THE EFFECTS OF CLASSROOM GENDER DYNAMICS ON ELEMENTARY LEVEL ENGINEERING EDUCATION

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Abstract – This work in progress is a study to examine the effect of gender dynamics in elementary level engineering education. Three experimental populations are created to investigate the impact gender has on attitude and performance in elementary aged students. Small groups in each population are required to design and build a contraption capable of meeting a defined set of requirements. To reinforce previous curriculum work, each group must utilize simple machines in their designs. Populations will be observed by educators and Tufts University GK-12 Graduate Fellows for motivation, self-determination, and overall interest in the project and classroom dynamics. This study will provide insight into appropriate gender make-up and structuring in the classroom to achieve successful integration of engineering concepts that male and female students can benefit from equally.

Index Terms – Engineering education, Elementary level, Gender effects,

INTRODUCTION

The effect of gender on education at all levels has been a topic of interest and research amongst the education community for some time. Mathematics, Science, and Technology have always been areas where female students perform below male students; this can be seen in the fact that men are five times more likely than women to choose engineering as their major in college. \(^1\) Creating classroom environments and curricula to combat these differences has obvious impacts on efficacy of engineering education at the K-12 level. Increasing the interest and participation of women in engineering requires strong foundations at early ages, thus applying these gender related questions to elementary age students offers insight into strategies and pedagogy for erasing the gender gap in science/engineering education.

The researching parties have extensive experience with hands-on engineering projects and have observed that male students tend to dominate these activities. Female students often become observers and have little to do with decision-making and construction of various projects. This leads to general decreased interest in females and thus the trend begins of women avoiding science and engineering.

THE STUDY

The proposed study examines the effect of gender make-up on classroom dynamics and performance in hands-on engineering activities. Students will undertake a design challenge working in small groups (3-4 students) to design and build simple machine contraptions to get a ball over a two-foot wall using the least amount of effort, measured in Newtons. They are required to use at least one simple machine to complete the task, and they must be able to identify the machine and the purpose for using it. The design challenge was worded with gender-neutral language, avoiding the use of such words as shoot or launch and references to sporting terminology. The project will be concluded with a creative writing exercise where each student will have to invent a scenario as to the reason for building a machine capable of carrying out such a task. This paper will give insight into varying ways of introducing activities to different genders to increase interest and participation.

TEST POPULATION

The test population consists of 73 students in 6th grade public school in Central Massachusetts. The population is divided into four classrooms: (1) mixed gender classroom with mixed gender groups (control group), (2) mixed gender classrooms with same gender groups, (3) an all female classroom, and (4) an all male classroom. Students will be observed for attitudes and aptitude for designing to meet constraints.

PRESENTATION OF RESULTS

The authors expect to witness four very different classroom atmospheres and present the findings based on observations of attitude and performance and make suggestions for improved classroom gender make-up for more effective engineering education.

REFERENCES