teacher was working one-to-one with students in the control group, she was able to monitor the activity of the experimental group easily by strategically moving to view the monitors, thus ensuring on-task behavior.

Conclusions

With efforts of national and state educational organizations to increase the technological literacy of today's students, the use of virtual manipulatives provides yet another opportunity for engaging students in the world of technology. The use of the computer helped students understand the nature and operation of the system, thus increasing their proficiency in its use. They developed a positive attitude toward the technology and practiced responsible use of the computer hardware, software, and information.

This study examined the effectiveness of using virtual manipulatives to increase the cognitive learning of 4th grade students. The results of this study, although reinforcing the teacher's hypothesis, should be interpreted with care, as the study is limited to one teacher and 20 students. However, the positive results are significant enough that further study is definitely warranted.

On both the quiz and post-test, student improvement within the experimental group was impressive– an increase of approximately one-half of a letter grade. This may be due to the students having had an opportunity to practice with dynamic visual representations when they viewed the virtual manipulatives – an opportunity that does not exist with textbook pages and worksheets. Multiple simultaneous inputs of information may have complemented one another as an instructional strategy.

More on-task behavior was noted because of the structured nature of the computer program. The software focused their attention on what was to be learned and did not allow for off-task behavior. Student appeared to motivation rise. The technology provided students a less threatening environment in which to work and learn and thus facilitated better communication between the student and teacher.

Virtual manipulatives are an innovative and useful way to enhance mathematics teaching. This article highlights some of the advantages of integrating technology to teach mathematical concepts. It is hoped that the study referenced in this project will prompt others to examine the effectiveness of dynamic virtual manipulatives in elementary mathematics classrooms.

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