Getting Freshmen to make the Connection between Courses through Integrative Learning Blocks (ILBs)

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Abstract

The College of Engineering faculty worked specifically on revising the freshman courses to include team-based problem solving and experience in design methodology. In 1997 the University of Hartford launched a pilot program that created seven Freshman Interest Groups (FIGs)-a pairing or clustering of courses in which a group of 20-plus students take two or three courses together. The goal was to get faculty to cooperate on the shared outcomes between the clustered (FIGed) courses, which are called "Integrative Learning Blocks (ILBs)". The idea was very successful as far as students' performance, interest, and their GPA. In 1998 the College of Engineering (COE) had a pilot FIG, involving an introductory engineering course and a writing course. Recently, the COE received a significant grant from the NSF for "Integrating Engineering Design with Humanities, Sciences and Social Sciences" where the experience gained from the pilot FIG comes in very handy. This paper is to explain the procedure of the FIG and the ILBs, assess their effectiveness, reflect on the experience and offer other institutions a picture of what goes on in such an environment.

Introduction

The University of Hartford is an independent, mid-size comprehensive, primarily undergraduate institution of about 6500 students (full & part-time). It is complex for its size with seven baccalaureate schools/colleges—arts and science, engineering, business, engineering technology, and education/nursing/health professions, an art school, and a school of music/dance/drama—as well as 2 two-year colleges. The COE enrolls about 400 undergraduate students on full-time or part-time basis and offers ABET accredited programs in Civil, Electrical and Mechanical Engineering. It also offers a practice-oriented Masters program in various disciplines.

The University's Strategic Plan (1996) identifies the improvement of the First-Year Experience as one of the institution's four highest priority items. As part of the effort by the University of Hartford to improve the freshman experience across campus, faculty from the COE as well as those from four other collegiate units participated in a two-year initiative sponsored by a NSF Institutional Reform grant. The goal was to improve students' learning in the first-year courses across the university through the use of

technology, collaborative learning, and peer coaching[1]. The COE faculty worked on revising the first-year courses to include team-based problem solving and experience in design methodology. As a result, two new courses were added: "Principles of Engineering" and "Principles of Design" [2]. The former introduces students to the engineering profession and engineering practice. It involves cooperative learning using small-group projects. The latter allows students to experience the design-making process on engineering problem solving in a step-by-step, sequential fashion; thus they learn a methodology for future problem solving activities. In 1997 the University of Hartford launched a pilot program that created seven Freshman Interest Groups (FIGs); a pairing or clustering of courses in which a group of 20-plus students take two or three courses together. Obviously, the traditional course structures and course scheduling mechanisms had to be revamped to support the effort. The goal was to get faculty to cooperate on the shared outcomes between the clustered (FIGed) courses, which are called "Integrative Learning Blocks (ILBs)". ILBs are the real or virtual moments of intersections among courses at which point common learning outcomes can be enforced. The idea was very successful as far as students' performance, interest, and their GPA.

The problem and the solution

The preliminary assessment of the first-year sequence shows a positive impact on student Grade Point Average and retention. However, the fragmented structure of the first-year curriculum still creates problems in terms of student learning. Students seldom relate engineering topics to other topics covered in other courses even those taken during the same semester. For example, while students are learning to write in their "reading and writing" course they still are unable or willing to apply their new skills and knowledge to writing technical reports in the engineering course. Based on the University's success with the FIGs/ILBs, the COE in 1998 had a pilot FIG. It was between ES 141, Principles of Engineering (an introduction to engineering course), and RLC 110, Rhetoric, language, and Culture (a writing course), where the concept of FIG and ILBs were applied. Figure 1 shows the ILBs between the two courses. This was done as a test to serve as the basis for "FIGing" other courses in the engineering curriculum. The outcome was very positive and a change in students' attitude toward learning was noticeable.

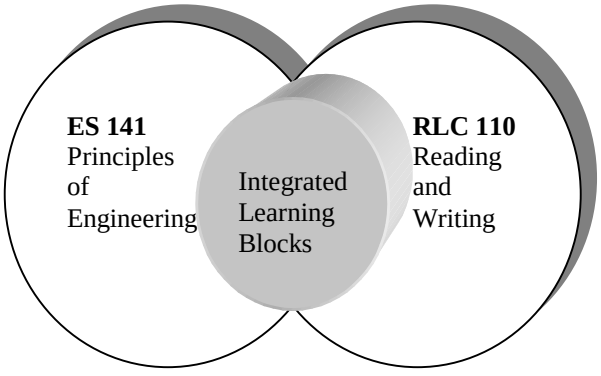

Figure 1: The first-semester Freshman FIG

How to establish a FIG

A FIG could be established between two or three courses. For example, to establish a FIG between three courses the instructors of course X, course Y and course Z from the different colleges should do the following activities:

- Individually prepare their course syllabi.
- Individually produce a list of the expected outcomes of their respected courses.
- Exchange the syllabi between the instructors of X, Y and Z and if possible the textbooks.
- Each instructor should read and try to understand the syllabi of the other courses, then write any possible shared outcomes (ILBs) between the courses.
- The instructors then should get together (several times) and work on:
  - Agreeing on the list of the shared outcomes (ILBs). There should be no confusion about the source of the shared outcomes. They are part of the individual courses' outcomes, however the instructors feel that they are common to the FIGed courses.
  - Producing a list of activities to support these shared outcomes. This could include assignments, projects, presentations, etc.
  - Specifying the technology tools that will be used to support these activities (e-mail, web, chat, advertising, etc.)
  - Establishing an assessment method to measure students' performance in these shared activities.
- When all of the above is achieved, a table showing the week-by-week topics to be covered in each of the FIGed courses and the shared outcomes would be helpful.
- The faculty in consultation with the leadership in each of the departments participating in the FIG should cooperate on scheduling the FIGed courses to avoid any conflict with any other course needed by the FIGed students. Also, they should identify the FIGed courses in the published bulletin for that semester.

The ILBs

The integrative learning blocks are central features of FIGed courses. They are the real or virtual moments of intersections among courses at which point common learning outcomes can be enforced. These learning blocks will be constructed so students become engaged in collaborative projects with clearly defined learning outcomes that have been developed by faculty from the identified disciplinary areas. Students attend their regularly scheduled courses and sharing in time/space between the courses could be possible to have a long period in which to explore a topic in more depth or the faculty can team-teach a class. Since the ILBs are centered on a body of work that is common to all the FIGed courses, it allows faculty members to pursue the learning goals of integration and critical thinking together. Students experience a learning situation that is not fragmented by discipline or course; their learning about the common work will employ multiple perspectives of the courses. It creates among the faculty, a community of common learners, or students. When designing/establishing the activities to support the ILBs an essential component should not be overlooked: a main project [1]. Teams of

students will have to work on a project(s) and the projects should be structured to require students to integrate creatively both the content knowledge and the skills developed in all of the courses in the particular ILB. For example, one of the ILBs of the pilot FIG was [*Communicate technical information, in written and oral form, in a professional manner*].

How does it work?

During their "normal class time" in engineering, students are learning how to interpret graphs, how to apply the principles of engineering problem solving to technical problems, how to use computer tools to solve engineering problems, in addition to learning about various engineering disciplines and career paths. In their writing course students learn to read critically and to analyze in writing personal and social conflicts, as these are grounded in historical realities. Students begin to analyze the complex cultural, social and linguistic forces that shape all acts of reading. In the ILB, teams of students might work on a case study involving the design of a new child's toy or the design of environmentally sound classroom. Students could use their engineering skills to analyze the potential market for the new product based on information obtained from a variety of sources and then present arguments, written and oral, pro and con, for the production of this product. If the decision is made to produce the toy, students could then develop a series of advertisements for their product intended for a variety of media, print, radio, TV, internet, etc. Other teams of students could be determining the social impact of such a product if it were marketed, examining the social and legal implications of the new product. All activities would be student-led and involve teams of students working collaboratively.

When my students worked on designing an environmentally sound classroom (to support the ILB mentioned above) it was clear to them that the technical aspects of the project would be covered and discussed during my course, ES 141, and the other aspects would be discussed during the RLC 110 course. However, when the time came for presenting the final project we, the instructors, would be there. It was part of their RLC course to explain the views and methodology used to design the classroom in writing, and it was part of my course to work on presenting their views orally.

Discussion

As mentioned above a pilot FIG was tried in fall 1998 with little planning since I wasn't sure about the extent of the curricular cooperation/integration and wasn't able to fully plan for it with the RLC instructor who was unavailable during summer due to illness. However, due to the positive feedback from my students, a formal pilot took place during fall 1999 semester. The planning was done during summer 1999. The coordination between the RLC instructor and myself was very helpful. I was aware, as was the RLC instructor, of what will be taught or discussed in the other class in advance. This enabled me to refer or point to subjects covered in RLC 110. In reality, students could not make excuses such as they never heard of this topic before or (my favorite) the instructor of the

other course did not or has not covered it yet. Several crucial issues come to mind and they are the product of the experience gained from the two pilots:

- Critical to the success of such ILBs is the opportunity for faculty across disciplines to spend significant time developing a common set of learning outcomes and the activities to achieve them. Planning should be done during summer and this includes sequence and timing of the semester.
- The whole idea of FIG and ILBs should be explained in class as early as possible in the semester. Students should be aware of as much details as possible. The following web-site provides more information and explanations about FIG http://uhavax.hartford.edu/~FIGS/welcome.html.
- Teamwork is a must, at least for the ILBs if not the whole course.
- The FIGed faculty should visit each other classes at least once during the semester.
- A final project is a must and all FIGed faculty should be present during the presentation(s).

Conclusion

Similar measures are going on nationwide as "Learning Communities". Some learning communities are "Theme-based" while others are based on adding an extra credit for students to work together. Some institutions have a selection process, where students are selected based on some parameters to be part of a learning community either before or after arriving on campus, while others have a process of "forming special groups" and they track their performance for four years. These "special groups" meet regularly in large and small groups to achieve pre-set objectives [5]. In our model, the College of Engineering at the University of Hartford, we do not follow any of the above models. Since our courses are built around the team-based problem/project solving approach we only had to make some minor adjustments to accommodate the process. We do not have a special theme, an extra credit, special groups or a process to identify the groups. In fact all full-time students have to take these FIGed courses. In conclusion, we did not try to alter the traditional course structure or to add extra courses or credits rather we did alter for the better some of the content and changed the pedagogy of the courses. Due to above reasons our FIGS are unusual in the sense that they are economical and efficient.

The pilots were very successful as far as students' performance, interest, and their GPA. Students achieved a better understanding of their majors and their relationship to other disciplines (this is based on preliminary results of a survey conducted by Prof. R. Duran, School of Communication, with the final results to be available soon). They were able to make the connection and see by example that there is a relationship between engineering and being able to write (as is the case in this FIG). Faculty began "connecting the disconnect in the curriculum" and eliminating redundancy among the courses. Finally, the COE recently received a significant grant from the NSF for "Integrating Engineering Design with Humanities, Sciences and Social Sciences". Under this proposal the concept of FIG will be applied on two courses in the freshman year, a new design course in the second semester of the sophomore year, and on a design course in the second semester of the junior year. Almost all the engineering faculty and about 15 faculty from the other

colleges at the university are involved and are working on developing the FIGed, SIGed (sophomore), and JIGed (junior) courses. Fall 2000 will be the official starting date.

Acknowledgement

The contribution of Mrs A. Ader, the RLC instructor, was very critical to the success of the fall 1999 pilot. Part of this work was supported by a grant from the NSF, Grant # EEC-9872433, the University of Hartford and the Engineering Application Center at the College of Engineering.

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Biography

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