Studio Design Experiences

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Abstract

Some of the buzz words of engineering education for the past decade and today are: interdisciplinary, diversity, groups, critical evaluation, ideation, design, etc. We have been experimenting with these aspects of engineering education in a unique educational adventure. On several occasions over the past five years we have combined our respective "introduction to design" courses for three week periods to jointly work (in teams composed of both art and engineering students) on interdisciplinary projects. These experiences have been in a studio environment that may not be well known by some engineering faculty. This paper describes the studio design process and our thoughts about it in an interdisciplinary setting.

Introduction

Design is not unique to engineering. The basic tenets of design -- order, organization, and efficiency – are more common than exclusive. We can learn much from observing how other disciplines utilize and teach design. For the past five years there has been a teaching collaboration between the authors of this paper. One has taught a sophomore design course in mechanical engineering for over ten years, and the other has taught foundation design in art for twenty years. Each spring these courses are scheduled at the same time so that students can collaborate on selected design projects in a "studio" environment. This experience has been very rewarding and educational for both the students and the instructors. As one might expect the students are both apprehensive and curious: apprehensive because they do not know what to expect from students whom each side considers to be completely foreign to their own discipline, and curious because there is at least a little "artist" and a little "engineer" in all of us. An interesting result is that in the end most agree that there is a large "common" ground shared by the two disciplines. This common ground is the design process itself which, in theory, is

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independent of discipline even though in practice there may be many apparent differences, e.g., the specific constraints and goals that are set, the complexity of the analysis and methodologies that are employed, the resources that are utilized, and the type of information and/or materials that are worked with, etc. See for example references 1 to 4 which discuss the "engineering design" process" and/or references 5 to 7 which take a more general view of the design process. Many of the engineering students find that "dealing" with the studio environment itself to be the most difficult part of the experience. The purpose of this paper is to reflect briefly on these experiences and to describe the "studio" design environment for those who may not be familiar with it. (See reference 8 also.) In addition, it is the authors' contention that the studio environment is a more objective, creative, and nurturing environment for design and problem solving than the traditional groups-working-in-isolation paradigm followed in most engineering academic design settings.

The Studio

The studio, utilized in one form or another, is the traditional learning environment for the "visual arts". The studio is equivalent, but definitely not the same as, the engineering or science laboratory. In the studio paradigm, projects are assigned to or developed by the students, and it is assumed that the student will devote a certain amount of time, e.g., twelve to eighteen hours a week, to completing the project. It just so happens that six of those hours are in and during the regular meeting of the studio. The students come to the studio expecting to work on their projects, but they also seek advice from peers and teachers, offer advice to peers, and usually expect to take part in a "critique". It is the critique and the culture of the critique that more than anything sets design in the visual arts apart from engineering design. The critique is discussed briefly here but will be discussed in more detail in the next section. A critique may take place in every studio period or once a week or only every two weeks depending on the magnitude of the project. Two or three critiques may be associated with a project, so the timing of the critiques is related to the timing of the project. The idea of seeking help from peers and teachers is not new to engineering students and in fact is, unfortunately, all too common in an undergraduate engineering laboratory section when most of the students come unprepared. However, what is new is the sharing of ideas, the unrequested advice, and the dreaded (for the engineering students) critique. For the visual art student these aspects of the studio are at the very heart of the studio concept. There is a strong sense that they all succeed together while for the engineering students individual success is usually paramount. The college-level visual art students have probably experienced the studio for ten years, and the studio is part of their culture. For engineering students this exposure to the studio environment is likely their first.

An important aspect of the studio culture is that the student and the instructor work as a team. During the studio period (normally three hours, twice a week) the students work on their projects while the instructor "circulates" informally reviewing and commenting on each project. The studio requires two resources which have equivalents in engineering education: the meeting space or studio (the laboratory for engineering) and the human

resource (the instructor for both). Just like the laboratory in science and engineering, the studio is a dedicated space which is usually assigned to a faculty member or a small group of faculty in the same discipline, e.g., interior design, graphic design, etc. and reserved specifically for the teaching of studio courses by that faculty or the small group of faculty. To engineering faculty the teaching space resembles the "old" engineering "graphics" room with either a set of working tables with chairs or drafting tables with stools. The important elements are that classes are limited to about twenty students and competed works of previous classes and other drawings, posters, and artifacts related to the discipline are displayed. Access to the studio is granted at any time during the class day, on a space available basis, to any student enrolled in a class using that studio. It is not uncommon to see students of several different classes (and academic levels) working side by side during a class and to see students working alone in the studio when classes are not meeting. The instructor's office is usually adjacent to the studio, and the instructor is usually accessible throughout the day.

This picture may resemble the "open lab" concept used in the some engineering programs and in fact it is similar in appearance (except for the electronics and the hardware). Of course, the other difference is that in the engineering laboratory there is usually a specific outcome objective, a data collection process and a reporting requirement. In the studio, the objective is usually not as well defined as in the engineering sense. The expected result is a new and unique image or artifact that satisfies to varying degrees an array of preset constraints and goals that are generally based on a "sense" or "feeling" rather than demonstrating or illustrating an engineering principle. The instructor's role is also quite different. In the engineering laboratory course the instructor is attempting to help the student find the "right" path; in the studio, the objective is for the student to discover his/her own path.

The Culture of the Critique

As noted above the educational process in the visual arts is more of a team process: the student and the teacher being the team, than it is in engineering education. Of course, in a larger project there could be a "team" of students. In another sense all the students in the class view themselves as "team members", or at least consultants, on all the projects in the class. Once this "team" culture is accepted, the role of the instructor is much easier. Criticism is viewed positively and constructively. Students welcome the instructor's comments. But criticism, no matter how well received, is usually not without at least a little resentment. Over the years of experiencing "artistic" criticism (i.e., sometimes vague opinions and multiple suggestions as opposed to declarations that the work is either right or wrong, along with specific suggestions, rules, or references), the visual art students learn to truly "grin and bear it" (or develop a "thick skin" and learn to turn the other check) because they trust the instructor and acknowledge the "team" aspect of their relationship. It is true that the instructor must eventually "judge" the student, but that judgment is based on more than simply the student's performance on a few "tests"; it is based on a semester long "working relationship".

The Critique

Critiques, lasting up to an hour or more, are held on a predetermined schedule during the time period assigned to a given project. Usually there are two or three critiques for a given project. The process begins with each student (or group) placing his/her current image or artifact on the table with all the other unfinished projects. The submission is anonymous, but many, including the instructor, can place the artist with his/her work. The instructor may group the submissions according to the point(s) to be made that day or the submissions may be discussed individually. In any event, the instructor will usually solicit initial input and comments from the class for each grouped or individual submission. The comments may be accepted, commented upon, discussed by the class, or rejected, all under the watchful eye of the instructor. Many times the discussion will lead to the inclusion of other submissions and expansion or reduction in the sizes of the groupings. When the class discussion on a given submission is over, the instructor will usually present a summary of the discussion and possibly an "edited" set of suggestions for the artist. But perhaps even more important than the opinion of the instructor is the discussion that the submission stimulated and the chance for the artist to hear his/her influence firsthand. This discussion is akin to "brainstorming" and even if the ideas put forth are not directly applicable and may have to be developed further, the seeds have been planted.

The Reaction

Initially, most engineering students do not take well to the public nature of the critique. In our combined classes, a few engineering students resist participation. Formal class evaluation instruments are used in the engineering class (in addition to the College's mandated Course Evaluation Forms) to help determine the student's thoughts and feelings about the class. Special attention is given to solicit comments about the interaction with the art class. Some engineering students enjoy the experience and want to do more such projects. At the other end of the spectrum, some engineering students are resistant to the interaction and see no value in it. To say the least most of the engineering students are apprehensive about the collaboration before it starts, but most are also pleased with, and in a sense proud of, the experience. In another paper at this conference (Session I.A), one of the joint projects is presented and the student reaction is discussed.

Another type of reaction should also be mentioned - - that of our teaching colleagues. To say the least, their reaction is disappointing. They are willing to listen (for a short while) about the collaboration, but no one has been interested enough to "check it out."

The Instructors' Reactions

Engineering students and industry generally have a much greater interest in "design" than most engineering faculty. This statement is based on the students' responses to

questionnaires completed by all graduating students (stating that they feel they would benefit from solving more "real-world problems") and the feedback received from students indicating that most of the time during their job interviews is spent discussing their design experiences rather than their gpa's. Because of the limited "space" allocated to "design" in most undergraduate engineering programs, we feel that the more varied the design experience the better. We feel that it is important to demonstrate the inclusive nature of the design process, i.e., by practicing it in a truly interdisciplinary environment, rather than to treat it as an exclusive process, e.g., by calling it "engineering design" even in the introductory level courses. By emphasizing the universality of the design process, we emphasize the "process" more than the "results" and hope to help students gain respect for the potential contributions of all "designers", e.g., craftsmen and technicians as well as visual artists.

Summary and Conclusions

These interdisciplinary experiences have been worth the effort, expanding the minds of both the instructors and the students. Perhaps this glimpse of "the other side of design" is a sufficient experience for many engineering students whose long term interests lie outside of design, but those pursuing a career path related to design would benefit by a much expanded experience. As a minimum benefit, one aspect of design missing from most engineering programs (due for the most part to the lack of faculty experience and expertise), esthetics, is covered quite well.

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