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Reflection Paper:

The Development of Professional Expertise in the Workplace

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This semester has presented me with more academic and philosophical conflict than any other I can remember. Although I am still developing my philosophy of education, it has recently changed significantly.

I teach computer engineering at BYU-Idaho. Until four months ago, I was pursuing a Ph.D. in computer science. Everyone knows that the way to become a better university professor is to get a Ph.D. in one's chosen academic field, right? Those computer science courses were conducted like almost every other science, math, and engineering course I had ever taken. My job was to find out what the teacher thought was important, study the lecture notes and related topics in the book, and then prove my ability to apply those principles on a test. I ran my classes at BYU-Idaho very similarly. That is how higher education had always been and was supposed to be.

The Great Awakening

All of that changed during the 2002 Christmas break when I began to question the experts of computer science. I had completed all of the coursework specified by my advisor in Idaho Falls and submitted a proposal for my dissertation topic. In fact, I had already done some preliminary work on it. A week later, I was notified of a change in plans. I would not be permitted to research a computer hardware topic as had been agreed earlier–it must be something that involved a significant amount of programming instead. Also, I had to take eight additional classes that my advisor had told me were unnecessary. Most of them were prerequisite courses for the graduate classes I had already successfully completed. The CS department said the agreements with my advisor were invalid, because the department chairman had not signed off on them. I felt betrayed and angry because I had no influence in deciding what would be best for my own career plans. The experts claimed to know what was best for me and I had to comply. Most of it was unrelated to anything I am doing now, or expect to do in the future. The educational system seemed to be constraining me instead of helping me to develop my potential. This was not the path to my goal.

A New Direction

Some friends at work were in the adult education program and recommended it highly. I took two classes this semester to see if it was right for me. The philosophies behind adult education made complete sense. They had particular impact because I had recently experienced the effects of some opposing philosophies in the computer science program. My challenge would be to find a way of incorporating this new philosophy into my own teaching of undergraduate engineering students. Engineering education has traditionally been very different from what I have been learning this semester and there must be a way to improve it.

Suggestions for a Better Way

Although I have not yet been able to completely understand how to integrate the principles of adult education into a pre-professional engineering curriculum, there have been some guide posts along the way. One of them is a paper by Vivian Mott in the Summer 2000 edition of *New Directions for Adult and Continuing Education*. Mott partially answers one of my questions: How can learners be self-directed before they understand enough about engineering to know what is important to master? It has seemed ludicrous to walk into a Freshman class and ask them what they were interested in learning. Mott reaffirms this and suggests a different approach.

Learning is a process that builds upon a person's existing knowledge and ability "to extend and amplify" that knowledge, skill, and ability. There is a spectrum of experience within which everyone is positioned. At one end is found the novice who has little previous background and relies on external authorities for knowledge. At the other end of the spectrum is the more experienced person whose learning is less formal and more "self-initiated." Three overlapping modes of learning bridge this spectrum: (1) instruction, (2) inquiry, and (3) performance. While Mott declares that these learning modes apply to "continuing professional education" and differentiates between that and pre-professional education, I believe they can be adapted to both.

The instruction mode is the most passive of the three. It consists of learning what has been predetermined by the instructor. This is useful mostly at the novice level. Although this may be an appropriate starting point for Freshman students, or any other group during the introductory

phase of a new topic, it is the least effective way to learn. It should be used only to lay a foundation for the rest of the course.

Next is the inquiry mode. This is when students begin to explore for themselves. Cooperative learning techniques work well here. Learners begin to invest themselves in their own learning and may discover new techniques or concepts that would ordinarily not be covered by the course. "Learning is [seen as] an active, constructive, and goal-oriented process that is dependent upon the mental activities of the learner" (p. 27). According to Mott, this learning mode is superior to the rote learning of the instruction mode. This learning "is retained longer, facilitates subsequent learning of related information, and is more likely to be transferable to new contexts" (p. 27). I believe that switching from instruction mode to this inquiry mode should be done as soon as possible. In beginning courses, this transition will probably take much longer than in the more advanced ones.

The performance mode is defined as "practice in the actual work setting." Mott states that professionals often comment that what they learn from the practice of their profession is more valuable than what they learned in their formal education. There are a few opportunities to incorporate this as well. Courses can simulate some aspects of a work setting by presenting students with problems and situations found in professional practice, rather than simply covering the material and assigning problems from the book. An internship can be another valuable work setting experience.

These learning modes indicate that a single approach to engineering education seems impractical. People learn and develop skill "according to a progression from novice to advanced beginner, to competent, and finally expert" (p. 27), which can be loosely related to the advancement of a student through his or her formal coursework. As students become more proficient at engineering, our approach should change from telling them what they should know, to helping them decide and discover it for themselves. Fostering this by creating a practical, real-world situation in which students can experience problems and explore their own solutions, is superior to using only the traditional instruction mode in a classroom setting.

A Paradox

It seems that following the traditional approach to being a better engineering teacher may actually be counter-productive! If I had stayed in the CS program, the instruction method of teaching would have become such a part of me as the only correct method, that I would probably have continued using it for years. By abandoning my discipline, I have discovered that what I have learned all these years actually contradicts the principles of effective education.

The Future

One of my goals during this new course of study is to discover a more effective method of engineering education. Once done, the next challenge will be promoting it in a discipline that has a deep-rooted tradition of using less effective methods.

References

Mott, V. W. (2000). The development of professional expertise in the workplace. *New Directions for Adult and Continuing Education,* (86), 23-31.