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Connections

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by

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The role of teacher is defined and delineated by its fine balance of give and take, of pedagogy and curriculum, of metacognition and epistemology, and of carrying and allowing students to carry. The decisions teachers make about what and how to teach push and pull students through fulfilling and not so fulfilling learning experiences. Nonetheless, one underlying goal to most instruction is the desire to facilitate students in the making of connections amongst themselves, the curriculum, and the world. During my last year of graduate school, amidst my own juggling of the roles of student and teacher, I began to fully realize and appreciate the complexity of this endeavor for both my students and myself. Through the voices of my students, I discovered that the search for connections is an ongoing and extremely rewarding process.

It was during this period that I created and oversaw a senior field experience for five soon-to-be student teachers of secondary mathematics. The Center for Teaching and Learning's rationale for requiring this field experience is the further preparation of students for their upcoming student teaching experience and ultimately for their future role as secondary teachers. Moreover, my goal in setting up this particular experience was to allow my math methods students access to alternative mathematical teaching and learning settings.

I wanted these students to be part of the current calculus reform which, on this campus, integrates the use of computers to enhance the learning of calculus concepts. To this end, they were semi-trained in the use of certain calculus and graphing software. Using this brief indoctrination, they then tutored calculus students in the math department's new computer lab.[1] In other words, they also were to learn as the experience unfolded. Under the direction of several different calculus instructors, they were introduced to the use of the computer as a tool for enhancing the learning of calculus through the visualization and manipulation of various graphing and algebraic concepts. These five student/tutors were encouraged to gently guide struggling students to discover their own solutions via the tutors' use of leading questions. After 18 hours of tutoring and training, the student/tutors presented a demonstration of various calculus and graphing concepts to two local high school math classes. Because more and more mathematics is being required of high school students, there exists a high probability that my students will teach calculus at some time in the near future. A particular objective of the directors of the computer lab was to allay any fear these soon-to-be math teachers might have regarding the use of computers to facilitate learning in their future classrooms.

Because I felt my students also needed more time in the secondary school setting, they were asked to tutor math students for 10 hours at another local high school's resource room. The high school students were allowed to come to this room on a voluntary basis when they needed extra help with lessons. In a journal entry, one of the tutors wrote about her initial entry and the purpose of the resource room:

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- Today for the first time I went to the Vocation Resource Room ... I didn't know what to expect since I had never heard of anything like it before ... The location of the room was a shock to me, it was around a corner, downstairs, and around another corner. It appeared to me to be a location similar to that of a janitor's closet or supply room. I was welcomed with open arms by Jean[2] ... [She] explained to me that the resource room had been around for [eight] years. It was designed for students to come to and seek help ... students can ask their teachers for permission to leave their class in order to work one-on-one with Jean in the resource room. The students also have a free period during which they are supposed to come for help ...

The tutors soon realized that the obscure site of the resource room was by design to ensure the anonymity of its participants, high school students who might otherwise be less willing to seek out assistance. The teacher in charge of the resource room was a nurturing, patient woman; qualities that the tutors would shortly realize were vital to her role and, more significantly, to their roles as tutor/teachers.

At the onset of this field experience, I felt some concern about my students being pulled in two very different directions and about the confusion and stress of scheduling and transportation. Because of my own time constraints regarding my studies and my other teaching responsibilities, I, too, felt pulled toward and away from my personal involvement in this experience. However, I soon realized that, after the initial set up, the logistics were and should be the responsibility of the students. My primary role was to facilitate their making of connections within and between the two experiences through an ongoing dialogue in the math methods classroom and through their writings. Yet, my "nagging inner voice" kept questioning my students' interpretations of the value of the two experiences. Was it asking too much of my students to reflect on and learn from these two experiences at one time? Would they be able to see the connection between the two? Because the students were asked to journal regarding their activities in and thoughts on both settings, I was able to glean from their reflections the answers to these questions.

The students actually wrote very little about the hassles of finding time or energy to participate in the experience; they merely accepted the terms and went about fulfilling the requirements, sometimes solemnly and other times with great enthusiasm. However, they wrote often about their confidence or lack of confidence in their roles as tutor, teacher, and/or presenter:

- I am feeling very comfortable in being able to help students without giving away the answers ... I am learning from my mistakes.
- When I found out today that we would be working with word problems, I nearly fainted! These scare students–(and me a little also hahaha!).
- I feel that I can now explain math material better ... I think I can address a group better because of this one-on-one or one-on-three, etc.
- They [resource room students] were excited to finish their homework ... I felt like I was finally doing something worthwhile.
- I felt like one of the most difficult things for us during the presentation was that we didn't know enough about [the software].
- I now feel more confident in leading my class through concepts on the computer.
- Overall, the experience has helped me to gain confidence about what I was doing and my abilities to come across as a person.

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[2]Names have been changed.

The importance of self confidence to the role of teacher in any setting needs little explanation. It was clear that all five students saw a parallel between their knowledge of the math or computer content and their teaching confidence, yet they wrote more often about their feelings regarding their abilities and inabilities to reach their students.

The realizations the student/tutors came to regarding how their students experienced learning were illuminated in their writings and were especially revealing. The following comments were written in reference to the computer lab:

- Another thing I appreciated was students helping each other.
- I noticed several groups of students working together, not always at the same computer. This may help the students to learn to communicate with others mathematically, maybe even just talking to someone in class will encourage the students to talk outside of class as well.
- I feel that the visualization process enhanced the students' understanding of the concepts, ex. Delta and Epsilon.
- There were many students that made mistakes ... because of not reading directions ... maybe it is simply a fact of motivation ... many of these kids just want a magic little formula instead of truly understanding the concept.
- The students were confused ... I believe they needed a lesson before the first lesson.
- Overall, the students seemed quite comfortable with Newton's Method [a latter computer lesson] ... I think that this is part of any new style of teaching ... it will take time for them to adjust to the change.

While reading this last entry, I was reminded of John Dewey's comment about students and teachers getting used to their chains in terms of teaching and learning styles and how hard change is for all of the participants.

Similar and not so similar comments were written about the resource room students and the ways they experienced learning:

- He was the type of student that didn't want to work at anything but rather wanted the answer to appear without any effort.
- He knew the basic forms, but I think never made an effort to finish them because of peer pressure.
- [O]ne student ... was always willing to help someone with something else [rather than his own work]
- The steps are getting better, most of the students are showing them now. It was hard because they all wanted their answers on one line [with] their work. I am trying to have them work vertically instead of horizontally.
- The students really didn't know how to study, so we worked on it.
- It made me realize how much we take for granted that our students know.

The following comment was preceded by several stars, the tutor's method of drawing my attention to and emphasizing his excitement regarding this particular episode in the resource room:

- ***I think that the students realized that they *must* start to show their steps in their work because of the "putting together" of previous and new material ... Finally! Let's hope this trend continues!!!

Through the student/tutors' journal entries I discovered that one significant and glaring difference between these two experiences was the concept of resistance to learning. Many entries referred to the frustration and questions encountered when dealing with many of the students in the resource room who did not want to learn, had learning disorders, or were in some sense at risk:

- During part of the time, I worked with a severe ADD student who could hardly concentrate ... It made me realize the challenge it is to get things across to these students ... Sometimes I wonder if it is possible to meet these students' needs completely in the regular classroom.
- One student did come down from his algebra class. He didn't actually come for help. He came ... because he didn't want to be in class ... maybe for him it is right to get out of the classroom when he is losing interest and can't concentrate on the lecture any more ... I don't know the student's past ... On the other hand I believe people need to be taught some kind of discipline. That student isn't going to be able to get up and leave whenever he feels like it if he gets bored.
- What does one do with students who refuse help and don't want to learn?
- [S]ome of these kids don't really want to be in school let alone learn something ... They are there only because they are not yet 16 or simply for the social life.

One entry reflected the writer's humorous insight into the frustrations of attempting to help one student who repeatedly resisted any assistance:

- Mary needed only a little help with Algebra I. Otherwise, I was free to entertain Jim, the student who doesn't want any help.

Gradually, I saw the transformation of these five students from student to teacher emerging through their reflective comments and questions about their roles and relationships with their students. They began to take the initiative in creating environments for learning to take place. They became ready and eager to teach.

- In order for me to be able to start working with more students I started going to [the resource room] at an earlier time. Jean has arranged for a group to start coming at the time I will be there ... We decided to set up this program after I spent another day with no students.
- Today I made a special trip to help Gary. He is behind ... This guy is probably the one who needs the most help.
- Finally! I get to tutor an actual math group ... What an unruly group ... I will try to set up some discipline, and they will probably get better as they get comfortable with me.

The journal entries repeatedly contained inquiries into and comments about the nature of the role of teacher and how that role supports and engenders successful relationships with students.

- Somehow I wonder if as teachers we will always force kids to think.
- Mostly I was there to assure them that they were doing it right. This is what might be lacking in these students ... self-confidence and esteem. I think we need to work on this aspect.
- How do we get these kids interested, do we have to become personally involved ... I think this will work but it takes a lot of extra time and effort.
- Everyone finished the entire assignment. Hooray!! I feel I am really getting through to the students, this is the first time I have feel [sic] this good after meeting with them.

- I don't think teachers can be students' friends ... Students should know their teacher cares. But a teacher can't force a student to care ... I don't know how I can win Leslie's respect.

The journal entries revealed a wondrous mixture of reflective commentary on the nature of teaching and learning and of authentic voice regarding the personal interpretations of the two different experiences. I was struck over and over again by the positive and enthusiastic attitudes of these aspiring teachers. However, most of all, I was made aware (again!) of the importance and necessity of allowing our students the responsibility and the space to find their own place and make their own connections in the world of teaching.

Throughout this semester these five student/teachers were asked to reflect on the experience and to evaluate their progress continuously. Hopefully, the intrinsic value of learning to successfully assess and self-assess and the extrinsic value of gaining more experience in different and "alternative" educational settings will guide and inspire these student/teachers in their future teaching experiences. Of course, my role as facilitator was not without its rewards. The morning I entered the local high school where my students were to present their demonstration of the computer and calculus skills they had honed over the term, I was nervous and still wondering if it would all fall together. Yet, and perhaps in part because the school itself had recently been beautifully renovated, there hung in the air a sense of excitement and of new beginnings. After an initial pep talk, the five eager presenters broke into their two groups and busily went about setting up their equipment. And, as I sat quietly in the back of each of the two classrooms watching my students teach calculus concepts via the computer to some sleepy and some interested young minds and bodies, I was filled with an elation that only a teacher who feels she has witnessed a connection can truly understand.