Retention Through History

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Abstract

Civil Engineering has a long history of which most of our baccalaureate graduates are completely ignorant. Upon occasion a student may be aware of projects or people that are local in nature. Beyond this students seem to feel engineering has always been here with little or no development over the years.

Since much of the theory currently in use in the civil engineering profession was developed in the twentieth century older members of the profession have had the advantage of learning the craft either directly from those who created it, or by reading articles by those same individuals. Current faculty are seeing students without an understanding of who we are and where the profession came from. It has recently been proposed by EdAC (the Education Activities Council of the American Society of Civil Engineers) that the ABET (the Accreditation Board for Engineering and Technology, Inc.) requirements for civil engineering in particular be amended to include the history and heritage of civil engineering, adding this to an already overcrowded curriculum.

Another problem facing programs today is the retention of students, especially in the first two years of their college education. It is in these years that we demand our students obtain the necessary mathematics, science and communications skills required to be successful, often with little or no contact with their major. Students despair seeing the long road ahead, and no apparent reason for taking these courses except that they were told to.

In this paper the author will present the solution currently employed by Boise State University. By the addition of a one-credit seminar at the sophomore level students are being informed of historically significant events and persons in the civil engineering profession. This course offers a point of contact for the students with both the faculty, the program and with other majors in their field.

The Problem

Engineering education has always been known for having a high attrition rate at the undergraduate level. Based upon limited data[1] losses of 40% to 50% at the freshman year are not uncommon for schools with an open enrollment policy. An additional 15% to 25% drop at the sophomore level also occurs. There are many reasons for this, some of which include students who are not properly prepared for the rigors and demands of the various programs, students who are unable to afford either the time or the expense of an education and students who feel lost or abandoned in the early parts of their engineering education.

Students who are not properly prepared for the rigors of a university education can be brought up to speed with the proper advising and rigorous application of prerequisites. Students who are unable or unwilling to afford the time of an education can often be helped through discussion with a faculty advisor. Many of these students are older than what is traditionally thought of as college age, and their problems center around apprehension of competing with "kids" in classes and that they are wasting the best earning years of their lives. Students with financial problems have the traditional avenues of scholarship and part time employment by which to seek aid. It is the students who feel lost that will be addressed in this paper.

In the first two years of a nominal four year baccalaureate program students in engineering are asked to complete most of the background or foundation courses required in order to begin an engineering degree. Most of these courses are from fields outside of engineering, focusing primarily on mathematics, the sciences, the social sciences and English. There is limited interaction with other students in their major, and even less interaction with the faculty of their major.

In addition to this isolation due to subject matter, many students are unclear as to what they are majoring in. New students often have only a narrow view of the major they have chosen, usually from personal contact from someone in the field (or a related field), and are not aware of the breadth available within the major they have selected. This is true to greater and lesser extents for most engineering disciplines. It is especially true in civil engineering which will be the major used as a focus for this paper.

Added to the above-mentioned problems there is a general lack of knowledge and appreciation of the history of the profession. Many students realize that the Romans were engineers and that there are ruins from the Roman Empire all across Western Europe, the Middle East and even North Africa. Upon occasion a student may be aware of projects or people that are local in nature. Beyond this students seem to feel engineering either has always been here, and hasn't changed, or that it has recently appeared with little or no development as if like Athena it sprang full grown from the head of Zeus.

Since much of the theory currently in use in the civil engineering profession was developed in the twentieth century older members of the profession have had the advantage of learning our craft either directly from those who created it, or by reading what were then current articles by those same individuals. As time progressed this information has continued to be presented to the students, although now it is second, third or fourth hand at best. Also as time has progressed many of the lesser deities of engineering are being ignored due to lack of time in the education process. Current faculty members are seeing students graduating without an understanding of who we are as engineers, and where the profession came from, items and thoughts that were omnipresent when those faculty members were students themselves.

It has recently been proposed by EdAC[2] that the ABET/EAC Criteria for all of engineering, but civil engineering in particular, be amended to include the history and heritage of engineering. The result seems to be a desire to include historical information in an already

congested curriculum. However, it is through this avenue that both the retention and the heritage problems are being addressed. By the addition of a one-credit seminar at the sophomore level students at Boise State are being informed of historically significant events and persons in the civil engineering profession. This course offers a point of contact for the students with both the faculty, the program and with other majors in their field. By giving the students an historical prospective they feel tied to a larger, but not impersonal, thing that will soon be revealed to them through further studies.

The Method

At the sophomore level in most civil engineering curricula students will be taking their third and fourth mathematics courses, courses beyond the first year of calculus. The will also be completing their science requirements in both Chemistry and Physics and their English requirements. None of these courses are traditionally taught by members of the civil engineering faculty, and are often taught in buildings not used by the civil engineering program. By the sophomore level many of these students will have had an Introduction to Engineering course, usually during their freshman or even pre-freshman year. It is also at the sophomore level that these students will be taking their mechanics courses, courses in Statics, Dynamics and Strength of Materials that are often required by several disciplines. As a result students could reach the junior level having little or no interaction with the civil engineering faculty. With this in mind it becomes imperative that a point of contact be inserted during the sophomore year.

The solution currently employed by Boise State University is to require a one (semester) credit seminar where students are introduced to historic projects and persons having to do with the civil engineering profession. The American Society of Civil Engineers, in honor of their 150th anniversary, have been developing tools and information concerning the history and heritage of our profession. A key tool available through ASCE is their "History and Heritage of Civil Engineering" web site[3]. This web site is an invaluable tool to be used for either homework assignments or in-class exercises.

In addition to the web site a text or series of readings are needed. This is often the hardest part trying to find a text the students, who have little understanding of engineering at this point, can understand and appreciate. The dilemma of a text also includes the limited amount of time the students will have. This is a one-credit course extending over a 15-week period. While there are a number of books discussing various projects available to the instructor, time, workload and variety of subject need to be considered. ASCE is a source for texts about various aspects of Civil Engineering, or an overview of the profession as a whole. Any text will be limited and should be supplemented with brief articles from diverse sources. American Heritage magazine is a good source for such articles.

Beyond the written word, even the written word as it appears on a web site, pictures and visual presentations are a must. The generation of students currently in school has a much greater appreciation for topics with a visual reference. There are a number of sources of pictorial material, including slide presentations put together by the instructor. An example of such source material would be the History Channel, the Discovery Channel or the Learning Channel on television. Various programs that are shown on these networks highlight specific projects. If these are tied in with reading assignments about these or similar projects the students gain a reinforced understanding of the material. ASCE is generally not a good source for video material, with the exception of the Building Big[4] series created for the 150th anniversary, and available to school for presentation. The Building Big series presents an overview of many aspects of civil engineering.

It is suggested that regional projects and people be emphasized as well as national and international. Students need to be made aware of local impact on the field, and where local examples of such projects are to be found. It is difficult for students to visualize the problems that needed to be overcome in a different time as well as a different geographic setting. While attending school in the east it was all but impossible to visualize the massive water projects of the west. Dams with 100-foot locks for barge traffic were beyond conception. In the same vein getting students in the intermountain west to understand the concept of limited land availability,

or the fact that the Appalachian Mountains are a significant barrier to transportation is equally difficult.

Conclusions

The addition of a one-credit seminar in the sophomore year of a traditional civil engineering curriculum is a limited intrusion on an already overcrowded course of study. The value of this seminar, with its focus on the history of civil engineering, may be defined in several ways. Such a course would generate a point of contact with the student body at a point when they are half way through their college career and have seen little or nothing of their major. This course is a vehicle to present the students with an historical overview of the profession, illustrating the triumphs and failures through noted projects with name recognition that the students may be vaguely aware of. In addition this course will give faces and context to the accomplishment of various individuals and their contributions to engineering and society as a whole.

Bibliography

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