Abstract  Advising undergraduates in engineering education is problematic at most institutions. The thesis of this paper is that one reason advising is hard to do successfully in engineering is because engineering educators try to improve it with typical engineering approaches and philosophies, to which advising is not amenable. The approach taken by most engineering educators to advising is that it is an information flow problem. In fact, it is an interpersonal dynamics problem, to be solved by improving the quality of face-to-face interaction between individual students and individual faculty.

Index Terms — undergraduate advising, engineering problem solving, student satisfaction.

INTRODUCTION

Even though it is explicitly mentioned as an ABET accreditation criteria for faculty [1], academic advising is rarely discussed in the engineering education literature. This paper addresses the topic (in both the narrow sense of curriculum guidance and the broader sense of mentoring) toward the goal of improving this important function of engineering faculty. It makes the point that doing a good job of transmitting curriculum facts to students is necessary but not sufficient for good academic advising in engineering.

Engineering faculty's academic advising of their undergraduates is evidently not a universal success at present. Engineering Benchmark Inc. data show that student satisfaction with faculty advising is lower than satisfaction with instruction in major courses, non-major courses in engineering, chemistry, physics and calculus [2]. On the University of Wisconsin-Madison campus where I work, overall student satisfaction with undergraduate education is high, as indicated by the National Assessment of Student Engagement [3], but satisfaction with advising is much lower, with the College of Engineering near the bottom of the school-and-college standings. To sum it up, academic advising in engineering is a problem. Faculty are reluctant participants, and students are strident critics. While some engineering faculty might say that advising is not necessary because good students don't need it and poor students don't want it, the fact is that good students want advising and poor students need it.

This paper presents a thesis, supported by my observations over two decades of engineering education, from advising thousands of undergraduates, from four different college advising committees over the years, and more recently, from my role as chair of the Engineering and Science Advising Commission of the National Academic Advising Association (NACADA). The thesis is that academic advising is a problem in engineering because it is not amenable to typical engineering problem solving strategies. This short paper will present case histories as well as an examination of engineering problem solving strategies, as they apply to undergraduate advising. The conclusion is that we need to look at academic advising not as just an exercise in transmitting facts, but as a valuable opportunity for face-to-face interaction between professionals and future professionals.

SUPPORT FOR THESIS

My argument is anecdotal, based on case histories such as the following.

Case History 1

Our second-largest department, with 550 undergraduates (sophomores through seniors), has historically taken pride in its ability to present its curriculum on just two pages. On one side is a flowchart; on the reverse are notes that explain the few choices on the flowchart, and a list of technical electives. The size of the boxes indicates the number of credits. In cases where students have a choice, the boxes are hatched. Footnotes explain additional instructions to students. So well is the curriculum set forth that students rarely have the need to submit requests for exceptions; rarer still does the department see a need to grant one. In addition to the

---

1 Don Woolston, University of Wisconsin-Madison, 2640 Engineering Hall, 1415 Engineering Dr., Madison, WI 53706
woolston@engr.wisc.edu

0-7803-7444-4/02/$17.00 © 2002 IEEE
flowchart, the Department has an extensive, up-to-date website that gives auxiliary information about registration, graduation, and referrals to student services offices around campus.

The latest Engineering Benchmark Index data show that this department's students have the lowest satisfaction with undergraduate advising, when compared with satisfaction of students at peer institutions. Furthermore, this department's students were less satisfied with faculty advising than with any of other aspect of their education. The paradox is obvious. This department does an excellent job of telling its undergraduates what it thinks they need to know, yet the students say they are not being well advised.

Case History 2

In the late 1980s, before web browsers were commonly used, our largest engineering department attempted to improve advising by creating a carefully scripted menu of telephone messages that students could access to answer their academic advising questions. The creators of the telephone system took months to program it, and another month to record the messages. It of course was a nightmare to keep updated.

It never received more than a handful of calls in any given month. Even when students used it, and received the information they were looking for, they still asked their advisor the same question to verify that what they heard was correct.

Twenty years later, this department has an elaborate undergraduate advising booklet, an accurate, well-tested computerized degree audit system that students can access online to check their progress toward graduation, and a complete website. Satisfaction with advising remains low, according to my discussions with students.

DISCUSSION

In engineering, we frequently have to pause to ask "What problem are we trying to solve?" I contend that many of our attempts to solve problems with advising are really designed to solve the problem of making curriculum information more accessible and accurate. That effort is essential. But good advising, as my case histories relate, requires solving a different problem: giving students a chance to find out from faculty what students want and need to know, and that is not information about the curriculum. Below I discuss two engineering problem-solving philosophies that I believe are getting in the way of better advising.

Facts vs. Opinions

Engineering is a kingdom of facts, not opinions. My students look down their noses at economics, because "It's all opinions. You can't prove any of it." Following the same logic, advising in engineering has a tendency to reduce itself to an absurd minimalism. The only pure facts at hand are which classes are required for a certain degree, and what the prerequisites for those classes are. Therefore, that is what we pass off as advising.

I was chastened by a student who came to see me, ostensibly about his class choices for the next semester. My first response, given the retched, hectic schedule I had that day, was to pull out the handy flow chart and start circling classes. But, a minute into the conversation, the student covered his eyes and said tiredly "Please. Put that away. I just want some advice." He wanted opinions, not facts. Clearly, advisors in engineering need to greatly raise their opinion of opinions, and expand the topics that they feel comfortable about exploring.

As an illustration of what faculty in engineering should consider talking about when advising, Wes Habley, the ACT advising expert, has data showing that career advising is the one advising topic that students view as very important, but not likely to come up in meetings with advisors. Specifically, his ACT Survey of Academic Advising showed that three of the four items that showed the greatest gap between what students wanted to discuss with a faculty advisor and what actually was discussed occurred with career-related topics: finding a job after college/job placement; identifying career areas which match the student's skills, abilities, and interests; and continuing education after graduation [4]. Students would very much appreciate the advisor asking some questions about their career plans, and offering opinions on various possibilities.

In short, students want opinions, as well as facts, and no one is in a better position to dispense well-informed opinions than an engineering faculty advisor.

We are making progress in this area, at least judging from the remark I heard from an alumnus in engineering the other day. "The most important piece of data I have for any project," he said, "is my boss's opinion." That's sound thinking. Advising in engineering will be better, and its value more recognized, when we give up on that elusive fabrication called objectivity. Facts are important. So are opinions, and our students want the opportunity to discuss ours with them, especially as they relate to the students' professional futures.

Deterministic vs. Gestalt Thinking

Determinism, which is essential to the everyday work of engineers and scientists, says that all outcomes are
determined by a set of events, in a highly predictable manner. The Gestalt viewpoint, on the other hand, holds that the entire context has to be understood, and that the parts don't sum to make a whole in a predictable manner. I appreciate this conflict in particular when I sit in on curriculum meetings in engineering.

The typical heated, extended debate makes it clear that the participants are trying to craft a mechanism that will infallibly do its job: produce 100% excellent students. Of course, this goal is never met, yet the number of requirements and complexities keeps expanding (at least where I work). I conclude that perhaps curricula don't quite have the same causal effect on students that velocities and payloads have on rockets. My students succumb to the same fallacy when they think there is some magic to the combination of classes they take, or, on a larger scale, the combination of a certain degree with a certain minor. Life just doesn't work that way, engineering education and careers don't work that way, and our approach to advising must accommodate the fact that there are many paths to the same destination.

CONCLUSION

Academic advising is just as important to engineering undergraduates as it is to other students, perhaps more so. As seekers of a professional degree, our undergraduates need more than just information on the complex degree requirements. They need, at different times, admonitions, reassurances, clarifications, and, most important, validation from their faculty advisor.

In my opinion, improving undergraduate advising in engineering will only be possible if we try to solve a totally novel problem: trying to model professional, collegiate behavior for our students. (I credit this philosophy to Richard J. Light, who articulated it in a Chronicle of Higher Education opinion piece last year[5]). If we are too busy or preoccupied to be collegial and professional, then we have to hire proxies who aren't (a tragic concession, in my opinion), or give up on good advising as a desirable educational goal. Efforts to solve the problem by making academic advising information accurate, accessible and easily understood are necessary, but not sufficient for improving student satisfaction with advising. Only access to faculty interested in conversing with undergraduates on a collegial level will help. Fortunately, that is not a difficult solution to implement, conceptually at least. We all just have to remember: it's not rocket science!

REFERENCES


