

A Simple Approach to the Introduction and Assessment of Lifelong Learning in a Freshman-Level Technology Course

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Abstract

Engineering and Engineering Technology programs have been struggling with practical ways to incorporate the assessment of lifelong learning. In this simple approach, a freshman manufacturing processes course introduced students to the expected practice of lifelong learning. Students were required to pursue and document three hours of independently pursued “Professional Development Opportunities.” Introduction to the requirements provided opportunity to discuss the breadth of available lifelong learning resources. The exercise required students to take independent initiative on topics of personal choice or interest and to identify available resources. Specific submission criteria required students to reflect on their activity as a learning experience, comparing it with their goals prior to the activity. The resulting student submissions insure that student-submitted summaries address lifelong-learning outcomes, enabling easy and direct assessment.

Introduction

TAC-ABET criteria (h) specifies requires the outcome of “a recognition of the need for, and an ability to engage in lifelong learning.”¹ Two components of lifelong learning are to be evaluated:

- (1) Recognition of the need for lifelong learning
- (2) Ability to engage in lifelong learning.

Litzinger et. al.² note that these components were described to ASEE as early as 1978 by G. H. Flammer³ under the terminology “motivation” (or “will do”) and ability (or “can do”), and that they have subsequently been supported by the broader education research, such as in Candy’s 1991 book *Self-Direction for Lifelong Learning: A Comprehensive Guide to Theory and Practice*.⁴

Mourtos⁵ argues that without a “recognition of need” which leads students to have a positive attitude and commitment to their education, it is not possible to develop the second part, the skills (or “ability”) to engage in lifelong learning. A reasonable hypothesis follows that fostering a recognition of the need for lifelong learning earlier in students’ academic progression may improve their acquisition and practice of “ability to engage” skills across the undergraduate course sequence.

Mourtos selected the following measures for the component of student recognition of the need for lifelong learning:

- Willingness to learn new material on their own.
- Reflecting on their learning process.
- Participation in professional societies' activities.
- Reading engineering articles or books outside of class.
- Attending extracurricular training or planning to attend graduate school.

A Freshman Introduction to Lifelong Learning Activities

At Kansas State University Salina, early recognition of the need for lifelong learning for Mechanical Engineering Technology students is attempted by means of a simple assignment embedded into the freshman Manufacturing Methods course. Students were required to select and independently pursue three hours of “Professional Development Opportunities” of their choice, and report on these by answering two basic questions:

- (1) “What were you hoping to learn or get out of this event?”
- (2) “Briefly describe your involvement in the event or activity, what it was, and what you learned or otherwise got out of it.”

The original intent of this approach was simply to get students used to the idea of pursuing career-related learning beyond the classroom. However, the reporting requirements additionally required students to focus their thinking specifically on how the activities helped them achieve their learning goals—as well as to reflect on what learning goals they might have in the first place. Thus, this approach allows direct demonstration of Mourtos' first two measurements of student recognition of need: (1) willingness of students to learn on their own, and (2) reflecting on their learning processes. Mourtos' remaining measures may also be shown in student choices of professional society activities or outside readings.

This approach is distinctive in the following respects:

- It provides an introduction to the concept of lifelong learning in the student's first semester.
- Rather than specifying a specific learning need, this approach requires students to take early independent initiative in identifying and selecting lifelong learning opportunities based on personal goals or interest.
- It requires students to reflect on personal learning goals associated with selected activities.
- Assessment relies on simple metrics of whether the student identified, pursued, and reflected on acceptable lifelong learning experiences.

The Assignment Guidelines

Figure 1 demonstrates the form and requirements provided with the assignment. Students were required to “independently pursue” about three hours of professional development, to be reported by the completion of the semester. Points were assigned such that this assignment had about the same value as three weekly quizzes. This equated to about 2.6% of the overall course grade; certainly enough to make a difference for students who might be near a borderline course score.

Professional Development Opportunity Form

MET 121 – Manufacturing Methods
Fall 2010

Please submit electronically (under “Assignments”) by **Friday, December 17, 4:45 p.m.**

PROFESSIONAL DEVELOPMENT OPPORTUNITY POINTS

Twenty-four assignment/quiz points will be from “**professional development opportunities**” ***independently pursued by the student***. These could be participation in any event, meeting, or individual reading/research that leads to increased learning of career or technical information. **A typical 1-hour event or endeavor earns 8 points of credit**, with three typical events required to obtain the full 24 points. A form will be provided for students to submit information on the professional development opportunity they pursued.

Typical professional development opportunities may include, but are not limited to:

- Attendance of **professional organization meetings or tours** (such as the Society of Manufacturing Engineers)
- Attendance of **campus career service events**. (In-class events do not count.)
- Participation in “**student clubs**” on campus that have some relation to technology or career skills (including interpersonal skills, leadership, etc.)
- **Independently pursued reading** or research on a technical topic of interest

Your Name: _____

Name of event or activity: _____

Date of event or activity: _____

Type of event or activity (Check one):

- ☐ Technical development opportunity
- ☐ Career development opportunity
- ☐ Leadership development opportunity
- ☐ Other:

Approximate time devoted to this activity:

What were you hoping to learn or get out of this event?

Briefly describe your involvement in the event or activity, what it was, and what you learned or otherwise got out of it:

Figure 1. Form for Student Submission of “Professional Development Opportunity” Credit.

Some suggestions for possible activities were provided with the assignment description. These suggestions were chosen to closely follow interests and learning objectives of students at this early point in their career: technical-related student clubs, career events, professional organization tours, and technical readings of interest.

The assignment was printed in the syllabus and discussed at the beginning of the semester. After an overview of the assignment expectations, students were encouraged to discuss with the instructor if they had questions about what sort of activities they could pursue. The electronic assignment form was posted on the main page of the course web files, and periodic reminders were given over the course of the semester.

Electronic submission of the assignment forms allowed students to submit at any time during the semester. Though these were ultimately due by the end of the semester, students were encouraged to submit early—or to consult with the professor—in order to obtain feedback in case they found that their submissions needed improvement or did not meet the guidelines.

Results

For Fall, 2009, the response from the class as a whole was disappointing, but clear. Of fourteen students who completed the course, six decided not to turn in Professional Development Opportunity assignments. (See Figure 2.) Obviously, “recognition of the need” was not being achieved in the freshmen first semester.

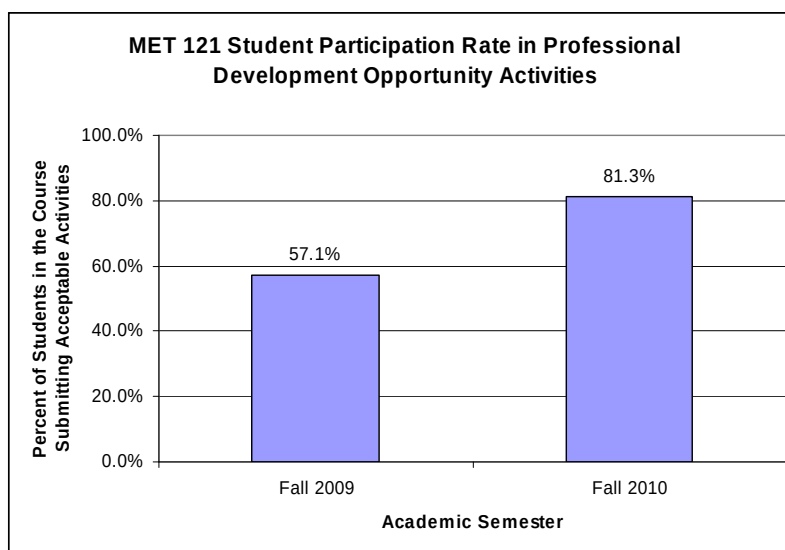


Figure 2. Participation Rate of MET 121 Students in the Professional Development Opportunity Points.

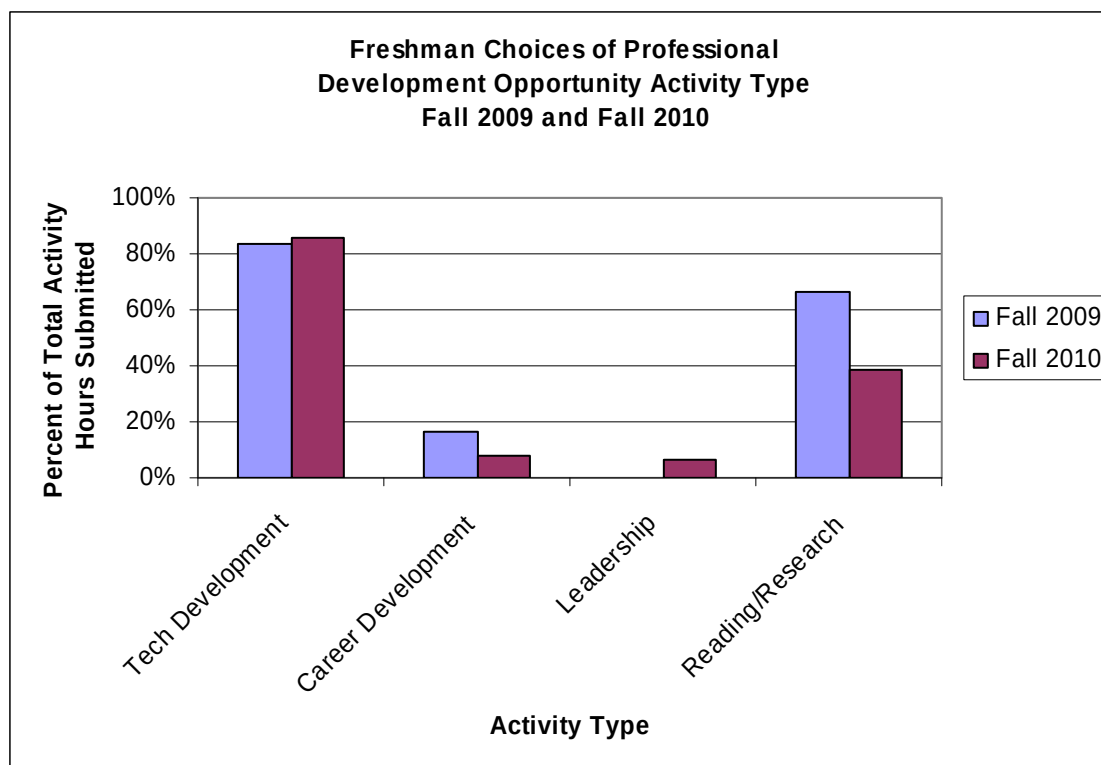


Figure 3. Types of activities selected by students, Fall 2009 and Fall 2010.

From those students who did return the assignments, there were some surprises. We expected the bulk of the students to report their participation in relevant student clubs, plus some campus career events—particularly because the freshmen seminar encourages both of these sorts of activities. However, this year over half the submissions reported readings from technical literature or other technical resources. Instead of attending an existing technical presentation, training event, or technical activity, “Readings/Research” are activities that typically require students to take more initiative to locate an appropriate article of interest or information related to a goal, and then to report on it. The fact that students were willing to go to that trouble is a positive demonstration of student “willingness to learn new material on their own.”

Figure 3 demonstrates a tally of the types of activities which students pursued and reported. Percentages are of total hours of activities submitted by all students that semester. Each activity submitted by a student was categorized as either Technical Development, Career Development, or Leadership-related, so the total percentages of these three add up to 100%. Whether an activity was a reading or research activity, as opposed to an “event”-type activity, is a separate category which describes how the Technical Development, Career Development, or Leadership-type activity was pursued by the student.

For 2009, 83.3% of the activity hours pursued by students were categorized as “Technical Development.” These included the following activities:

- A patent search on a student design idea
- Technical readings

- Participation/Work in the Mini Baja Club
- Participation in a Society of Manufacturing Engineers (SME) plant tour.

The remaining “Career Development” activities (16.7%) included:

- SME meeting participation
- Career research on Mechanical Engineering versus Mechanical Engineering Technology

For those students who did pursue the assignments, their reflections on their activity goals tended to demonstrate a sense of importance in the activity, as seen in some of these statements:

- A student’s reasoning for attending a Society of Manufacturing Engineers club meeting: “I was hoping to benefit from being in a club and learn more about manufacturing engineers. . . . I hope to learn more about the possible career options I’ll have in the field.”
- Another student had a similar hope from a plant tour: “A better understanding of the careers within engineering.”
- One student was doing outside reading to help with the class: “I wasn’t very good at metrology when we first started this semester. I read an article about shop floor metrology. . . .”
- One searched U.S. patents hoping to learn “whether or not a product idea that I had had been thought of before.”

The reasons for the low overall participation in Fall 2009 was something of a mystery. Did students just put this off until the end of the semester, and then decide it was too much trouble? Were students thinking of the activities as inaccessible? Did they simply underappreciate the value of the activities?

For Fall 2010, increased effort was made to emphasize expectations and opportunities associated with the assignment. Results demonstrate the fruit of these efforts, with the percentage of students submitting acceptable activities jumping from 51.7% in 2009 to 81.3% in 2010. For the 2010 class of 16 students, the three that did not submit professional development activities had issues with other submittals in the last days of the course; it does not seem to be a lack of clarity of expectations or student judgment of this particular assignment as irrelevant.

For our simple assessment, therefore, we met our criteria for success with over 80% of students successfully identifying, pursuing, and reflecting on professional development activities.

Figure 3 shows that student choices between technical activities and non-technical career or leadership activities in Fall 2010 was fairly consistent with the previous year’s class. However, the selection of activities within a category was quite different.

Technical activities pursued by students in Fall 2010 included:

- Participation in activities of Mini Baja, Electric Car Club, or the Rocketry Club.
- Technical training provided by their workplace (3 students).

- Technical research toward a specific hobby application or personal project (3 students).
- General technical reading

Not only is the percent of Reading/Research-type activities down, but those that in the previous year had been largely article readings of general interest, while the 2010 reading-and-research activities were more typically focused on solving a specific technical problem in a hobby or personal project. For example, one student was involved in demolition-derby events and submitted activities in improving his demolition vehicle to meet particular competition goals. Another submitted work he did with his grandfather in installing a personal wind turbine.

Also new in fall 2010, multiple students applied workplace training to their activity portfolio. The numbers of workplace-active students partially reflects more non-traditional students we had that semester. However, the increase in both these and the hobby-related submissions together suggest the influence of the instructor's in-class explanation and description of acceptable activities; 2010 students were encouraged to submit lifelong learning activities in areas of interest they were already pursuing. For more uniform results--and more consistently effective communication of the activity objectives--a fixed media introduction to the assignment, such as an online slideshow or video might be beneficial.

Because of the broad goal to simply get freshmen students to recognize and pursue career-relevant lifelong learning activities and to reflect on them, scoring has intentionally emphasized simply achieving student participation over measuring the quality of their engagement. One could argue that its present form lacks rigor in encouraging students toward more quality activity participation and reflection. The present assessment method meets our simple goals. However, quality of student reflections could be encouraged by issuing a scoring rubric outlining tiers of acceptable and excellent identification of learning goals and results and other reflection. An earlier due-date--or periodic due dates--could give time for more effective feedback and allow students to submit improvements on marginal-quality student reflections

Conclusions

Overall, as of Fall 2010, the assignment has met its goals of introducing the concept and practice of life-long learning among Freshman Mechanical Engineering Technology students. Students have self-documented their awareness and practice of these activities through reflection of their learning goals and results.

The simple approach of assessing student willingness to pursue, report, and reflect on acceptable lifelong learning activities is an easy task for student and instructor. It easily slips into the freshman course sequence as a low-impact assignment and meets the simple goal of first exposure to life-long learning concepts. However, more rigorous feedback could be built into the assignment lifecycle to encourage better-quality engagement and reflection for this and future lifelong learning opportunities.

Year-to-year differences in student approaches to the required activities seem to indicate that results of the assignment are highly dependent on the way in which the instructor introduces and

facilitates the assignment. Implementation of a media-based learning module or other fixed materials to introduce appropriate lifelong-learning options and activities might achieve more consistent results.

Bibliography

¹Technology Accreditation Commission of the Accreditation Board of Engineering and Technology, “Criteria for Accrediting Engineering Technology Programs,” 2007-2008, p. 5.

²T. Litzinger, S. H. Lee, and J. Wise, “Engineering Students’ Rediness for Self-directed Learning,” *Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition*, 2004.

³G. H. Flammer, “Undergraduate Foundations for Lifelong Learning,” *Proceedings of the 1978 ASEE Annual Conference, University of British Columbia*, 1978, cited in [2].

⁴P. Candy, *Self-Direction for Lifelong Learning: A Comprehensive Guide to Theory and Practice*. San Francisco: Jossey-Bass, 1991, cited in [2].

⁵N. J. Mourtos, “Defining, Teaching, and Assessing Lifelong Learning Skills, *Proceedings of the 33rd ASEE/IEEE Frontiers in Education Conference*, 2003.

Biographical Information

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Associate Professor Julia Morse (MS Manufacturing Systems Engineering and BSIE) teaches manufacturing and design-related courses for the Mechanical Engineering Technology program options at Kansas State University Salina. She is a Certified Manufacturing Engineer and a Certified Enterprise Integrator with experience in quality assurance, industrial engineering, and product development in the automotive and truck parts industries.