6-14-2009

A Model For Coordination And Management Of Resources For Multiple Sections Of An Active Learning Style Freshman Course

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Publisher Citation

Nocito-Gobel, J., & Thompson, A., Barratt, C., & Collura, M. (2009). A Model For Coordination And Management Of Resources For Multiple Sections Of An Active Learning Style Freshman Course. Paper presented at 2009 American Society for Engineering Education Annual Conference & Exposition, Austin, Texas, June 14-17, 2009.

AC 2009-1102: A MODEL FOR COORDINATION AND MANAGEMENT OF RESOURCES FOR MULTIPLE SECTIONS OF AN ACTIVE-LEARNING-STYLE FRESHMAN COURSE

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Model for Coordination and Management of Resources for Multiple Sections of an Active Learning Style Freshman Course

Much research in recent years has verified that an active learning style approach to freshman engineering design courses adds value to undergraduate engineering programs and improves retention rates. Many universities have established First Year Programs to coordinate the activities and classes for first year students. However, not all universities have the funds to establish programs separate from disciplinary programs. How can faculty that are not assigned to a First Year Program efficiently manage multiple sections of a hands-on course with limited resources?

There are several models for teaching basic engineering concepts in electrical, mechanical, chemical, computer, civil and system engineering to freshman engineering students. One approach is faculty team-based with each faculty member teaching their specialty at some point during the course. Another approach involves the teaching of basic engineering concepts in only discipline-specific courses by faculty members whose specialties encompass that course's concepts. Both of these traditional approaches described do not require the amount of coordination and overall support from a program coordinator because the faculty members are delivering concepts within their realm of expertise. However, in our model, where one faculty member from one of the engineering programs is teaching basic concepts from all disciplines, a coordinator is needed to ensure that the basic concepts are covered in a consistent and high-quality way.

EAS107P Introduction to Engineering – Project-Based is taken by all incoming engineering freshmen first semester at the University of New Haven as part of the ***Multi-Disciplinary Engineering Foundation Spiral*** curriculum. Throughout the course, students are introduced to basic engineering concepts through a series of hands-on projects. Student understanding is enhanced as these topics are revisited in subsequent courses taken during the second semester freshman year and through the sophomore year. This approach requires significant collaboration between faculty involved in the spiral curriculum courses in order to achieve the program's intended results, namely, academic consistency across sections, and the need to adequately prepare students for the next tier of courses.

This paper discusses our experience at the University of New Haven in addressing issues that arise when running multiple sections of a first semester freshman engineering course. Some of the management issues that occur involve scheduling time of teaching assistants, planning and purchasing materials, scheduling classrooms, recruiting and training full time faculty and adjunct faculty and planning for their schedules, and managing the dissemination of information under tight budget constraints.

Introduction

Many changes in engineering education over the past 20 years have focused on enhancing the first year experience to improve the academic performance and persistence of engineering students. These enhancements include first year courses, student assistance programs inside the classroom including the use of various active/collaborative learning methods, as well as student assistance programs outside the classroom such as individual and group tutoring[1]. Regardless of whether a program uses one or a combination of these enhancements, the implementation of them in first year programs requires different levels of resources and support.

A common approach used by many universities is to create a program or department separate from disciplinary programs to administer and support all activities of first year students. For instance, The Ohio State University has implemented a two-track program, referred to as the Introduction to Engineering (IE) program and the Engineering Honors Program (EHP)[2]. All incoming freshmen choose one of these two tracks. Administration of the courses in both of these tracks, which includes scheduling of classes, and support services such as the peer mentoring used in the classroom and labs, is through the office of First Year Experience Programs. While the number of students serviced by this office - approximately 1000 per year - certainly warrants this type of support, smaller universities/colleges may not have the resources to create a separate administrative unit to offer their first year courses.

Common to the curriculum of most first year programs is a first year engineering course (typically a semester or 2-semester course) that introduces students to the engineering profession, focusing on the design process and developing problem solving skills. However, not all introductory engineering courses are taught using the same approach. Some programs offer discipline-specific introductory courses taught by faculty whose expertise encompass the concepts discussed in the course[3]. Others offer team-taught introductory courses with faculty teaching their specialty at some point during the course. Since most first year programs include an introductory engineering course, typically this course has multiple sections depending on the student population of the institution, and may require additional resources and support depending on the type of course, e.g. project-based, and approach used. The burden for administering and coordinating these first year courses rests with disciplinary programs when dedicated faculty are not assigned to First Year Programs.

New Approach

The University of New Haven is a small, private institution with an undergraduate population of about 3000 students. The Tagliatela College of Engineering at the University of New Haven has approximately 350 engineering students and offers programs in Civil, Chemical, Mechanical, Systems, Electrical and Computer Engineering. During the 2004-05 academic year, faculty at the University of New Haven began the implementation of a new curriculum that stresses development of professional and technical skills during the first two years, while introducing basic engineering concepts. The ***MultiDisciplinary Engineering Foundation Spiral*** (***MDEFS***) is a four-semester sequence of engineering courses (EAS prefix), matched closely with the development of students' mathematical sophistication and analytical capabilities and integrated with course work in the sciences[4]. The engineering science content found in traditional courses (e.g. statics, circuits, mass balances, thermodynamics) is presented in a multidisciplinary context to provide greater breadth. As the students enter disciplinary courses in their junior and senior years, the traditional depth is still present, but the students should have a broader view of engineering and be better able to work in the multidisciplinary environment of the engineer of 2020. The sequence of courses in the curriculum is illustrated in Figure 1.

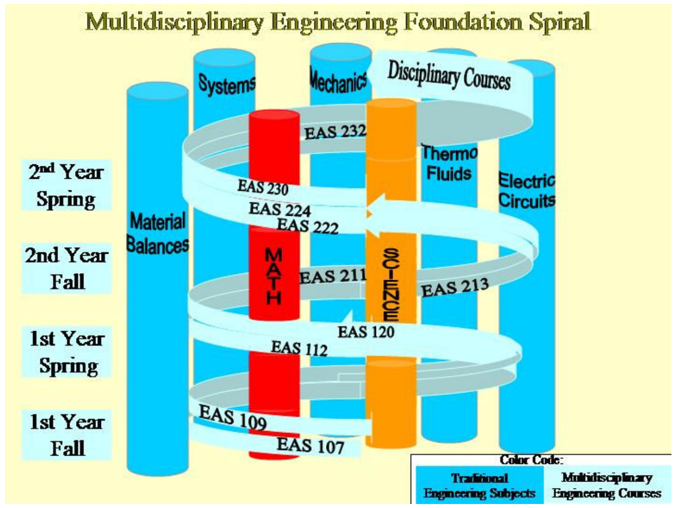

Figure 1: Multidisciplinary Engineering Foundation Spiral

Students develop a conceptual understanding of engineering basics in the series of EAS courses shown in Figure 1 which stress practical applications of these principles. Topics in these courses include electrical circuits, fluid mechanics, heat transfer, material balances, properties of materials, structural mechanics and thermodynamics. Each of the foundation courses includes a mix of these topics, presented in a variety of disciplinary contexts. By the second semester of the sophomore year, each EAS course addresses a single engineering foundation area. A solid background is developed by touching key concepts at several points along the spiral in different courses, adding depth and sophistication at each pass. Each foundation course also stresses the development of essential skills, such as problem-solving, oral and written communication, application of the design process, teamwork, project management, computer analysis methods, laboratory investigation, data analysis and model development. Students go on to build substantial depth in some of the foundation areas in disciplinary courses, while other topics may not be further developed, depending on their chosen discipline.

One of the foundation courses taken during the freshman year is EAS107P Introduction to Engineering Project-Based. This introductory engineering course is a hands-on project based course. It differs from the more traditional first year models that are either team-taught or discipline specific courses in that for each section, a single faculty member from one of the engineering disciplines teaches basic concepts from all disciplines. Since this course is an interface to subsequent foundation courses, it is important that all engineering students have a similar experience, and are introduced to the same basic engineering concepts. For this reason, coordination among the various sections of EAS107P is critical to ensure that the basic concepts are covered in a consistent and high-quality way.

The University of New Haven provides support for all first year students through the Office of Academic Services and the Center for Learning Resources. Centralized tutoring and academic skills development through these offices provides an economical option for supporting all freshmen. However, introduction of the new spiral curriculum prompted engineering faculty to develop support programs specifically designed for first year engineering students. In 2004, a living-learning community for first year engineering students was established, featuring tutors in the dorm, periodic field trips and increased opportunities for faculty interactions with the students. As full implementation of the spiral curriculum occurred over the next couple of years, an Engineering Foundation Program director for the new curriculum was established to coordinate the scheduling of all EAS courses, recruit faculty and adjuncts to teach EAS courses, and to manage the resources (supplies and equipment, salaries for undergraduate TAs) allocated to support the spiral curriculum.

EAS107P Introduction to Engineering – Project-Based

EAS107P is a required course for all engineering majors as well as for students in computer science and information technology. Students typically take the course first semester freshman year. However a section of EAS107P is offered during the spring semester for transfer students or those students who lack adequate math background. Because EAS107P fulfills one of the university core requirements, non-engineering students often enroll in the course[5], although the majority of students are engineering majors. Generally during the spring semester, the fraction of non-engineering majors is higher, but is still less than about 25%.

EAS107P was developed by a team of faculty from various engineering disciplines. The objectives of the course are to

1. introduce students to the disciplines of engineering;
2. develop a foundation of professional skills for future engineering work including teamwork and technical communication;
3. develop an understanding of engineering design from a multi-disciplinary perspective,
4. develop a basic understanding of the engineering foundation topics, including mechanics, electrical circuits, and systems.

Students in EAS107P develop skills in problem solving, teamwork and technical communication through a series of projects that showcase the primary engineering disciplines[5]. It is through these projects that students develop their first layer of skills and engineering concepts. Lectures are used as-needed to provide background information on projects or to supplement information related to a particular project. Projects emphasize different aspects of the design process, including computer simulation, optimization, technical communication, and construction of physical models. In addition, EAS107P approaches engineering design from a multidisciplinary perspective: an understanding of issues and an ability to apply simple concepts from other disciplines[4]. Thus, an effort was made to include projects of a multidisciplinary nature, such as robotics and fuel cells.

Since active learning methods are extensively used, student participation is an important element of the class. Individual class periods consist of a brief lecture to introduce concepts, followed by hands-on activities, with time allowed to work on projects. The first three weeks center on discussions and in-class activities related to the engineering profession, the design process and teamwork, followed by the projects. Cooperative learning methods are also used. For instance, instead of a lengthy lecture on the different engineering professions, students in teams research a field of engineering, including a description of the field, the needs of society served, job opportunities, and areas of specialization. Each team member chooses a different sub-discipline to research. As a team, the students prepare a brochure, summarizing their research on the specific discipline and make a PowerPoint presentation to the class. In this way, students learn from each other about the engineering professions, while developing their communication skills.

The remainder of the semester is structured around 4 project modules that introduce students to basic engineering concepts from electrical circuits, fluid mechanics, material balances, and structural mechanics. The details of typical modules have been discussed in a previous paper[5]. During the fall 2008 semester the projects used included the design, construction and testing of bridges based on the West Point Bridge Design program; the design of a remote pumping station powered using a renewable energy system including solar panels and fuel cells; building and programming robots to create a model of an automative transportation system, and solid 3-D modeling and construction of puzzle cubes.

A pilot version of EAS107P was first introduced during the fall 2002 semester. The next fall semester (2003), 3 sections were offered by two different faculty for the incoming freshmen engineers. Management of the course was equally shared by these two instructors. Summarized in Table 1 is information related to the increase in the number of instructors teaching the course starting with the 2004-05 academic year. As shown in Table 1, the number of sections and instructors teaching remained the same through the 2005-06 academic year. However, problems began to surface during the fall 2006 semester as the number of sections increased to 4 with different instructors for each section.

Table 1: EAS107P Offerings from 2004 Academic Year to the Present

Academic Year	Total Enrollment	No. of Sections Fall Semester	No. of Sections Spring Semester	No. of Different Instructors
2004-05	63	3	1	2
2005-06	70	3	1	2
2006-07	91	4	1	4
2007-08	94	4	1	4
2008-09	143	6	2	5

Courses such as EAS107P that use active learning techniques differ from traditional lecture style classes in that the instructor needs to manage classroom time effectively. It is easier to manage classroom time when primarily lecturing than if the time needs to be divided between lecturing and having time for some hands-on activity. This became apparent during the fall 2006 semester when different sections began varying the amount of time allocated to complete each project. By the end of the semester, the final project in certain sections was reduced by a week in classroom time in order for students to complete the project. The added time constraints on the students resulted in increased student frustration and a reduction in student motivation.

Strategies for Maintaining Academic Consistency – The Role of the Course Coordinator

Management of EAS107P during the 2003 through 2005 academic years was easily handled by the 2 instructors teaching the course. Responsibility for posting new and updated course materials, purchasing supplies for day-to-day activities and projects, and maintaining equipment in the studio-style classroom was shared by both faculty members. However, as the number of sections and instructors increased, it became apparent that a designated individual was needed to coordinate the logistics for the course to ensure academic consistency. During the 2007 fall semester, a course coordinator for EAS107P was introduced.

The primary responsibility of the course coordinator is to manage resources for the course and ensure that the objectives for the course are satisfied for all sections. One of the faculty members who had been involved in the development and teaching of EAS107P was assigned as the coordinator. The course coordinator serves as the primary contact for all daily activities related to running multiple sections of the course. Responsibilities include ordering books for the course, training of first-time faculty during the summer, recommending and implementing changes in course materials, purchasing equipment and supplies for the course, posting all materials to BlackBoard, and meeting with other instructors throughout the semester.

The course coordinator schedules and determines the frequency of group meetings with all faculty involved in teaching EAS107P. She is also able to work with specific faculty to address any problems associated with his/her particular section(s). Feedback from the faculty is used to determine whether problems have persisted (and why) or have been successfully remedied.

Scheduling of multiple sections of EAS107P is done by the Engineering Foundation Program director in consultation with the course coordinator. The need for new instructors, either full-time professors or adjuncts, is identified, and the course coordinator assists in contacting potential adjunct instructors.

In addition to coordinating daily activities occurring in multiple sections, it is the responsibility of the course coordinator to collect data to be used in the assessment of EAS107P. Materials to be used for assessing the course are determined by the course coordinator in consultation with the faculty teaching EAS107P. The course coordinator reviews student evaluations from all sections, and provides a summary for faculty of both their individual section and all sections collectively. Feedback from faculty throughout the semester, identifying problems and modifications to activities and projects, along with feedback from the student evaluations provides the basis for continuous improvement of the course. The role of the course coordinator is to implement necessary changes.

Strategies for Maintaining Academic Consistency – Faculty Training and Collaboration

An important feature of the MDEFS curriculum is the threading of engineering topics throughout the first four semesters for engineering majors. Because the engineering concepts introduced in EAS107P will be discussed and developed further in subsequent courses, it is imperative that academic consistency be maintained across all sections. Three methods are used to maintain consistency in multiple sections of EAS107P: 1) summer training program; 2) faculty observation in class; and 3) faculty collaboration and coordination.

All faculty members teaching EAS107P for the first time are asked to participate in a 3-4 day intensive training session prior to the start of the fall semester. The course coordinator along with an additional experienced faculty member guides the new instructors through the entire course. Engineering concepts that are introduced in EAS107P are discussed along with the 5 projects around which the course is structured. The objective of this training session is to familiarize the faculty with the software used in the course and the hands-on activities they will be using in the classroom. Potential problems or issues associated with particular activities or projects in previous offerings of the course are also discussed. Some time is allotted for faculty to begin working on the projects. Compensation is given to new faculty members participating in the training session.

Although the training session provides an extensive overview of the course for faculty teaching EAS107P for the first time, it does not completely prepare them for the issues often associated with an active learning style class, such as time management. For this reason, faculty are asked to observe another section of EAS107P taught by a more experienced instructor. The preferred method is to have faculty sit in on a section of EAS107P to observe the class the semester prior to their teaching the course. Typically, faculty are given release time (assigned credits) to do this with the understanding that they will teach the course the following semester or academic year. However, for all other first time faculty, including newly hired faculty or adjunct professors, the model used is to have the faculty member observe a class during the semester in which they are teaching. Observing the class gives a first time faculty member a better idea of how to manage time needed to complete the hands-on-activities, potential problems that may arise during the activities, and whether more time needs to be allotted for explaining certain concepts. If schedule conflicts prevent a first time instructor from observing a class prior to his/her section, an experienced faculty member will attend classes to assist a first-time instructor.

Faculty collaboration plays a pivotal role in ensuring consistency among all sections of EAS107P throughout the semester. Group meetings with all faculty teaching the class are used to troubleshoot any problems that arise. Both formal and informal meetings allow faculty to communicate their concerns and help track the progress of each section. In addition, these meetings provide a forum whereby faculty from the various engineering disciplines teaching the course can share their experiences and ideas, often resulting in improvements and innovations in the projects.

Another method used to ensure consistency among multiple sections of EAS107P is the use of a common course management system for posting course materials. The system used at the University of New Haven is BlackBoard. All materials for the course including lecture notes, assignments, project materials and announcements are posted on a single BlackBoard site accessible to students from all sections. This allows all students and faculty to access the same materials for the course. Although the course coordinator posts all course materials, announcements can be posted by any of the faculty. The BlackBoard system also allows for the creation of groups to facilitate communication with individual course sections when needed.

Resource Management

As aforementioned, classes that use an active learning environment such as EAS107P typically require careful management of classroom time. To assist in the management of classroom time as well as the resources needed for this project-based course, undergraduate teaching assistants are used in the classroom. Each section of EAS107P is assigned 1 or 2 TAs, depending on the size of the class and availability of the TAs. Typically, TAs are recruited during the spring semester for the following academic year.

The primary responsibilities of the undergraduate TAs are to assistant the instructor in the classroom and maintain equipment used for the projects. TAs can also help the instructor answer questions raised by students while completing a project or solving in-class problems. This is particularly important when students are learning how to use software. In addition, each TA is responsible for at least 1 hour outside scheduled class time to assist students with projects or answer questions.

With multiple sections of a course, maintaining equipment and organizing supplies for the projects is necessary for the course to run properly. Each TA works with the coordinator to ensure that the equipment for a particular project is functioning properly, and that their particular section has the supplies needed to perform the project. During the fall 2008 semester, TAs kept a single log book to record their activity for other TAs to see. The coordinator would purchase supplies for the course, but the TAs would assist in organizing the materials for each section.

Assessment of Academic Consistency

To determine whether the proposed model used to manage EAS107P resulted in academic consistency between sections, the final grades for the course were compared. Only data for the 2007-08 and present academic year were used since the course coordinator was first introduced during the fall 2007 semester. Summarized in Table 2 are the average final grades for each section. During the 2007-08 academic year, the average final grades across all sections varied

Table 2: Average Final Grades for 2007-08 Academic Year and Fall 2008 Semester

2007-08 Academic Year		Fall 2008 Semester	
Section Number	Average Final Grade	Section Number	Average Final Grade
1	3.0	1	3.1
2	3.4	3	3.4
3	3.4	4	3.4
50	3.1	5	3.3
S1	3.0	50	3.3
S1: Spring 2008 Semester			

from 3.0 to 3.4. In comparison, the average final grades across all sections ranged from 3.1 – 3.4 during the fall 2008 semester.

To test whether differences in the average grades are statistically significant, SPSS was used to perform an one-way ANOVA analysis using first the data for the 2007-08 academic year, and then the fall 2008 data. A one-way ANOVA was used to determine whether there are differences across the sections in relation to final grades. A significance level of 0.05 or less, $p < 0.05$, would mean that the value of the average grade in one section is statistically different than the average grade for all other sections, given a 95% confidence interval. For the 2007-08 data, the resultant significance level was 0.30 and for the 2008 data, the significance level was 0.59. Thus, for both years, the results seem to support the assertion that the average final grades are the same and thus, there is consistency across sections.

Pair-wise comparisons between sections during a particular year were then determined using a Tukey Multiple Comparison test. Summarized in Tables 3 and 4 are the resultant significance levels from each test for the 2007-08 and fall 2008 semester data, respectively. For the 2007-08

Table 3: Significance Levels from Tukey Multiple Comparison Tests for 2007-08 Academic Year Data

Academic Year: 2007 – 2008					
	Section Number				
Section Number	1	2	3	50	S1
1	--------	0.596	0.515	0.998	1
2	0.596	--------	0.999	0.827	0.598
3	0.515	0.999	--------	0.751	0.515
50	0.998	0.827	0.751	--------	0.999
S1	1	0.598	0.515	0.999	--------
S1: Section 1, Spring 2008					

Table 4: Significance Levels from Tukey Multiple Comparison Tests for Fall 2008 Data

Fall 2008					
	Section Number				
Section Number	1	3	4	5	50
1	--------	0.743	0.518	0.946	0.84
3	0.743	--------	0.994	0.99	1
4	0.518	0.994	--------	0.911	0.997
5	0.946	0.99	0.911	--------	0.994
50	0.84	1	0.997	0.994	--------

data, the p-value varied from a low of 0.515 to 0.999 with an average of 0.78. Based on the fall

2008 data, the p-values were similar with only the comparison between sections 1 and 4 resulting in a p-value of 0.518 with an average of 0.89. The 2007-08 results show 4 different comparisons that yielded p-values between 0.5 and 0.6. Regardless, large p-values indicate consistency in the average final grades between the sections.

During the fall 2008 semester, 5 different instructors taught 6 sections of EAS107P. The background of the instructors teaching these sections is summarized in Table 5. As shown in the table, two of the instructors taught the course for the first time; one was a newly hired, tenure-track faculty member and the other a newly hired adjunct professor. One of the faculty taught the course a couple of times, and the other two had significant experience (>= 4 years) teaching EAS107P. This diverse group of faculty had expertise in various engineering disciplines. Even with this diversity, the average final grades for each section were quite consistent across sections.

Table 5: Background of Instructors Teaching EAS107P

Fall 2008 Instructors				
Section Number	Instructor	Faculty Status	Engineering Discipline	No. of Times Previously Taught EAS107P
1	A	Adjunct	Chemical/ Materials	0
2	B	Full Prof.	Mechanical	2
3	C	Assoc. Prof.	Civil	5
4	D	New, Tenure-Track	Systems	0
5	E	Full Prof.	Mechanical	4
50	D	New, Tenure-Track	Systems	0

In addition to average final grades in EAS107P, on-line course evaluations from the fall 2008 semester were used to determine whether the outcomes were achieved across the sections. Students were asked to rate the usefulness of the course, not their own performance, in helping them achieve the following stated outcomes:

1. Demonstrate an understanding of the common and unique attributes of the major engineering disciplines (Civil, Mechanical, Electrical, Industrial, Chemical and Computer Engineering);
2. Understand and demonstrate the attributes of an effective team member;
3. Be able to communicate technical information with engineering graphics, drawings and written documents;

4. Understand the engineering design process as applied to multidisciplinary projects;
5. Demonstrate a basic understanding of engineering concepts in Material Balances, Electrical Circuits, Thermodynamics & Fluids, Mechanics, and Systems;
6. Have a basic understanding of engineering terminology (eg. stress, strain, load, safety factor, etc..).

A 6 point Likert scale was used in the evaluation. Summarized in Table 6 is the percentage of students rating each outcome as Very Useful or Useful in each section. Because of the small number of responses per section, these values are significantly influenced by an individual student's response. For checking consistency of the course sections in addressing the outcomes, a ranking was established for each section to show which outcomes the students thought were addressed well and which were not addressed well. Table 7 shows these results, with color coding to show grouped rankings which differed by one student's response. In 4 out of 5 sections, outcome 5 was rated among the lowest and outcomes 1 and 2 were rated highest. This indicates a fairly high level of consistency in how the various sections addressed the course outcomes.

Table 6: Student Assessment of Course Usefulness in Achieving Outcomes

Student Assessment of Course Usefulness in Achieving Outcomes - % Useful or Very Useful							
		1	2	3	4	5	6
Section Number	Outcome Responses	Engng. Disciplines	Teamwork	Communication	Design Process	Engng. Concepts	Terminology
1	7	100	100	100	100	85.8	71.4
3	19	84.1	73.7	74.5	73.7	78.9	78.9
4	16	100	93.8	87.5	93.7	75	81
5	11	82.4	100	70.6	94.2	52.8	82.4
50	11	90.9	100	100	81.8	63.6	81.8

Table 7: Ranking of Outcomes by Students

Ranking of Outcomes by Students					
Section	1	3	4	5	50
Most Useful	1	1	1	2	2
	2	5	2	4	3
	3	6	4	1	1
	4	3	3	6	4
Least Useful	5	2	6	3	6
	6	4	5	5	5

It should be noted that the course coordinator will use this data to follow up on improving the methods used to address outcome 5. Such feedback mechanism is part of the course coordination mode.

Feedback from instructors in second semester courses as well as sophomore level courses has provided valuable input for helping us to assess whether course objectives are met in EAS107P. Program assessment meetings held during the summers of 2006 and 2007 focused on evaluating the course outcomes for the first year EAS courses. Input was sought from faculty teaching the next course in the spiral curriculum, EAS112 Engineering Analysis, taken by students during their second semester. Feedback received from the EAS112 instructors indicated a need for additional quantitative work in EAS107P. Thus, additional homework problems in statics and electrical circuits were added to the structural system and fuel cell modules in EAS107P during the fall 2007 semester to better prepare the students for EAS112. In-class quizzes on the readings were added during the fall 2008 semester based on observations from instructors in EAS107P along with sophomore-level courses.

Conclusions

EAS107P continues to evolve as feedback provided by students and instructors from the previous academic year serves to improve the course, both its delivery and content. We have found that faculty collaboration and assigning a coordinator for the course has helped to ensure that academic consistency is maintained for all sections. The somewhat larger average value of the p-statistic for the more recent offerings of the course appears to indicate that the coordination is achieving a high level of consistency across sections. Given the introduction of two new instructors in the fall 2008 term, such a high level of consistency in final grades was not expected.

Future work will include a finer level of detail in checking consistency, such as grades on particular projects, quizzes and the final exam. An attempt will also be made to check for inherent differences in student ability among the sections. However, given the natural variations expected, we believe that the approach used here has allowed us to provide a consistent experience in the course while using the diverse talents of instructors with very different backgrounds.

Considering that one goal of the curriculum is to help students develop a multidisciplinary perspective, we feel strongly that a multidisciplinary set of instructors contributes greatly to this goal and would recommend a similar approach to others.

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