

LESSONS LEARNED FROM IMPLEMENTATING AN ALTERNATIVE TEACHING APPROACH IN ENGINEERING TECHNOLOGY EDUCATION

Sami Tannous

Indiana University-Purdue University Fort Wayne, Indiana

ABSTRACT

In the fall of 2005, an alternative teaching approach was carried out in the engineering construction class, which is a third-year undergraduate engineering technology class in the baccalaureate degree at Indiana University-Purdue University Fort Wayne. The new approach deviates from lecturing by the instructor by utilizing the potential of students to teach and learn from each other. This approach implements the concept of teaching by learning and learning by teaching. Each student assumes the instructor's role for one class period where he or she delivers the material selected by the student from a variety of topics presented in the beginning of the semester. This paper describes the process and outlines the lessons learned from this method of teaching.

1. INTRODUCTION

Developing and implementing new and innovative methods to enhance the undergraduate engineering technology education has been encouraged by most, if not all, educational societies and institutions. Indiana University-Purdue University Fort Wayne (IPFW) is no different than the rest. Faculty members are strongly encouraged to explore new methods to improve existing teaching skills and gain new ones. Furthermore, state and federal authorities and national societies have created various programs to introduce and implement new ways of instruction to enhance and continuously improve undergraduate education. For instance, the American Society of Engineering and Education (ASEE) and the Accreditation Board of Engineering and Technology (ABET) are dedicated to promoting engineering and engineering technology education. The ASEE convenes an annual conference and exposition exclusively for this purpose (American Society of Engineering Education, 2005). ABET does the same. An educational program's continuous improvement is one of ABET's primary objectives during its visits and accreditation to an engineering technology program (Accreditation Board of Engineering and Technology, 2005).

2. LEARNING BY TEACHING

Most of the promotion of engineering technology education focuses on improving the education process from not only the instructor's side, but also from the student's side. Both of them involve teaching and learning (Kuzmar, 2005).

Understanding students' learning habits enables the instructor to modify his teaching style to increase their learning. A good method to make students understand the learning process is to

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reverse the role in the classroom. The student becomes the instructor while the instructor becomes a member of the audience in the class.

3. THE ALTERNATIVE TEACHING APPROACH

Generally speaking, students in the construction engineering technology program at IPFW seem to prefer to work in groups, especially to complete course assignments and projects. They feel comfortable asking each other questions, seeking help from one another, and disputing and correcting each other. They engage each other in constructive discussions and debates. That is, they teach and learn from each other at the same time.

This teaching approach, which was new to the instructor, was carried out in the construction engineering class (CNET 443) in the baccalaureate degree of the construction engineering technology program at IPFW. Unlike traditional teaching approaches, this new teaching practice utilized students' potential to teach and learn from one another. It implemented the concept of teaching by learning and learning by teaching (Novak, 1999).

From a list in the syllabus, students selected a topic at the beginning of the semester and the date to present it. They were also told that all their work would be done under the supervision of and in coordination with the instructor.

After each student selected his or her own topic and the day of delivering the material, the challenge began. Students at first were hesitant to accept the idea of playing the role of the instructor in class. Some feared not doing a good job or not finding enough information about the topic. Others were just not comfortable with the idea of standing in front of the class and presenting. However, the majority of students realized the value of being a lecturer, which is to learn by teaching.

Prior to their presentation, several meetings took place in the instructor's office. During those meetings students expressed their fear of not doing well during their presentation due to being uncomfortable presenting in front of other students. Other discussions revolved around the students' topic and materials to be covered in their presentation. In each of those meetings, the instructor positively encouraged students, and carefully discussed their topics with them, pointing out materials they needed to either explore more or clarify better so their classmates would not be confused.

Each student assumed the role of the instructor and was prepared for his or her session, which was treated as an integral part of the course and was included as a part of his or her tests or assignments during the semester. There were two reasons for that: 1) students who are lecturing prepare harder and learn more about their topic because they will be asked questions by other classmates; and 2) students take the subject more seriously because they know that they will be tested over their presentation and that will have an effect on their grade in class. Knowing that in advance gave students the incentive to prepare better, pay more attention, take notes, and get involved in the class.

As planned, when students assumed the role of the class instructor during their presentation, class sessions went well. The student in charge was well prepared and engaged other classmates by asking questions, giving short class assignments, and responding to their questions. It was an interactive session between students more so than classes are between faculty and students. The class atmosphere was relaxed but serious in all sessions. The majority of students responded positively to this new class setting. They acted as if the class was given by the instructor and not by one of their peers. They sought clarifications when necessary to make sure they understood the subject matter and got the correct answers to the problems given in class by the presenter (Kuzmar, 2005).

As students taught their sessions they were totally in charge of the class. The instructor was acting as a moderator and observer. He did not intervene in class proceedings unless it was necessary, such as when something incorrect or drastic took place, or in case students needed additional clarification on the subject being presented. The instructor acted as a student attending the class.

4. BENEFITS OF THE ALTERNATIVE TEACHING APPROACH

Using this new teaching approach benefited the students presenting, other classmates, and the instructor.

Students playing the role of the instructor learned a great deal about their topic and from this experience. They felt a sudden sense of urgency by realizing that the spotlight was on them to deliver a good presentation (Kuzmar, 2005). As a result, students spent extra time researching, preparing, and practicing their lecture. They visited the instructor's office prior to their session. During the visits, students went over every detail of their presentation preparing to ask others questions and making sure that there would be no pitfalls during their session. This gave students a sense of ownership for the class and deepened their knowledge of the topic (Kuzmar, 2005).

Classmates adequately learned the specific topic at hand. This is because, as mentioned earlier, students collaborate well with each other. They felt more comfortable asking each other questions. Another reason is because the presenter was well prepared, coordinated closely with the instructor, and learned ways to engage students in his or her presentation.

Even though the instructor was an observer most of the time, this teaching approach was beneficial to him in various ways. It allowed him to observe and have a better understanding of how students think, participate in class, and learn better. This knowledge enabled him to improve his own teaching skills for this specific course and will have a similar effect on his teaching career. Using this teaching approach the instructor discovered ways to improve his teaching style and get students engaged in the lecture. This was accomplished by listening to students during their presentations and observing the classmates' reaction and interaction during those sessions. When the instructor occupied a neutral seat, he learned possible student pitfalls. In a traditional teaching setting, the instructor does not easily recognize these dangerous pitfalls because he is occupied giving his lectures. For future purposes, the instructor can incorporate this valuable knowledge to improve his teaching approach.

5. LIMITATIONS OF THE ALTERNATIVE TEACHING APPROACH

As usual, there are limitations and constraints to every new teaching approach. This new approach is no exception to this general rule (Kuzmar, 2005). First, the new teaching style can be applied effectively only to small size classes because only in a small class can the instructor afford to divert enough time for students' presentations. Also, a fledgling undergraduate student can manage to instruct a small class, but it will be an extremely difficult situation with a large class. Second, students may not be willing to participate in this approach. Academically strong students tend to accept participating in this approach, but weaker students may be hesitant to participate. Third, not all courses may be suitable for this style. Finally, most noticeably, this new teaching approach requires extra efforts from the instructor. Instead of preparing and giving a one-hour lecture, the instructor needs to spend extended hours with each student presenting. Some faculty members may not see that as feasible due to their schedule of classes or other commitments.

6. STUDENT FEEDBACK

At first, students were apprehensive and nervous to present in front of their classmates. But after all has been said and done, the majority of students agreed that this was one great experience in which they learned a good deal about their topic and how to deliver the material in an understandable way. Even though it was challenging work, students were determined to do an excellent job in delivering their presentation. To be well prepared and present the material in a professional way gave students a sense of pride and ownership of the class, and that feeling enhanced their learning process. The majority of them found this approach an interesting and challenging experience.

The classmates listening to the lecture given by another student found this technique to be useful and amusing. They paid attention to the presenter and learned from others' presentations and pitfalls. All of them agreed that each student had done a wonderful job delivering his or her presentation. No one complained about these sessions. Students were asked to evaluate each others' presentation at the end of each session and write three questions from the presentation. Students were informed that some of those questions would be used in exams. They liked this idea because it required them to pay attention and participate in every session, and it gave them an idea about some of the test questions.

7. THE INSTRUCTOR'S FEEDBACK

A few students were nervous and shy during their presentation, which was expected because it was the first time for them going formally through such an experience. Most students were confident and presented well. This may be attributed to two reasons. First, the class was small and everyone knew his or her classmate. Second, each student made extended preparation efforts before the presentation.

There was a concern that some students would not become engaged or would not take this seriously. When the instructor noticed that was happening in some presentations he reminded

students that this was going to be a part of their grade. Then presentations were delivered in a proper manner and students took notes and engaged in class sessions.

The instructor made it very clear that he would be a facilitator before the presentation and would not intervene during the presentation, unless additional explanation was needed so other students would better learn the material. Students, as expected, were virtually independent in their presentations.

It was very interesting to observe students lecturing and engaging classmates in their presentations. In general, the pattern of participation from students was very similar to that of the normal setting, with a small exception. Students who did not usually pose questions to the instructor during his lecture posed questions to their fellow presenting students. These questions were indeed legitimate and interesting ones. It seemed that students felt more comfortable asking questions to their peers than to their instructor.

It was intriguing to see students try very hard to accentuate their own teaching style. Nonetheless, it was remarkable to see them actually emulate the instructor's teaching style. Frequently, the instructor felt as if he was listening to himself in these presentations. At first this felt awkward; however, this turned out to be gratifying to him because it showed that students were listening to him. Furthermore, the instructor could see from first hand experience his own teaching weaknesses. Several reasons could be behind this imitation. First, students could have felt it was comfortable and effective to follow the instructor's teaching style. Another reason could have been that students wanted to flatter the instructor. Finally, this style could have been the only approach students knew to present their topic.

8. CONCLUSIONS

Involving undergraduate students in actual teaching in the construction engineering class CNET 443 at IPFW has its benefits and constraints. In general, this approach was found to be a viable method to the normal format in which all of the teaching is performed by the instructor. The undergraduate students benefited from this new teaching experience, and that has a remarkable and positive impact on their learning practices. The majority of students favor this style while a minority preferred the old technique where the instructor did all the talking and lecturing. That majority of students was enthusiastic about giving their presentations and learned by teaching, while the minority did it because it was a part of the class.

The instructor gained a great deal of knowledge from this approach and that has its constructive influence on his teaching abilities and skills. He learned about how students interact with each other in class while delivering the material to their classmates. Also, by observing students presenting, it gave him some insight on how to use new ways to make students feel more comfortable, ask questions, and participate in the lecture. All of this enhanced the education process in this particular course. Instructors at IPFW or other institutions are encouraged to try this teaching technique, but they have to be careful with its limitations and constraints.

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BIOGRAPHY

SAMI TANNOUS: A Lebanese-American assistant professor in the construction engineering technology program at Indiana University-Purdue University Fort Wayne (IPFW). He is a member of ASEE, and ASSE. His teaching experience is at IPFW, Kansas State University, and Pittsburg State University. His expertise area is in construction safety