Need for Engineers to Continue to Learn and Educate Themselves

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Abstract

To properly develop a system for continuous improvement, there is a need to establish a set of Program Educational Objectives for engineering graduates. One of these objectives is that engineering graduates should continue to learn and educate themselves. The data collected to determine the extent to which this objective is being met consists of five components: an alumni survey, employer focus groups, an Advisory Board, employment statistics, and feedback from senior students. Each component will be discussed, results will be presented, and conclusions will be drawn. An alumni survey was made via the internet with 760 responses, including graduates from the 1940s through the 2000s. The focus groups were then used as a means to obtain the employer perspective from comments received in the alumni survey. At Advisory Board meetings, members were asked to give feedback concerning how important they felt this attribute was in developing engineering graduates. In addition, employment statistics were studied for a five year period, and seniors were surveyed to find their opinions. Surveys have shown that companies rate this attribute very high and that our graduates are meeting their standard.

INTRODUCTION

The mechanical engineering curriculum at Rose-Hulman Institute of Technology (RHIT) is designed to prepare students for productive careers in industry, government, education, and private consulting as well as graduate study. It, therefore, is based on the fundamental principles of science and engineering. These provide a strong foundation that enables students to apply what they have learned to the complex technological problems of today and to teach themselves the new technologies of tomorrow.

The mechanical engineering department fully embraces the spirit of EC2000, and has invested a significant amount of time into the assessment problem. Our end-of-term faculty course assessments have proven to be an excellent and efficient tool for this and will be continued.

EDUCATIONAL OBJECTIVES

The department has developed a program to help us to continuously improve. This program contains a set of six educational objectives. One of these objectives, the subject of this paper, is that Mechanical Engineering graduates must be able to continue to learn and educate themselves in the following areas:

a. Ethics – a recognition of ethical and professional responsibility
b. Contemporary Issues – an understanding of how contemporary issues shape and are shaped by mathematics, science, and engineering
c. Global – an ability to recognize the impact of global societies on citizens and professionals
d. Culture – an ability to understand diverse cultural and humanistic traditions
e. Teams – an ability to work effectively in teams
f. Communication – an ability to communicate effectively in oral, written, graphical, and visual forms
g. Problem Solving – an ability to apply the skills and knowledge necessary for mathematical, scientific, and engineering practices.
h. Interpreting Data – an ability to interpret graphical, numerical, and textural data
i. Experiments – an ability to design and conduct experiments
j. Design – an ability to design a product or process to satisfy a client's needs subject to constraints

A successful engineer must continue to learn and educate one's self in all these areas. Students must appreciate that not only do they need to know current technology: they must learn new technologies and become familiar with related disciplines.

IMPLEMENTATION & RESULTS

To improve our program, we must have feedback/information from our constituency. These include: students, departmental faculty and staff, alumni, employers of our alumni, and a ME advisory board. The advisory board consists of ten members from industry who meet with the department annually and review our programs. Feedback from this group is representative of the employers/ educators constituency.

ALUMNI

Mechanical Engineering alumni were surveyed March and April, 2005, via the internet. Of the 760 alumni who responded, 16 (2%) graduated in the 1940s, 28 (4%) in the 1950s, 55 (7%) in the 1960s, 144 (19%) in the 1970s, 182 (24%) in the 1980s, 218 (29%) in the 1990s, and 117 (15%) graduated in the 2000s.

Respondents to the survey were asked to rate the six educational objectives developed by the department in terms of importance to their current position. They were also asked to rate how well these attributes were developed at RHIT. In addition, respondents were asked to indicate the number of additional courses or workshops they had completed and whether or not they had earned any advanced degrees. This question was asked to provide evidence of lifelong learning.

Alumni reported a broad range of additional degrees earned since graduating from Rose-Hulman with 39.2% earning some type of additional degree and 33.4% completing a professional certificate. The additional degrees earned by alumni included 148 MS/MA (19%), 10 JD (1.3%), 2 MD (0.2%), 20 PhD (2.6%), and 11 other types of degrees (1.4%). The percentage of alumni reporting that they have taken additional courses is shown in Table 1. Adding together the categories of '1-4', '5-10' and 'greater than 10' indicates that 87.4% of alumni have taken additional courses since graduation. This is a strong indication that graduates continue to learn and educate themselves.

Table 1: Percentage of Alumni Reporting that They Have Taken Additional Courses

	Not Responding	None	1-4	5-10	Over 10
Percentage Reporting	2.9	9.7	18.1	18.8	50.5

Alumni, regardless of graduation year, felt that continuous learning was an important attribute in their current position. They provide strong evidence of the importance of life-long learning through the taking of various courses or the attainment of additional degrees.

EMPLOYERS

In January of 2006, representatives from several companies were contacted and asked to meet with ME department representatives to discuss Rose-Hulman graduates. The companies selected were companies that hire RHIT graduates. All of the employers indicated that our graduates were well prepared to continue to learn and educate one's self. The employers listed this attribute as the third most important among the six educational objectives. They listed it as the number one developed objective by RHIT alumni.

ME ADVISORY BOARD

During the May, 2006 ME Advisory Board meeting, members were asked to give feedback concerning how important they felt each of the six attributes was and how well each attribute is developed in RHIT graduates. The ME Advisory Board is considered to represent both alumni and employer perspectives. All of the members of the board have participated in hiring for their respective companies in some capacity. They placed "how important is continuing to learn and educate one's self to your company", as number three among the six desirable attributes. When asked "how well are these attributes displayed in RHIT grads", they gave the highest rating to "continuing to learn".

SENIOR MECHANICAL ENGINEERING STUDENTS

ME Seniors have been surveyed to determine their opinions of the importance of the ME Program Educational Objectives and how well they felt prepared to meet those objectives. In considering the importance of these objectives, the students listed “continue to learn and educate one’s self” as number two in importance. However, in rating how well they felt they were prepared in this area, they listed it at number five.

CONCLUSIONS

Independent Learning – continue to learn and educate one’s self – is a recent addition to our program objectives. We feel that by explicitly asking students to demonstrate they have learned new material that they will not only gain experience but also understand that the faculty believes it is important. We have identified a constituency of students, departmental faculty and staff, alumni, employers, and the ME Advisory Board, and by systematically receiving feedback from these constituents, we can continue to improve the educational process.

References

01. Program Self-Study Report for The Rose-Hulman Institute of Technology Mechanical Engineering Department, June 26, 2006