

Peer Efficacy Evaluation of ME4010 Students and Their Impact on Participating Elementary School Students

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Biography

Apurva, Steven, and Doug all graduated from Clemson University with a Bachelor's of Science Degree in Mechanical Engineering. Upon graduation, each joined the Clemson Engineering Design Applications and Research (CEDAR) Group. The CEDAR Group at Clemson focuses on complex engineering problems, ranging from product design and optimization to research on engineering design theory and development of new design tools. Apurva, Steven, and Doug have engineering experience with local partner companies such as BMW Manufacturing, Robert Bosch, Electrolux, and Itron.

Fall 2016 Design Team



L-R: Apurva,
Steven, & Doug

Overview:

This research aims to understand the change in perception of ME4010 students regarding their peers from a peer efficacy perspective. Additionally, the research also looks at the impact of ME4010 involvement on the elementary schools participating in the program. The data necessary for this evaluation is being collected using a survey tool. A paper survey was given to the ME4010 students, whereas the elementary school students were given a verbal survey where the responses were tallied by their respective teachers. A set of these surveys was conducted at the beginning of the Fall 2016 semester, and the same surveys are planned for the end of the semester as well. Once the results from both instances of the surveys are collected, they will be analyzed to evaluate the change in responses over the course of the semester.

Motivation

The primary motivation of conducting this research is to provide a better understanding on how the involvement of mechanical engineering senior design students affects elementary students' perspective on engineering. Moreover, how does this interaction in turn affect the senior design students with respect to their perception of their peers. This information will provide insight in developing more engaging and involved STEM curricula in K-12 education, as well as shine some light on whether the senior design experience renders the ME4010 students to change their outlook on their peers.

State of the Art

The current literature on this subject does not show any studies conducted to evaluate the change in students' perspectives over the semester. Work has been done to identify middle school students' perspective on engineering as a field [1], and to identify the student self-efficacy in a entrepreneurship class [2], however, there is a lack of research showing the effects of senior level undergraduate students working with elementary school students and teachers.

Intellectual Merit

This work addresses the following research questions:

- Does the interaction of ME 4010 students improve elementary school students' perspective on engineering as a career field?
- Does the senior design experience, coupled with interaction with elementary school students positively affect the ME 4010 students with regard to their perception of their peer?

These questions are important to answer because they provide an understanding of the growth on elementary school students due to the involvement of senior level undergraduate students.

Broader Impact

The broader impacts of this research should lead to a better understanding on what types of programs are beneficial for STEM students in cultivating excitement and respect for engineering as a career field. Additionally, the results will also shed some light on the change in perspective, regarding their peers and their capabilities, that senior design students undergo during the course of their first senior design semester. The results gained could potentially lead to changes in the curriculum to allow for more constructive interaction between the students.

Research Approach

This research will be conducted primarily using a survey. Two separate surveys are designed; one for ME4010 students and one for elementary school students. The survey for ME4010 students consists of 39 questions focused on peer efficacy, and their perceived impact of engineering. A 100mm line is used to collect the students' levels of agreement with the statements made in the survey. A Matlab based image processing script will be used to read the responses on this survey.

As for the survey for elementary school students, a short "yes or no" survey was developed with an additional free response question where the students could draw something they thought was engineering related. The data collected from these two surveys will be analyzed for its statistical relevance and for the purpose of identifying any patterns that may be found.

Findings to Date

Initial survey was completed; however, the data is currently being analyzed.

Conclusions

We anticipate that the involvement of ME4010 students will result in more positive outlook of STEM fields in elementary school students.

References

- [1] Paquette G. D., Bessette A., Patel D. N., and Morkos B. W., 2016, "EXPLORING THE USE OF REVERSE ENGINEERING AS A MEANS TO INTRODUCE ENGINEERING TO MIDDLE SCHOOL STUDENTS," *Proceedings of the ASME 2016 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*.
- [2] Zapata-ramos M. L., Perez-vargas M. J., and Lugo J. E., 2016, "PROMOTION OF INNOVATION AND ENTREPRENEURSHIP IN ENGINEERING," *Proceedings of the ASME 2016 International Design Engineering Technical Conferences and Computers and Information in Engineering*



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