**Development of student motivation in a required Electrical Engineering (EE) course for non-EE majors**

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**Introduction**

- Students, who are required to take courses outside their fields of major, might lack motivation to learn and apply the material. This is a challenge for any instructor, and a loss for students who skip valuable learning.
- We investigate how student motivation develops in EECS 314 Electric circuits, Systems, and Applications – required course in Electrical Engineering (EE) for non-EE majors.
- This report includes quantitative and qualitative data collected in 4 surveys conducted during Fall 2013 semester.

**Working Hypotheses**

1. Non-EE engineering students who are taking a required EE course can develop interest in EE, become motivated and confident to apply EE to their fields of major.
2. Researchers can identify what teaching events and/or components of the course foster students’ interest and motivation.
3. Researchers can find out what parts of the course material the students see as valuable, applicable to their fields of engineering.

**Student Demographics**

- Fall 2013: 194 students; Winter 2014: 223 students.
- Students are from several different engineering majors and academic years.

**Course Structure**

EECS 314 Electric circuits, Systems, and Applications is a 4-credit, one-semester course, which includes:
- 3 hours of lectures (entire class), weekly
- 1 hour of discussion (4 sections, ~50 students each), weekly
- 2 hours of in-lab work (2 students per team; 9 teams per lab section); 8 projects during the semester, each includes pre-lab,-in-lab, and post-lab.
- Two midterms and a final exam, in multiple-choice format.

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**Theory of Motivation**

- Motivation is a concept with a wide variety of definitions across many different fields.
- We chose to use Ryan and Deci’s (2000) self-determination framework to examine the differences between intrinsic and extrinsic motivation.

**Preliminary Findings and Conclusions**

**Satisfaction and Interest in the Course**

- In their responses to the midterm survey (given ~2 months after the beginning of the 14-week semester) students reported high satisfaction and interest in the course material.
- The results from the final survey:
  - 79% non-EE students are satisfied with this course
  - Very satisfied: 11%
  - Satisfied: 59%
  - Neutral: 29%
  - Dissatisfied: 6%
  - Very dissatisfied: 2%
- Strongly agree: 10%
- Agree: 39%
- Neither agree nor disagree: 39%
- Disagree: 6%
- Strongly disagree: 0%

**Change in Interest, Motivation, and Applicability**

- In the final survey (after the last lecture, before the final exam) students report increase of interest, motivation, and confidence.
- 51% students reported increased interest in EE due to taking the required course.
- 62% non-EE students report increased motivation to apply EE to their fields.
- 79% non-EE students report increased confidence in applying EE to their fields.

**Satisfaction and Interest by Course Topic**

- Labs provide Most Positive Experiences and serve as Most influential Motivators
  - The results from the final survey:
    - Changes in interest and motivation for non-EE students in EE course
    - Labs are the most positive experience for non-EE students in EE course
    - Lab are the best motivator for students to learn EE and apply it to their fields

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**Further Research**

We plan to pursue the following goals:
1. Summative, including:
   a) Analyze the rich information already collected, using quantitative and qualitative techniques
   b) Verify whether the results reported here are reproducible/sustainable in future semesters.
2. Formative, including:
   a) Design of the course structure and assignments to foster students’ internal motivation, interest, and confidence
   b) Apply the methods, which have been successful in this course, to other courses for non-majors.

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