Redesign of an Introduction to Mechanical Engineering Course to Keep Students Engaged and Interested

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Abstract

An Introduction to Mechanical Engineering course is redesigned by integrating activities that involve experimentation, exploration, analysis, and discovery. The course includes a brief introduction of principal subject areas in the major and basic training with select software tools. Technical subjects are supplemented by presenting and discussing other important topics including engineering ethics. Behaviors that promote future success such as class attendance along with teamwork, communication, and other soft skills are emphasized. Students are given group and individual assignments, all of which are graded and returned with additional feedback. Besides providing a detailed overview of the course, the observations made and lessons learned from teaching the redesigned course for one semester are presented and discussed.

Introduction

Over the past three decades, many undergraduate engineering programs have sought to introduce students to their chosen disciplines as early as possible, e.g., first semester of first year. There are many reasons for this growing trend. The principal motivation is usually to keep students engaged and interested in their selected majors with the long-term goal of improving both retention and graduation rates [1-3].

A limited survey of the related literature shows that a variety of approaches has been considered in different engineering disciplines such as Aerospace Engineering [1], Chemical and Environmental Engineering [4] and Mechanical Engineering [5], as well as courses devoted to general introduction to engineering [6]. The formats of these introductory courses vary from program to program. In some cases, either a single one-hour seminar style course [7] or an extended three-credit course is used [8], whereas in others, the introductory contents are stretched over two or three courses [1]. Most involve some combination of lectures and hands-on activities, with the latter often done in a laboratory setting [9]. Others involve introduction to the engineering design process and/or associated challenges [4], [10], [11]. This literature review is by no means comprehensive, but it highlights the importance placed on the first-year experiences in many engineering programs.

There are several factors that can make these introductory courses challenging to design and deliver. Besides the fact that most students in these courses have just started college and are beginning to get acclimated to the new college environment, they are often placed in a class with a population that is considerably larger than those they previously experienced in high school.

Large sections are usually inevitable due to faculty constraints and increasing enrollments. In many cases, the laboratory spaces cannot accommodate a large number of students. Coupled with other factors, the choices are often narrowed to keeping students in a typical lecture-format classroom with all activities designed for implementation in the same location.

The Introduction to Mechanical Engineering (MEE 101) course at the University of Maine was first introduced in the 2003-2004 academic year. Prior to that, GEE 101 - Introduction to Engineering Design was used to introduce the students to the major, the faculty and the department in addition to discussing typical mechanical engineering problems and the importance of teamwork skills [12]. Over time, MEE 101 evolved to include some limited hands-on activities. As a consequence of growing enrollment, two sections of this course have recently been offered in the fall semester with an average enrollment per section that has grown to over 50 students.

In the fall 2017, through a clean slate approach, the course goal was revised to give students a broad understanding of the field of mechanical engineering through active participation in analysis, experimentation, exploration, and discovery. Together with a brief introduction of principal subject areas in the major (e.g., solid mechanics, fluids, and thermodynamics), select software tools (e.g., Excel and Mathematica) were introduced. Teamwork and analytical skills were enhanced through assignments and in-class activities.

A detailed overview of the course redesign, challenges faced, and lessons learned after teaching the redesigned course for one semester (Fall 2017) is presented. Guided by the feedback from the students and the experience teaching the redesigned course, additional steps are envisioned to continue to improve the effectiveness of this course in the future.

Course description

MEE 101 is a one credit-hour course with one contact hour (i.e., 50 minutes) per week. The course is required for all mechanical engineering students. Transfer students who have had a similar course elsewhere are exempt. The instructional objectives and learning outcomes of the course are listed in Table 1.

Table 1. Instructional objectives and learning outcomes

Instructional Objectives:	
1.	Introduce students to general concepts in mechanical engineering.
2.	Teach a variety of basic computer skills for engineering students.
Learning Outcomes: By the end of this course, students will be able to	
1.	Attain a better understanding of Mechanical Engineering discipline.
2.	Perform simple engineering analysis and physical experiments.
3.	Use Excel or Mathematica to produce graphs and charts describing various measurement or calculation results.
4.	Produce informative presentation materials using PowerPoint.
5.	Write short engineering reports using Word.

A brief list of topics discussed on a weekly basis is shown in Table 2. More details about the associated activities are provided in the next section. It is important to note that in some class periods one or more topics are discussed depending on the time, resources, and activities required. The scope of activities in Table 2 is described in terms of the four key areas: Exploration, Discovery, Experimentation, and Analysis. Exploration pertains to the subjects that students are introduced to for the first time (or with minimal prior familiarity), such as engineering materials, and through additional research as part of a class assignment, students discover why certain materials (based on their engineering and physical properties) are used for particular products. Experimentation may involve testing a physical model or performing a computer simulation (i.e., computer experiment) with students having the ability to measure the effects of various design parameters on a quantity of interest. Analysis implies the use of mathematical equations to predict a physical response, e.g., tip deflection of a cantilevered beam under a given loading condition.

There are certainly some similarities with approaches used in other introductory mechanical engineering courses. For example, Rabb et al. [13] combined both lecture and hands-on activities, and noticed a high degree of student satisfaction with the approach.

Table 2. Weekly course schedule and topics covered

Week	Topic	Scope of Activities
1	Intro to Mechanical Engineering and the Department	Exploration and Discovery
2	Introduction to Engineering Materials	Exploration and Discovery
3	Software Tools	Exploration and Analysis
4	Structural Mechanics: Beam Deflection	Experimentation and Analysis
5	Student Organizations & Clubs; Internship Opportunities	Discovery
6	Design Via Geometry Adjustment	Experimentation and Analysis
7	Research Seminar by Faculty; Library Resources	Exploration and Discovery
8	Mechanisms and Machines	Exploration, Experimentation, and Analysis
9	Engineering Ethics	Discovery
10	Tour of Advanced Structures and Composites Center and Wind Turbine Testing	Exploration, Experimentation, and Analysis
11	Thermodynamics and Heat Transfer	Exploration, Experimentation, and Analysis
12	Fluid Mechanics	Exploration and Analysis
13	Introduction to Manufacturing and Tour of Advanced Manufacturing Center	Exploration and Discovery

This is a pass/fail course with possible course grades of Pass (Avg ≥ 80%), Low Pass (60% ≤ Avg < 80%), and Fail (Avg < 60%). Each student's grade is determined based on assignments (80%) along with attendance and active classroom participation (20%). Class attendance is checked in every class with considerable penalty for unexcused absences. The course was taught in two separate sections by two instructors.

Summary of activities

The weekly activities listed in Table 2 are described in more detail in this section.

Week 1 - A presentation was given to introduce students to mechanical engineering as a discipline and the numerous career opportunities in the field. Students were also introduced to the Department of Mechanical Engineering, including faculty members, research areas, the curriculum, minors, advising resources, student clubs, and previous Capstone projects. The associated assignment asked students to write a short report (using Word) in which they (1) explain their choice of ME as a major, (2) select a sector/industry they are most interested in pursuing as a career, and (3) select the research area (under a current faculty member) that most interests them. They were required to provide their references using the ASME Citation Guide.

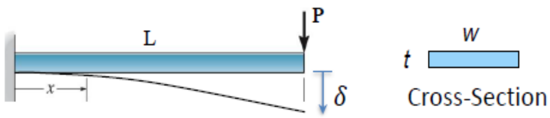
Week 2 - A 25-minute presentation covered the basics of engineering materials aimed at answering the question: *How do we select the Right material for the product of interest*? A three-step process was introduced. Step 1 dealt with product analysis based on function, operating conditions, cost, service life, risk of failure, and recyclability of a product. Step 2 examined the required material properties (strength, stiffness, density, etc.), whereas Step 3 focused on the identification and evaluation of candidate materials. After forming groups of three for a team activity, the students first selected one of the following products: car brake disk, ship propeller, traffic light pole, cell phone shell, elevator cable, and mower blade. Next, they followed the three-step process and chose a material they concluded was most suitable for their product of interest. Finally, each group prepared a short PowerPoint presentation—using a provided template—to describe their work. This work was started in class and finished outside of class. Due to time limitations, the students submitted their slides for grading, but did not present them.

Week 3 - The students were introduced to Excel and Mathematica. Several basic operations in Excel were demonstrated on the projector screen while the students replicated the steps on their own laptops. Due to the large number of students, a graduate teaching assistant and two junior-level undergraduates assisted the instructor in answering individual questions around the room. The second half of the period was devoted to Mathematica. Several basic Mathematica operations/functions were introduced while the students to follow along on their own laptops. An Excel and Mathematica "Tips and Tutorials" handout was given to the students for their reference. The associated assignment consisted of both Excel and Mathematica parts, and required the students to perform many of the operations covered in class.

Week 4 - A brief presentation was given on structural mechanics, with a focus on beam deflections. After forming groups of three or four, the students performed cantilevered beam tip deflection measurements. Each group tested four beams consisting of a "baseline" beam, one beam of a different material, one beam of a different thickness, and one beam of a different length (Fig. 1). Due to time limitations, each group applied only one weight to each beam. In the associated assignment, each student used Excel to calculate the theoretical tip deflections for each of the four beams for four different applied weights. The students used their experimental measurements to validate the theoretical calculations they had to perform in Excel using the analytical approach described in the lecture (Fig. 2). They submitted printed copies of their completed Excel worksheets for their assignment.

Week 5 - Representatives from several engineering student organizations, including ASME, AIAA, 3-D Printing Club, and Engineers Without Borders gave brief presentations in an effort to spark the students' interest and encourage them to join their organizations. In addition, a presentation was given by the College of Engineering Internship Coordinator on internships/coops and job fairs. For the associated assignment, each student wrote an "aspirational resume" that they would hope to represent their accomplishments close to the time of graduation. Resume assignments have been used elsewhere; for example, in [14], a resume-creation assignment (not aspirational) was assigned in order to make the students think about "Where am I now? And where do I want to be when I graduate?" However, the aspirational resume assignment developed in MEE 101 was designed to encourage the freshmen to set clear and ambitious goals that, in addition to boasting a high GPA, included an internship or coop experience and potentially an undergraduate research activity.

Beam Bending Exercise: Prediction & Validation



Deflection Equation: $\delta = \dfrac{PL^3}{3EI}$

1. Using the deflection equation, predict the tip deflection (cm) for the four beams defined in the table below when hanging a mass of 50, 103, 150, and 200 g at the tip.

Example: $\mathbf{P} = \text{weight} = mg = \left(\frac{103}{1000}\,\text{kg}\right)\left(9.81\,\frac{\text{m}}{\text{s}^2}\right) = \_\_\_\_\_\_\_\_\ \text{N}$

Material	Young's Modulus, *E* (Pa) = (N/m²)	Length, *L* (cm)	Nominal Thickness, *t* (in)	Nominal Width, *w* (in)
Low-Carbon Steel	2.00×10^{11}	45	1/16	1/2
Aluminum Alloy 6061	6.90×10^{10}	45	1/16	1/2
Aluminum Alloy 6061	6.90×10^{10}	45	3/32	1/2
Aluminum Alloy 6061	6.90×10^{10}	30	1/16	1/2

2. Experimentally measure the tip deflections of the beam samples (for an applied mass of 103 g), and compare with the predicted values.

Figure 1. "Beam Bending Exercise" summary.

Assignment #4 Template: Do not modify the cells with bold red text. Complete the highlighted cells. Enter your name:

	Young's Modulus, E (N/m²)
Steel	
Aluminum	

	Beam Nickname: "*Steel*" Material: Low-Carbon Steel Nominal Thickness: 1/16 in Nominal Width: 1/2 in Length: 45 cm				Beam Nickname: "*Alum*" Material: Aluminum Alloy 6061 Nominal Thickness: 1/16 in Nominal Width: 1/2 in Length: 45 cm				Beam Nickname: "*Alum - thicker*" Material: Aluminum Alloy 6061 Nominal Thickness: 3/32 in Nominal Width: 1/2 in Length: 45 cm				Beam Nickname: "*Alum - shorter*" Material: Aluminum Alloy 6061 Nominal Thickness: 1/16 in Nominal Width: 1/2 in Length: 30 cm			
Mass applied (g)	50	103	150	200	50	103	150	200	50	103	150	200	50	103	150	200
Weight applied (N)																
Length (cm)																
Length (m)																
Thickness (in)																
Thickness (m)																
Width (in)																
Width (m)																
Moment of Inertia (m⁴)																
Young's Modulus (N/m²)																
Theoretical Deflection (m)																
Theoretical Deflection (cm)																
Tip height before loading (cm)																
Tip height after loading (cm)																
Measured Deflection (cm)																
% Error																

Describe any possible sources of error that may contribute to a difference between the measured and calculated deflections.	Type your answer here.
Describe the effect of Young's Modulus on deflection (refer to theory and/or your experimental data):	Type your answer here.
Describe the effect of beam thickness on deflection (refer to theory and/or your experimental data):	Type your answer here.
Describe the effect of beam length on deflection (refer to theory and/or your experimental data):	Type your answer here.

Figure 2. Excel template for cantilevered beam tip deflection calculations and data analysis. Students complete the yellow cells by entering data or necessary formulas.

Week 6 - A presentation introduced the students to design of experiments and basic statistics with application to the autorotation optimization of a falling helicopter. In groups of four, the students designed and conducted experiments with "paper helicopters" [15-17] to determine the optimum helicopter body and rotor dimensions to maximize the drop time (Fig. 3) from a predetermined height. In the associated assignment, the students used Excel to calculate the theoretical drop time for each helicopter and compared them to their experimental results while addressing random variability and sources of error in their experiments.

Figure 3. Students conducting paper helicopter drop experiments.

Week 7 - A brief research seminar was given by a Mechanical Engineering faculty member to give the students an idea of the type of research conducted by our faculty, and to generate some excitement and interest in undergraduate research. In addition, a brief presentation was given on library resources by the Science and Engineering Librarian from the university library.

Week 8 - A brief presentation was given on mechanisms and machines, including gears, gear trains, chain drives, pulleys and cables, and four-bar linkages. The presentation included demonstration of a website featuring animated simulations of various types of four-bar linkages (e.g., crank-crank, crank-rocker, rocker-rocker) with several real-world examples [18]. The first part of the associated assignment required the students to design specific types of four-bar linkages by adjusting the lengths of the links and seeing their effect using this same website. For the second part of the assignment, students were given a partially completed Mathematica notebook, and were asked to complete it by solving the equations of equilibrium given to them for an automobile suspension system. They could use as reference the Mathematica examples provided to them in Week 3.

Week 9 - A brief presentation was given on engineering ethics. The code of ethics of the National Society of Professional Engineers (NSPE), the university's Student Conduct Code, and the Seven-Step Rubric for analyzing ethical situations [19] were presented. Short videos of two case studies were also shown. After each case study video, the students formed groups of four for a discussion. They were asked to put themselves "in the shoes" of one of the characters, apply the Seven-Step Rubric and refer to the NSPE Code of Ethics or the Student Conduct Code. In the associated assignment, using the same methods, each student analyzed four additional ethics case studies and submitted a short report written in Word.

Week 10 - Students toured the Advanced Structures and Composites Center located on campus. They were able to see and learn about numerous ongoing research projects. They also witnessed the testing of a scaled model of a wind turbine mounted on a floating offshore platform in the ocean engineering laboratory. In the associated assignment, they were given real data collected from a similar experiment, and tasked with generating multiple graphs with the data, in order to expand their Excel skillset while gaining better appreciation of engineering experiments.

Week 11 - A brief presentation was given on the basics of thermodynamics and heat transfer, with a particular emphasis on heat transfer from finned surfaces (Fig. 4). In the associated assignment, students used a Mathematica Demonstration [20] to study the effects of air temperature, fin type (rectangular or pin), fin length, and fin material on the heat transfer rate to a stream of air at fixed velocity. They generated multiple graphs in Excel to show the effect of each parameter on the heat transfer rate, and produced a Word report on their findings. In this assignment, they learned several critical skills, including how to insert an equation, graphs, and a table into a Word document, as well as how to format captions for figures and tables.

Assignment #10: Simulating a finned surface cooled by air flow

Fixed:

- Base temperature (500K)
- Fin thickness/diam. (1.5 mm)
- Air velocity (1 m/s)

Variables:

- Air Temperature
  - 250-350 K
- Fin Type
  - Rectangular, Pin
- Fin Length
  - 5-20 mm
- Fin Material:

Material	Thermal Conductivity (W/m*K)
Stainless Steel	14
Carbon Steel	60.5
Iron	80.2
Brass	110
Aluminum	237
Copper	401

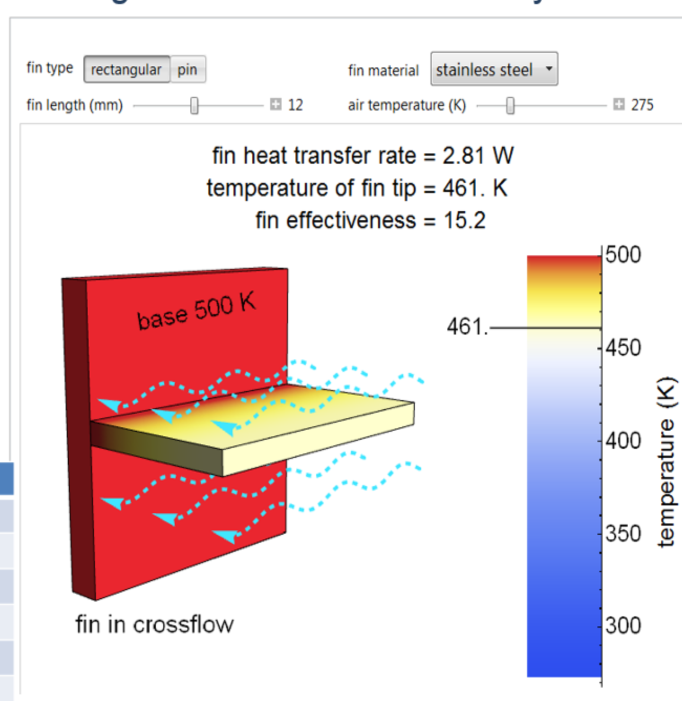
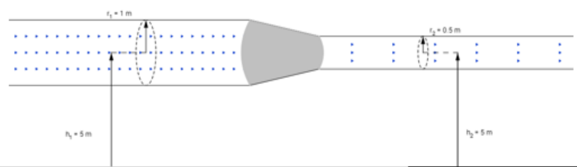


Figure 4. Assignment involving the simulation of heat transfer from a finned surface.

Week 12 - A brief presentation was given on fluid mechanics, with a particular emphasis on conservation of mass and Bernoulli's equations, including various real-world examples. In the associated assignment (Fig. 5), students analyzed the flow of water through a piping system, and generated a graph showing the effect of outlet pipe radius on the outlet velocity and pressure, using the aforementioned principles and equations. In addition, the students learned how to plot data on both primary and secondary vertical axes using Excel.

Assignment #11: Exploring Continuity and Bernoulli's Equations

Determine the effect of the outlet pipe radius on the outlet velocity and pressure of water flowing through a pipe system.



Assignment #11		Enter your name here:	
Density of Water: 1000 kg/m^3			
h1 = h2 = 5 m			
v1 = 3 m/s			
P1 = 6 x 10^5 Pa			
r1 = 1 m			
	Use Continuity Eq.	Use Bernoulli's Eq.	Use r2, v2 and water density
r2 (m)	v2 (m/s)	P2 (Pa)	m_dot (kg/s)
Outlet Pipe Radius	Outlet Velocity	Outlet Pressure	Mass Flow Rate
0.50			
0.55			
0.60			
0.65			
0.70			
0.75			
0.80			
0.85			
0.90			
0.95			
1.00			

Figure 5. Fluid mechanics assignment involving the analysis of water flow through a pipe system. Students complete the yellow cells in the Excel table by entering formulas.

Week 13 - Students toured the Advanced Manufacturing Center located on campus. They were able to see and learn about several manufacturing technologies and techniques, including wire EDM, 3-D Scanning and Printing, CNC Mill, and CNC Lathe. Prior to the tour, students were provided with several informational videos on each technique and a handout describing a dozen different manufacturing processes (e.g., casting, forging, milling, chemical milling, roll forming).

Observations made and lessons learned

The major challenges experienced in teaching the redesigned MEE 101 course for one semester (Fall 2017) included the following:

- The relatively large student enrollment (two sections of about 50-60 students each) limited student-faculty interactions in each class. A similar problem was discussed in [21] where the total enrollment was about 200 students, but the challenge was resolved by assigning the course to six faculty members. Durfee [22] encountered the same issue for a project-oriented introduction to engineering course sequence taught in two quarters.

- The short contact time (50 minutes/week) posed a challenge in limiting the coverage of each topic to only a single lecture period while combining an introductory lecture with hands-on activities. A similar issue faced the faculty in [23]; however, their course was based on a design approach.
- Implementation of hands-on activities inside a lecture classroom environment was challenging and inevitable due to the inability to use laboratory space due to high enrollment.
- Mathematica proved to be more challenging for the students than Excel. Although the brief introduction was meant to help students overcome their "fear factor" by learning the basic operations of a powerful mathematical software, some students experienced difficulty with the syntax, which often led to frustration in not being able to perform the intended analysis.

In light of the challenges noted above, the hands-on activities were positively received by the students. They were generally enthusiastic and worked well together in the group activities.

The lectures were designed to spark the students' interest while being as brief, simple, and accessible to the students as possible. The numerous in-class questions and the overall quality of the students' submitted work indicate that they were able to gain good general understanding of the materials covered. The improvement in the quality of students' work between the first and later assignments involving software tools also was a notable positive point.

In their very first assignment, as described earlier, students had the opportunity to express their interest in faculty research. By connecting each faculty member with their group of interested students, some students were able to begin participating in research meetings and related activities. As such, this assignment can be considered a success, and it is expected that the students' exploration of the faculty research areas will lead to even more collaborations in the coming years.

Following the introduction of student organizations, many students sought membership. Active participation in these student groups will accelerate the students' professional growth and often provide critical networking opportunities and benefits for their future careers.

Students enjoyed the tours of the research centers. By asking questions and learning more about the research projects and student internship opportunities, some submitted applications for work opportunities. It is never too early for students to start considering internships which are vital for their professional and educational development.

The students generally had little trouble with Word and PowerPoint, but many students struggled initially with Excel and Mathematica.

The students were generally familiar with PowerPoint (PP) which was reflected through their assignment results using this software. The first PP task was assigned using a set template provided to the students. The most common source of grade penalty was failure to use/follow the assigned template. This might seem a minor issue, but the students were admonished that the value of following the explicit instructions should not be underestimated in the success in Engineering College or any other career path.

Most students had previous experience using Word. However, it is essential to note that most students were already accustomed to using Word for the sole purpose of typing normal text (e.g., for an English or History course). One of the main purposes of the Heat Transfer report-style assignment was for the students to learn critical skills for technical writing. In addition to the using Excel to generate plots, the students were given the chance to learn (instructions were explained step-by-step) how to write a technical report using Word, including how to insert a table, an equation, figures, and captions. Students did not have any problem with the report style except with some minor issues that can be corrected in the future by the student on their own as they gain experience in this field. Technical writing will be a major part of their college career and even later on in their pursued professional careers.

Few students had prior experience with Excel. Accordingly, several assignments were designed to implement Excel, along with other objectives, to advance student abilities using this software. Some students initially thought of Excel simply as a program for data entry. It was important to underline the importance of Excel as an independent tool for calculating, plotting and representing data. After the first or second Excel assignment, these students started realizing the power of this software rather than seeing it as merely a table for data entry which in turn can be done using Word. Excel skills will be highly valuable in their future courses, particularly in their laboratory courses. The students have been warned about the limited plotting abilities that Excel has and the importance of learning how to use a mathematical tool such as Mathematica.

Finally, yet importantly, Mathematica was a major source of frustration for the freshmen. Only two out of the 100+ students claimed to have prior knowledge of Mathematica, but even these two did not have significant experience using it. It was a challenge to motivate students to learn this new tool. Although the importance of getting over the initial “fear factor” and learning from their mistakes was emphasized in class, the complex and sensitive syntax of Mathematica presented challenges to many students. Few of the students had prior programming experiences, fewer took calculus-oriented courses to start appreciating the real mathematical power of this tool and even fewer (if any) had ever used mathematical packages before. Step-by-step instructions and repeated use of the tool (in three assignments) eventually increased student comfort with Mathematica. Our hope is that this sets the cornerstone on which they can start building their own experience using this software which might prove very helpful in their other courses, especially for symbolic manipulation.

Common errors noted from students’ questions and in their assignment submissions:

- The capitalization at the beginning of each function or input in Mathematica caused frustration for many students who tried hard to catch errors in their work, but the error was often simply one missed capitalization.

- Clearing the variables, when necessary, had to be emphasized in class (especially at the beginning of the document in case the student runs the whole notebook instead of an independent block).
- Some syntaxes (such as Plot[..] or Plot3D[..]) were also sometimes a cause of frustration for some students due to often minor syntax errors, e.g., missing commas and inverting the syntax (x instead of y for example).
- The interchangeable use of brackets and parentheses was a common mistake as well. While Mathematica requires brackets after functions, most students are accustomed to using parentheses after functions such as in mathematics courses and in many computer software or programming languages.

Providing extra office hours, and step-by-step explanations in assignments helped some students overcome these difficulties. Sometimes the assignments were started in class to give the students an insight or a push to continue on their own, and this was also a helpful method for them. As described earlier, the Week 8 assignment involved a partially filled Mathematica notebook; students were asked to complete it to solve a set of equations. As expected, overall results for this assignment were significantly better than for the earlier Mathematica assignment; students generally appeared to become more comfortable performing simple operations in Mathematica as a result of this assignment. In the next iteration of the course, the instructors will consider using a partially filled notebook for the first Mathematica assignment.

Standard student evaluation forms were completed at the end of the semester (as for any other course at the University of Maine). The questions most relevant to this redesign effort, and the corresponding results, are as follows:

1) "How would you rate the subject matter of this course?" (5 = very interesting, 1 = uninteresting) obtained a mean of 4.17 with a standard deviation of 0.8 and a median of 4.

2) "How was the pace at which the materials were covered?" (5 = too fast, 1 = too slow) obtained a mean of 3.13 with a standard deviation of 0.41 and a median of 3.

3) "What is your overall rating of the course?" (5 = excellent, 1 = poor) obtained a mean of 4.03 with a standard deviation of 0.93 and a median of 4.

The course averages of 4.17 and 4.03 on questions (1) and (3), respectively, are significantly above the overall department averages of 3.98 and 3.85 for these questions. These indicate that students generally were satisfied with the course content and the course overall.

For question (2), concerning the pace at which materials were covered, a mean of 3.0 would be optimal. The average for this question was 3.13 (compared to the overall department average of 3.28). This question also had the lowest standard deviation (0.41). These results indicate that the pace should probably not be modified significantly in future offerings of this course.

Conclusions

The experience with redesigning an Introduction to Mechanical Engineering course and teaching it for one semester was presented. With the goal of keeping students engaged while introducing them to their selected major, weekly activities were designed to include elements of experimentation, exploration, analysis, and discovery. The one-hour per week classes, high enrollment, and various logistical constraints demanded that most activities, other than homework assignments, be performed either inside the classroom or at another location.

The end-of-semester evaluations indicated that the students were generally satisfied with the course. The two course instructors felt that although the topics covered gave students a reasonably good introduction to mechanical engineering, the limited contact period was a source of concern. A one-hour-per-week schedule, naturally does not leave ample time for extensive in-class (group or individual) activities. The course is really meant to give students a general flavor for the major with snippets of information about different courses in the undergraduate curriculum. Alternative options, such as expanding the weekly schedule to include a one-hour lecture plus a one or two-hour lab, are being considered along with other changes toward updating and modernizing the curriculum.

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