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Background

At a time when STEM fields are increasingly important to our society we need a more diverse group of scientists and engineers to improve our future. Right now the STEM careers and majors are lacking diversity. For example, 23% of STEM workers are women; however, women make up 48% of workers in all occupations (Hanewicz & Thackeray 2013). It is important to note that there are no performance differences between males and females, but females are failing to pursue STEM at the same rates as males. African American and Hispanic students are also taking significantly less courses in STEM than Caucasian and Asian students .

Introduction

WSU PREP is a three year summer program for 7th through 9th grade students. There is a three year curriculum that focuses on topics in STEM (science, technology, engineering, and math). The purposes of WSU PREP are to:

- Encourage diversity in STEM fields
- Provide a program to students that will help them better prepare for college.
- Promote knowledge and awareness of careers in STEM fields
- Help close the achievement gaps in STEM

Mindset

Students with a growth mindset are more likely to succeed in STEM and pursue STEM careers and majors. STEM courses often require a large amount of persistence and trial and error for success. A growth mindset can facilitate this success (Aschbacher and Roth 2009). One of the purposes of WSU PREP is to help students develop a growth mindset and realize that they can succeed in hard courses.

Methods

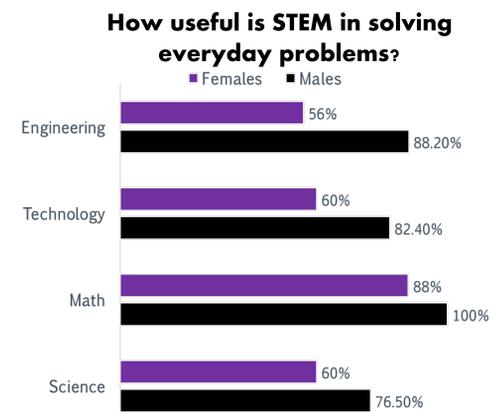
A survey was given to the students in the WSU PREP program. The survey included the following information:

- Demographics
- Usefulness of STEM
- Mindset
- Math and Science Identity
- Persistence in STEM

69 students participated in WSU PREP. 46 students provide consent for research; 42 students completed the survey.

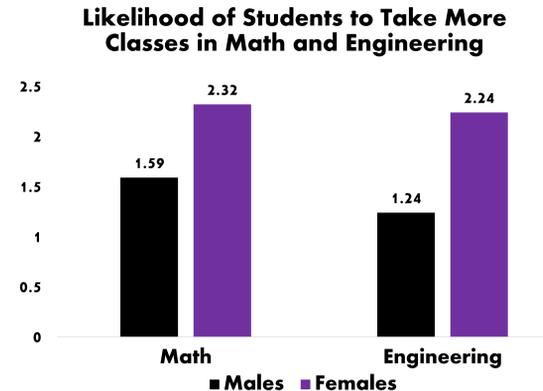
DATA

Figure 1A



Males were significantly more likely to report Engineering as very useful in solving everyday problems. For males **88.20 %** said engineering was very useful in solving everyday problems compared to only **56.00%** of females. $p=.043$, Cohen's $d=.7117$

Figure 1B



*A lower number correlates to a higher likelihood to take more classes.
An Independent samples t-test showed that males were significantly more likely than females to say they would take more math and engineering classes even if they didn't have to.
For Math $t= -2.47$, $p= 0.019$ with an effect size of $d= 0.72$
For Engineering $t=-2.91$, $p= 0.007$. With an effect size of $d= 0.84$

Figure 2

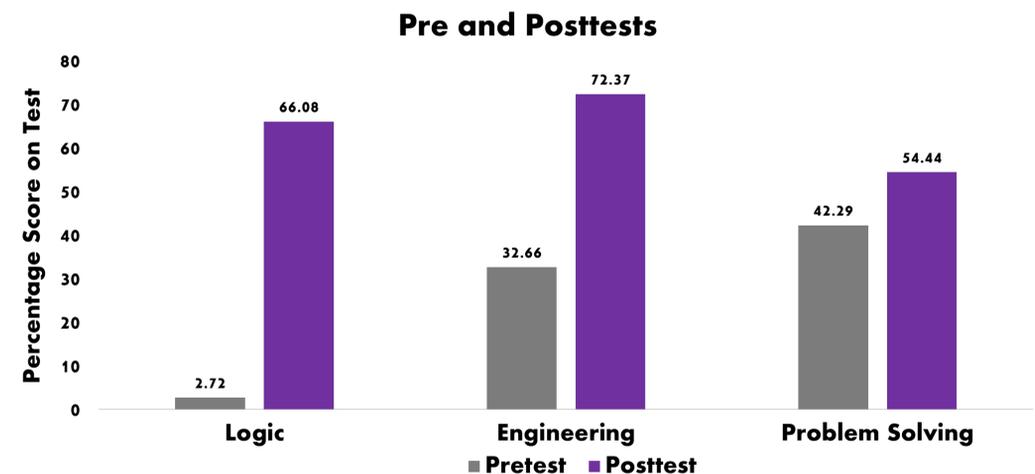
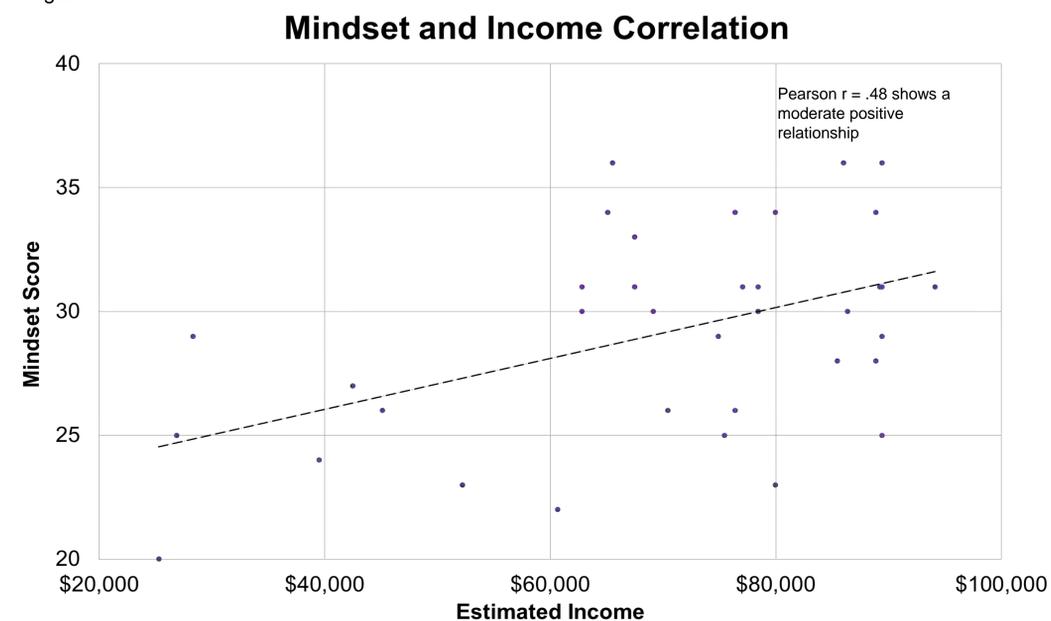


Figure 3



Results

A paired samples t-test was used to determine if student's pre and post test scores were significantly different (See Figure 2).

For the Logic test a significant difference was found in the pre and post test scores. For the pretest $M= 2.72\%$ $S.D.= 2.13$ and for the posttest $M= 66.08\%$ $S.D.=28.77$; $t= -15.17$, $p< 0.05$.

For the Engineering test a significant difference was found in the pre and post test scores. For the pretest $M= 32.66\%$ $S.D.=15.36\%$ and for the posttest $M= 72.37\%$ $S.D.=15.35\%$; $t=-13.69$, $p<0.05$.

For the Problem Solving test a significant difference was found in the pre and post test scores. For the pretest $M=42.29\%$ $S.D.=15.04\%$ and for the posttest $M= 54.44\%$ $S.D.=16.97\%$; $t=-5.134$, $p<0.05$.

Discussion

To summarize, our results showed and supported previous research that a gap in perception towards STEM exists between males and females. It is important to notice that we found no performance gaps between males and females, only perception gaps. We found that males were more likely than females to report that engineering is useful in everyday life. We also found that males were more likely than females to report they would take more classes in math and engineering even if they didn't have to.

We also found that SES may play a role in students mindsets and their perception of their abilities to learn new and difficult information (see Figure 3) (Hill and Rose 2010).

References

- Aschbacher, P. R., Li, E., & Roth, E. J. (2009). Is science me? High school students' identities, participation and aspirations in science, engineering, and medicine. *J. Res. Sci. Teach. Journal of Research in Science Teaching*. doi:10.1002/tea.20353
- Hanewicz, C., & Thackeray, S. (2013, June 6). Utah Women in STEM (Science, Technology, Engineering & Mathematics). Retrieved from <http://www.utahwomenandeducation.org/>
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