The Benefits of Engagement: Non-Traditional Technology Students and the New Educator

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Abstract

Teaching non-traditional students often means teaching in a non-traditional environment. Non-traditional may mean, for example, offering evening classes or classes off-campus. The drawbacks of timing and transportation are easily outweighed by the benefits of "engaging" the community, of teaching older, employed students who would otherwise not be able to attend classes. Non-traditional students can contribute an invaluable level of real-world questions, examples, and physical samples. For a new educator in a technical field, this input can be an invaluable asset in helping to involve the class in discussion and providing a connection between the course material and actual industrial practice. This paper gives examples and suggestions for the ways in which the input from non-traditional students can be used to expand and strengthen the classroom learning experience for present as well as future students.

Introduction

The experience described in this paper is based on teaching a one-semester introductory course in materials to undergraduate students at a regional satellite campus in Elkhart, Indiana, for Purdue University. Elkhart County and the surrounding area have a high concentration of manufacturing employment, from manufactured housing and recreational vehicles to musical instruments and pharmaceuticals. I have taught the course in the evenings, every fall semester, for three years. The course includes a lecture period and laboratory exercises. Most of the students are enrolled in the Mechanical Engineering Technology degree program, pursuing an Associate of Science degree. Teaching in the evening at a regional location makes the course, and the entire degree program, available to students who would not otherwise have access to a comparable educational program. Many of the students work full-time and are older than the traditional age for beginning undergraduate students.

Course Format

At the beginning of each semester, I ask the students to introduce themselves to the class and tell us about where they work and what they do there. I make notes during the introductions so that I can direct appropriate questions to the students as course material is introduced. During the semester, I encourage students to ask questions relevant to their work, or to provide examples from their experience. I make an effort to learn the students' names, so that I can more easily draw them into discussions. If no students volunteer information or questions, I ask about the

materials and processes they may be using. For example, if the lecture topic is heat treatment of non-ferrous materials, I may ask a student who works with aluminum castings whether or not the parts are heat-treated after casting. I might also ask if the heat-treatment is performed in-house or if the parts are sent out to a heat-treatment vendor, and what kinds of testing or verification may be performed on the treated parts. Even if the student does not know the answers to any or all of the questions, a discussion is usually started which continues with other students volunteering information about aluminum alloys, heat treatment vendors, testing, or some other related topic. This kind of discussion helps relate the theoretical information in the textbook to local manufacturing practice.

At the conclusion of the semester, each student is required to give a presentation about a materials topic. Many students choose to present information based on materials and processes from their own work experience. The presentation requirement is a modification of the format used by my colleagues at the campus in West Lafayette who teach mainly traditional students. Presentations are considered to be a core element of the course, to help the students become competent and confident at presenting technical information. At West Lafayette groups of students are directed to make presentations of the laboratory exercises performed during the semester. I have expanded the range of allowable presentation topics to include other materials topics to take advantage of the non-traditional students' experiences. Using this format has resulted in a number of informative presentations from students, on diverse subjects. Some of the most effective presentations included physical samples and covered the following topics: molding of products from synthetic, thermosetting elastomers, titanium dental implant devices, orthopedic implants and biocompatible materials, gray cast iron processing, material selection for exhaust fan hood design, automotive piston materials and manufacturing, and expanded polystyrene processing. I developed this course format because helps students relate the theoretical subject matter to their own experience, and because it takes advantage of the work experience present in each group of students.

There are some challenges to the instructor inherent in soliciting increased student input as part of the course format. Allowing students to ask potentially application-specific questions means that there will be occasions when the instructor is caught "flat-footed" about an unusual application or specialized material. The instructor needs to be able to admit when additional information is needed and then do further investigation before the next class session (or allow the student to do the investigation and present the results to the class). As an example, during the portion of the course covering polymers, a student asked whether the material used by his employer would be considered an ultra-high-molecular-weight polyethylene. He identified the material only by its proprietary trade name, and it was not a material that I was familiar with, so I had to tell him that I did not know the answer to his question. I then focused the class discussion on resources for identifying and evaluating polymer materials. In this case, we were able to use reference materials in the classroom to identify the material in question. Making a short deviation from the lecture plan was time well spent because the students were able to participate in a problem-solving activity stemming from a real-world question.

Benefits

Encouraging questions and input from the students and allowing them to share information relevant to their own work experience is beneficial for a number of reasons:

- It involves the students more directly in the theoretical material presented in the classroom. Because they are involved and thinking about materials and processes that are important to them, they are more interested in the course material. They can readily see the value of the information.
- The students are exposed to the materials, products and process of other local industries. This builds awareness of common materials issues and processing techniques.
- Students are encouraged to "network", to develop acquaintances or working relationships with other students who are working in the same community, and perhaps may some time be working together.
- It helps the instructor stay informed about current local material uses and manufacturing practices. Close ties to local industry can be crucial to forming working relationships for industrial research or consulting.
- Work-related questions and problems that are addressed and/or solved by the instructor enhance credibility of the instructor and the program and increase visibility of the educational program in the community.
- When students give presentations about the materials and products they work with, they often give the samples to the instructor, who can then use them in future semesters. Physical samples are excellent tools for teaching. Samples that are linked to a local industry are especially useful in helping students understand the relevance of materials topics.

Conclusions

Establishing a classroom setting for student involvement requires that the instructor take steps to draw the students into discussion and encourage them to share their work experiences. When the class includes non-traditional students with work experience in a technical field, the input from students can enrich the learning experience for everyone in the classroom. Non-traditional students have made contributions in the classroom and to me as an instructor that more than compensate for the minor inconvenience of teaching in the evenings or at a remote location.

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