Social Networking In *FIRST* Robotics

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Abstract

FIRST Robotics has goals of encouraging interest in science and technology and increasing social networking skills amongst high school age students. Some of these goals can be unconsciously activated through mindset priming. However, the gender of the participant matters when looking at the behaviors evoked by the activation of an unconscious goal. One of the factors to consider about gender is stereotype threat, regarding the stereotype of females and STEM subjects. A survey with three instruction sets of primes (social, academic, and neutral control) was given to the participants at the beginning of the *FIRST* season. A second survey with only the neutral control mindset prime instruction set was given at the end of the *FIRST* season. Participants primed with the social focus socialized more toward the end of the *FIRST* season. Females reported having better social skills than males, but reported learning less than males at the end of the *FIRST* season.

Social Networking In FIRST Robotics

Introduction

Self esteem is "an individual's opinion of his or her own behavior and person" (Lefrançois, 1995, pg 623). Past research has been conducted on the importance of self esteem, such as the 1967 study conducted by Coopersmith (Lefrançois, 1995, pg 552). In his study, Coopersmith divided 85 boys into groups according to whether their self esteem was high or low. Results from the study showed that individuals with higher self esteem found it easier to make friends, were more outspoken, less sensitive to criticism, and less self conscious. Additional findings from Coopersmith's study indicated that there are close ties between self esteem and behavior. When an individual's self esteem was increased, his or her chances of success were also increased. Past research has found that social networking amongst a student's peer group is related to self esteem. According to La Greca and Stone (1993), "the quality of children's relationships with their peers is very important for their happiness and adjustment" (Lefrançois, 1995, pg 460). Given the importance of social networks on self esteem and adolescent development, this study will take a look at the effects of social networking within *FIRST* Robotics, a program for high school students who are interested in science and technology.

What is *FIRST*?

FIRST Robotics (*FIRST*) was founded in 1989 by Dean Kamen. *FIRST* brings students together to partake in a fun and fast-paced robotics competition. For six weeks, students design and build a robot using a general kit provided from *FIRST* and any other materials their team has in its possession. The robots are then sent to various competition sites around the nation, and the teams compete for the chance to compete in a championship competition. An integral goal that Kamen planned for the *FIRST* experience was the exposure of young adolescents to science and technology in order to ultimately encourage them to be leaders in these fields. To achieve this goal, *FIRST* participants are involved in mentor-based programs that build science, engineering and technology skills. In addition to fostering interest in science and technology, *FIRST* aims to enable

participants to develop well-rounded life capabilities such as self-confidence, communication skills, and leadership skills through team work and networking between students. To measure how effectively *FIRST* is succeeding in its social networking and confidence goals, we assessed the social and networking skills of adolescent participants in *FIRST*.

Mindset Priming

The goals of *FIRST* participants vary between learning about science and technology and networking to make friends. Depending on each participant's conscious or unconscious goals, the way they interact with their peers can change with mindset priming.

The concept of unconscious goal activation is called "priming", the effects of which can last for an extended period of time. For example, in the study by Légal, Meyer, & Delouvée (2007), participants were primed with words related to either accuracy or inaccuracy. Next, the participants were given an instruction of accuracy, or a conscious goal. Lastly, the participants performed an unskilled motor task. The participants primed with accuracy related words performed the unskilled motor task better than the participants that were primed with the inaccuracy related words. The implications of their study indicate that "the pursuit of a conscious goal can be influenced by external factors that unconsciously regulate behaviors outside of people's awareness" (Légal, Meyer, & Delouvée, 2007, p. 87).

There exists a body of research regarding unconscious goal priming and activation goals. The research is showing that when activated by the environmental context in which the goal is pursued, the activation can have significant implications regarding self regulation and behavior (Shah, 2003, p. 662). There is compelling evidence that our representations of significant others can influence not only how we perceive others, but how we come to perceive and evaluate ourselves. The representations can come to influence what goals we decide to pursue. This effect can be explained as the self-discrepancy theory (Higgins, 1999), which assumes that in addition to pursuing our own goals we often pursue the ideals and obligations that significant others have for us. Over time, we gradually come to internalize or perhaps inhibit those goals (Shah, 2003, p. 662)

Some of *FIRST*'s strongest goals are to build science and technology skills, and to encourage social networking amongst the students that participate. If the self discrepancy theory is applied, if *FIRST* is able to make their participants aware of their goals consistently through priming, perhaps students can come to internalize those goals. With their goals coming closer to matching *FIRST*'s goals, perhaps there will be a change in their performance in both academics and social networking. Depending on what goals the participant may internalize, if a student has *FIRST*'s academic goals internalized, then perhaps they may feel more confident about their academics overall. If the student has *FIRST*'s social networking goals in mind, perhaps there will be an increase in the amount of friends they choose to associate with from *FIRST*. Additionally, with *FIRST* and the participant's goals in line, perhaps the mindset that *FIRST* is able to prime the participant in will have long term effects that may linger past the *FIRST* season.

With the past research on mindset priming and unconscious goal activation in mind, we wished to discover the effects of priming the participants to be focused on a social, academic, or neutral (control) viewpoint through the instructions in our survey. We wanted to see if there would be measurable effects on their responses and if these effects lasted for a short or long duration of time. To incorporate mindset priming into our study we added three different sets of instructions to our first round of surveys. We excluded the mindset priming in our second trial six weeks later to see if it had any measurable effect on the returning participants.

Gender and *FIRST* Robotics

Another factor besides priming that may influence the different goals participants have when participating in *FIRST* could be the gender of the participant. Gender not only denotes the biological difference between the sexes but the social and behavioral differences between males and females. Given that *FIRST* is a gender friendly program that encourages high school youth to be interested in science and technology and given the gender stereotypes of those who study science and engineering, we wanted to see in our study if the gender of the participant had an effect on the perception of the experiences during *FIRST*.

FIRST deals heavily with the STEM subjects, which are science, technology, engineering, and mathematics. While for the past several decades females who earn degrees in the STEM fields has been increasing, females continue to be underrepresented in science, mathematics, and engineering (Bell & Spencer, 2002). In elementary school, female children tend to achieve higher grades in math classes than male children, but starting in middle school and continuing through high school the trend reverses and females are outperformed by the males in math (Frome & Eccles, 1998; Kimball. 1989). Males outnumber females in bachelor degrees earned in STEM subjects (De Welde, Laursen & Thiry, 2007, p. 1).

Some studies have examined the biological differences between the male and female brain as a possible explanation for the disparity between males and females in the STEM subjects. According to Hanlon (1999), areas of the brain involved in mechanical reasoning, visual targeting, and spatial reasoning develop faster in male children; whereas, the areas of the brain involved in verbal fluency, handwriting, and recognizing familiar faces develop faster in females (Ripley, 2005). Because different areas in male and females develop at different times, Sax (2005) argued that perhaps co-ed classrooms may not be the proper learning environment for young children; rather he argued for same-sex classroom environments. "The reason women are underrepresented in computer science and engineering is not because they can't do it" says Sax. "It's because of the way they're taught" (Ripley, 2005).

While biological differences may exist in the development of the brain, this research does not explain why females perform better in math early on in life (Frome & Eccles, 1998; Kimball. 1989). Beyond biological differences, there is research that one possible reason for the gender gap could be due to stereotypes and more specifically stereotype threat. Stereotype threat can be defined as "the experience of being in a situation where one faces judgment based on societal stereotypes about one's group" (Spencer, Steele & Quinn, 1998, p.5). Relating this to FIRST and gender, gender stereotypes suggest that females have weaker abilities in mathematics.

Previous research on stereotype threat looking at female math performance was conducted in a series of three studies by Spencer et al. (1999). In one of the studies, male and female college students with equivalent

math backgrounds took either an easy or difficult math test. The results showed that females underperformed on the math test, but only when it was the difficult math test. Spencer et al. (1999) argue that these results show evidence of stereotype threat as the difficulty of the exam may heighten the anxiety in female participants to confirm the negative gender math stereotypes. In addition, Spencer, et al. (1999) also tested to see if awareness of gender biases influenced performance. In this study, half the participants learned that the test when given in the past had no gender bias, and the other half of the participants learned that the test had gender bias in the past. When the participants learned the test was without gender bias, both males and females performed equally. However, the participants learned that there were gender differences in the past, females underperformed on the test as compared to males. (Quinn & Spencer, 2001, pp. 57-58)

On the other hand, males can be affected by stereotypes as well. Some typical stereotypes that describe males as "reserved, intelligent, independent, active…" Other stereotypes describe women as "nurturing, group-oriented, and superior at tasks involving language skills…" (Smith, 2007, p. 77). These stereotypes imply that males are less adept socially. Previous research has examined the verbal skills of males as compared to females. According to the National Assessment of Education Progress (National Center for Education Statistics, 1999) it was reported that females outperformed males on reading achievement tests (Croizet, Désert, Dutrévis & Leyens, 2001, p. 296)

Some of these stereotypes persist through the social representation of gender via media such as television. Other stereotypes persist through the observations of a child establishing his or her own gender roles, and perhaps the attempt to conform to social behavioral models. Gilligan proposes that through development from childhood to adolescence, females are socialized to establish and maintain interpersonal relationships. Males are more likely to have been socialized more toward action and achievement orientations rather than relationship oriented. (Smith, 2007, p. 307). Additionally, as females transition from childhood to adolescence their social networks develop larger during early adolescence and decreases toward late adolescence. For males, the number of friendships in their social networks becomes increasingly smaller from early adolescence (Smith, 2007, p.308).

Based on the research on gender stereotypes and stereotype threat, we were interested in examining whether gender stereotypes and possibly stereotype threat influence participants perceptions and experiences in *FIRST*. In terms of general gender stereotypes, given the science and math focus of *FIRST*, females may feel differently (or possibly more negatively) about their experiences in *FIRST* than males. In relation to stereotype threat, it is possible that making participants aware of the rigorous academic nature of *FIRST* may induce a sense of stereotype threat and may influence the amount female participants report learning in *FIRST* in comparison with their other female and male counterparts. Additionally, because one of *FIRST*'s goals is to promote social networking between young adolescents and given that females place more emphasis on close relationships than males, perhaps male in the social focus mindset prime will report having less social relationships than females.

Present Research

Three hypotheses are proposed: (1) Mindset priming using the different instructions (academic, social, control) will have an effect upon the participant's responses in the survey. (2) Academic focus prime females will report learning less in *FIRST*, social focus prime males will report socializing less in *FIRST* (3) *FIRST* will have a positive impact on the participant's academic and social networking experience. We will be comparing participant's responses between the first trial and the second trial to see if there is a positive response overall or a negative response overall.

Method

Participants

There were a total of 430participants (262 male; 146 female; 22 Not specified) in this study. Participants came from all over the United States (Arizona, California, Connecticut, Colorado, Virginia, Florida, Georgia, Hawaii, Indiana, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nevada, New Jersey, New Hampshire, New York, North Carolina, Ohio,

Oregon, Pennsylvania, South Carolina, Texas, Utah, Washington, Wisconsin), Canada, England, and Israel. The

participants ranged from the ages of 13 to 49; and included *FIRST* Robotics participants (high-school aged) and

mentors (college students and other adults). For the analyses, there where total of 430 participants (262 male;

146 female; 22 Not specified) at the beginning of the season and a total of 251 participants (152 male; 99

female) at the end of the season. Overall, a little more than half the participants from the beginning of the

season participated again at the end of the season—as the response rate from Time 1 to Time 2 was 58 percent.

All participation was voluntary and all participants gave consent prior to participating.

Design

A 2 (Length of Time: Early in Season or End of Season) x 3 (Mindset Prime: Control, Academic Focus,

or Social Focus) mixed-design was implemented. To investigate whether the length of time participating in

FIRST influenced the social networks and social skills of participants, we assessed participants' attitudes early

in the season and after the robotics season ended (within-participants variable). To examine whether awareness

to different goals influenced social networking and social skills, participants were randomly assigned to one of

three different versions of the survey: 1) instructions reminded participants of the importance of social

networking while participating in *FIRST* (Social Focus Condition), 2) instructions reminded participants of the

importance of learning about science and technology while participating in *FIRST* (Academic Focus Condition),

and 3) instructions informed participants that the survey examined general experience in *FIRST* (Control

Condition).

Materials

Mindset Prime Manipulation. We wanted to examine if having different goals, such as the goal to

network socially or the goal of achieving academically, influenced social behaviors (e.g., networking, social

skills). To examine this, we created a mindset prime (adapted from Chartrand & Bargh, 1996) to lead

participants to believe that a) social networking was important in *FIRST*, b) learning about science and

technology was important in *FIRST*, or c) a neutral prime condition where participants were informed we were

interested in general experiences while participating in *FIRST*.

Length of Time Manipulation. To examine if length of time while participating in *FIRST* influenced participants' social networking skills, we administered the survey at the beginning of the *FIRST* robotics season and again at the end of the season. The season started in mid-January and ended in mid-April; thus there were approximately 3-4 months from the beginning of the season to the end of the season.

Self-Efficacy Measure. To see if participating in *FIRST* influenced self-efficacy, or the belief that one is capable of performing in a certain manner to attain certain goals, we measured their academic and social self-efficacy. To measure academic self-efficacy, we used the Academic Self-Efficacy Scale (Muris, 2001). It contained questions that measured how well participants believed they could handle different academic/learning situations. For instance, "How well can you get teachers to help you when you get stuck on your schoolwork?" We also measured their social self-efficacy with the Social Self-Efficacy Scale (Muris, 2001). It contained questions that measured how well participants believed they could handle different social situations, such as "How well can you have a chat with an unfamiliar person?" Both scales used a 5-point Likert-Type Scale (1 = Not Very Well; 5= Very Well; see Appendix A for both scales).

Social Connectedness Measure. To measure how socially connected *FIRST* participants felt, we adapted the Mediated Social Connectedness Scale (Gonzales & Gay, under review). This scale measures participants awareness of others and feelings of connection to others in *FIRST*, and used a 7-point Likert-type scale (1 = Strongly Disagree; 7 = Strongly Agree; See Appendix A for a copy of the measure).

Social Behaviors. To investigate the social skills of *FIRST* participants who are mainly in their teenage years, the Teenage Inventory of Social Skills Scale was adapted from Inderbitzen and Foster (1992). This scale measures social skills in teenagers, for instance "I talk more than others when I am with a group of people," on a 7-point Likert-type Scale (1 = Does not describe me at all; 7 = Describes me totally; See Appendix A).

Collective Self-Esteem. To measure how positively participants feel about their social group, we measured their collective self-esteem using the Collective Self-Esteem Scale (Luhtanen & Crocker, 1992). For instance the scale asks questions like, "Overall, my group memberships have very little to do with how I feel

about myself." This scale measures this on a 7-point Likert-type scale (1 = Strongly Disagree; 7 = Strongly

Agree; see Appendix A).

Competition. To investigate attitudes towards competition, the Competition Scale was used (Ryckman,

Hammer, Kaczor, & Gold, 1996). For instance the scale asks questions like, "I enjoy competition because it

gives me a chance to discover my abilities." This scale uses a 5-point Likert-type scale (1 = Strongly Disagree;

5 = Strongly Agree; see Appendix A).

Personality Traits. To examine the personality types of those involved in *FIRST* (e.g., competitive,

independent, masculine, feminine), participants indicated the extent to which personality traits described them

on a 7-point Likert-type scale (1 = Not at All ; 7 = Very Much; see Appendix A).

Other Social Networking Measures. As social networking may extend beyond *FIRST* and may even

include online social networking sites (e.g., Facebook), we also measured participants' involvement with

friends and certain activities. Participants indicated the number of friends they had in school, in *FIRST*, and on

Facebook. Participants also indicated the amount of time they spent with their friends from school, friends from

FIRST, and on Facebook (see Appendix A for questions).

Robotics and FIRST Websites. In addition to peer-to-peer social networking, we also investigated what

online sources participants used to help with their Robotics competition. We assessed the extent to which

participants were familiar with several different websites geared towards the *FIRST* Robotics competition (e.g.,

Chief Delphi, *FIRST* website, and WPI's ThinkTank website). We also assessed the usability and preferred

features of each website (see Appendix A for questions).

Demographics. Participants also provided demographic information including their age, gender, ethnicity,

and *FIRST* team/location.

Procedure

To recruit participants for the study, announcements were sent via *FIRST*'s email system and posted on

a popular blog for *FIRST* participants. To participate, participants logged onto a website and gave informed

consent. After giving informed consent, participants saw one of three different instructions (the mindset prime

manipulation). One-third of the participants were led to believe an important goal of *FIRST* was social networking, one-third were led to believe an important goal of *FIRST* was learning about science and technology, and the remaining one-third of participants were in the control (neutral prime) condition and were informed the survey measured general experiences in *FIRST*. After reading the instructions, participants completed the survey. The survey assessed Academic and Social Self Efficacy, Social Connectedness to *FIRST*, Social Skills, Collective Self-Esteem, Attitudes towards Competition, Personality Traits, Other Social Networking Experiences, and demographic information.

In addition, we were interested in whether the length of time participating in *FIRST* influenced social networking and social skills. To examine this, participants completed the survey early on in the robotics season (within the first 3 weeks), and they completed the same survey again at the end of the season (about 4 months later). Participants included a unique code (e.g., Mother's Birthday and their favorite color) to anonymously link their data from early in the season (Time 1) to the second data collection at the end of the season (Time 2). To recruit the same participants at Time 1 and Time 2, email addresses were collected and the second survey was sent to participants who completed the survey at Time 1. Each participant was fully debriefed after the second survey was administered at the end of the *FIRST* Robotics season.

Results

Academic Assessments

To assess whether the mindset primes or the length of time in *FIRST* influenced participants' sense of academic achievement, we conducted several analyses that investigated their academic self-efficacy, and their self-perceptions of the amount learned while participating in *FIRST*.

Academic Self-Efficacy

For this set of analyses, we conducted several ANOVAs to assess whether the mindset prime and/or the length of time in *FIRST* influenced how participants assessed their ability to handle academic situations via their responses on the Academic Self-Efficacy Scale.

Early in *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants self-reported academic self-efficacy at the beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The analysis showed a marginally significant interaction between gender and the participants time in *FIRST* $F(1, 193)=3.7$, $p= .06$. Females with a couple months experience in *FIRST* ($M= 4.13$, $SD=.08$) exhibited marginally higher academic self-efficacy scores than females with a year or more experience in *FIRST* ($M=3.92$, $SD=08$), $F(1, 193) = 3.32$, $p=.07$. There were no other main effects for instructions, gender, or time in *FIRST* (ps > .05), nor were there any other interactions (ps > .05). From this analysis, females who participated in *FIRST* seemed to experience lower academic self-efficacy the longer they participated in *FIRST*, at least when assessed early on in a new *FIRST* season.

End of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants self-reported academic self-efficacy at the end of the *FIRST* season (Time 2), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The analysis showed that a main effect of gender was statistically significant $F(1, 194) = 4.52$, $p=.04$. Males ($M = 4.0$, $SD=.53$) reported having lower academic self-efficacy than females ($M = 4.14$, $SD =.55$). There were no other main effects for instructions, gender, or time in *FIRST* (ps > .05), nor were there any other interactions (ps > .05). Thus, unlike early in the *FIRST* season, all females at the end of the season, regardless of the length of time spent in *FIRST* showed higher academic self-efficacy than males. Thus, over time in the *FIRST* season, female's academic self-efficacy becomes higher than male's academic self-efficacy.

Comparing the Beginning and End of *FIRST* Season. To see whether female's academic self-efficacy increased over the season, a repeated measures ANOVA was run with the academic self-efficacy at the beginning and end of the season as the within-participants factor and the instructions, gender, and time in *FIRST*

as the between-participants factors. This test bared no statistically significant findings. Thus, there were no significant changes in academic self-efficacy as a result of participating in *FIRST*, even for female participants. In conclusion, these results show that while female's academic self-efficacy does not significantly increase over the season, that by the end of the season, their academic self-efficacy is significantly higher than their male counterparts.

Self-Perceived Learning in FIRST

These analyses examined responses to questions that assessed self-perceptions about the amount of learning in *FIRST*.

Beginning of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants thoughts about learning in *FIRST* Robotics at the beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. There were no significant main effects or interactions between the data and factors.

End of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants thoughts about learning in *FIRST* Robotics at the beginning of the *FIRST* season (Time 2), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The test showed that a main effect of gender was statistically significant $F(1, 193) = 24.9, p = 00$. Females ($M = 5.77, SD = 1.05$) reported that they felt they learned *less* in *FIRST* than males ($M = 6.30\ SD = .71$). There was also a significant interaction between the participants time in *FIRST* and the instructions they received $F(2, 193) = 4.08, p = .02$. Participants who have spent a year or more in *FIRST* and had the control instructions felt that they learned more in *FIRST* ($M = 6.51, SD = .74$) than those who had spent a year or more in *FIRST* and received the social focus instructions ($M = 6.09, SD = .98$), $t(193) = 3.26, p = .00$. Participants who have spent a year or more in *FIRST*

and had the control instructions felt that they learned more in *FIRST* than (*M* = 6.51, *SD* = .74) than those who had spent a year or more in *FIRST* and received the academic focus instructions (*M* = 6.01, *SD* = .81), $t(193)$ = 2.38, *p* = .018. There were no other main effects for instructions, gender, or time in *FIRST* (*p*s > .05), nor were there any other interactions (*p*s > .05). Thus, overall, by the end of the season, females believed they learned less in *FIRST* than males. Moreover, those participants who spent a year or more in *FIRST* felt they learned less when primed with the social and academic focus instructions.

Comparing the Beginning and End of *FIRST* Season. A repeated measures (ANOVA) was ran with the Learning in *FIRST* scale at the beginning (Time 1) and end of the season (Time 2) as the within-participants factor and the instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as the between participants factors. The test showed that the main effect for gender was statistically significant $F(1, 182)$ = 8.62, *p* = .00. Males at the end of the season reported learning more in *FIRST* (*M* = 6.29, *SD* = .08) than females at the end of the season (*M* = 5.69, *SD* = .10), where $t(182)$ = 4.63, *p* = .00. Also males at the beginning of the *FIRST* season reported learning less in *FIRST* (*M* = 5.86, *SD* = .11) than males at the end of the season (*M* = 6.29, *SD* = .08), where $t(182)$ = 3.27, *p* = .00. There were no other main effects for instructions, gender, or time in *FIRST* (*p*s > .05), nor were there any other interactions (*p*s > .05). Thus, while males reported learning more than females at the end of the *FIRST* season, they also reported learning more as the season progressed.

Social Outcomes of Participating in FIRST

To assess whether the mindset primes or the length of time in *FIRST* influenced participants' social networking and social skills, we conducted several analyses that investigated their social self-efficacy, their self-reported experiences in *FIRST*, their social behaviors and their collective self-esteem.

Social Efficacy Scale

This scale measures how participants assess their ability to handle their social situations.

Beginning of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants self-reported social self-

efficacy at the beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The test showed that the main effect of the instructions were statistically significant $F(2, 200) = 3.17$, $p = .04$. Contrary to our predictions, participants who received the social focus instructions ($M = 3.69$, $SD = .61$) actually reported lower social self-efficacy than participants who received either the control ($M = 3.89$, $SD = .61$) or the academic focus instructions ($M = 3.86$, $SD = .66$). There were no other main effects for instructions, gender, or time in *FIRST* ($ps > .05$), nor were there any other interactions ($ps > .05$). Thus, at least early in the season, the mindset prime did not help activate goals to be more social and feel more social self-efficacy; rather it had the opposite effect.

End of *FIRST* Season. The same test was conducted on the data from the end of the *FIRST* season (Time 2) and produced no significant findings. Thus, the instructions only influenced participants' social self-efficacy at the beginning of the season.

Comparing the Beginning and End of *FIRST* Season. A repeated measures (ANOVA) was ran with the social self-efficacy at the beginning and end of the season as the within-participants factor and the instructions, gender, and time in *FIRST* as the between participants factors. There were no statistically significant results. Thus, in conclusion, the mindset prime may have had opposite effects than anticipated early in the season, but these effects were not long-lasting.

Social Connectedness in FIRST

These analyses examined responses to questions that assessed participant's feelings towards their *FIRST* experience.

Beginning of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants feelings towards *FIRST* at the beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and

time in *FIRST* (A few months, 1 year or more) as factors. There were no significant main effects or interactions between the data and factors (*p*s > .05).

End of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants feelings towards *FIRST* at the end of the *FIRST* season (Time 2), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The test showed a marginally significant interaction between gender and instructions $F(2, 193) = 2.58$, $p = .08$. Males who received the control instructions ($M = 5.83$, $SD = .93$) had more positive feelings about *FIRST* than males who received the academic instructions ($M = 5.44$, $SD =. 94$), $t(193) = 1.94$, $p = .053$. Males who received the social instructions ($M = 5.83$, $SD = .86$) also had more positive feelings about *FIRST* than males who received the academic instructions ($M = 5.44$, $SD = .94$), $t(193) = 2.03$, $p = .045$. In addition, females with the academic instructions ($M = 5.90$, $SD = .93$) felt more positive about *FIRST* than males with the academic instructions ($M = 5.44$, $SD = .94$) where $t(193) = 2.37$, $p = .019$. There were no other main effects for instructions, gender, or time in *FIRST* (*p*s > .05), nor were there any other interactions (*p*s > .05). Thus, while there were no differing reports on the experiences in *FIRST* early in the season, with time, this effect changed. In particular, males who were primed with the academic focus reported less favorable attitudes towards *FIRST* than their female counterparts also primed with an academic focus and their male counterparts who were primed with the social or neutral focus.

Comparing the Beginning and End of *FIRST* Season. A repeated measures ANOVA was ran with the *FIRST* Robotics scale at the beginning and end of the season as the within-participants factor and the instructions, gender, and time in *FIRST* as the between participants factors. There were no statistically significant results. Thus, while attitudes changed late in the season, they were not significantly different from the attitudes expressed early in the *FIRST* season.

Social Behaviors Scale

This scale measures the social skills of our participants.

Beginning of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants social behaviors at the beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. There were no significant main effects or interactions between the data and factors (ps>.05).

End of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants social behaviors at the end of the *FIRST* season (Time 2), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The test showed that the main effect of gender was statistically significant $F(1, 189) = 8.17$, $p = .01$. Males reported having less social skills ($M = 5.30$, $SD = .65$) than females ($M = 5.56$, $SD = .62$) at the end of the *FIRST* season. There were no other main effects for instructions, gender, or time in *FIRST* (ps > .05), nor were there any other interactions (ps > .05). Thus while there were no significant findings at the beginning of the season, as the season progresses males social skills become significantly less than females.

Comparing the Beginning and End of *FIRST* Season. A repeated measures (ANOVA) was ran with the social behaviors scale at the beginning (Time 1) and end of the season (Time 2) as the within-participants factor and the instructions, gender, and time in *FIRST* as the between participants factors. There were no statistically significant results. Thus while social skills got lower for males at the end of the season, this interaction was not present at the beginning of the season.

Collective Self Esteem Scale

This scale measures how positive participants feel towards their social group.

Beginning of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants collective self-esteem at the

beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. There were no significant main effects or interactions between the data and factors (ps>.05).

End of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants collective self-esteem at the end of the *FIRST* season (Time 2), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The test showed that there was a statistically significant interaction between gender, instructions, and time in *FIRST* $F(2, 191) = 5.21$, $p = .01$. Males with a year or more in *FIRST* that received the social focus instructions reported higher collective self-esteem ($M = 6.07$, $SD = .73$) than females with the social focus instructions with a year or more in *FIRST* ($M = 5.00$, $SD = 1.67$) *FIRST* $t(191) = 2.69$, $p = .01$. This finding was the only significant finding in this interaction. There were no other main effects for instructions, gender, or time in *FIRST* ($ps > .05$), nor were there any other interactions ($ps > .05$). Thus, as the season progresses, males have a higher collective self-esteem, or feel more positively towards their social groups, than females.

Comparing the Beginning and End of *FIRST* Season. A repeated measures ANOVA was ran with the Collective self-esteem scale at the beginning (Time 1) and end of the season (Time 2) as the within-participants factor and the instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as the between participants factors. There were no significant differences in collective self-esteem between the beginning of the season and the end, $ps > .05$.

Competition Scale

This scale measures the participant's attitudes towards competition. This scale shows whether or not the participant is focused on the social aspect of *FIRST* robotics or the competitive aspect.

Beginning of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants thoughts on competition at the beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The test showed a marginally significant interaction between gender and time in *FIRST* $F(1, 182) = 3.01$, $p = .08$. Males with a year or more experience in *FIRST* reported feeling marginally more competitive ($M = 4.34$, $SD = .51$) than females with a year more experience in *FIRST* ($M = 4.09$, $SD = .67$), $t(182) = 1.9$, $p = .06$. There were no other main effects for instructions, gender, or time in *FIRST* ($ps > .05$), nor were there any other interactions ($ps > .05$). Thus at the beginning of the season males seem to feel more competitive than females.

End of *FIRST* Season. To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the participants thoughts on competition at the end of the *FIRST* season (Time 2), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The test found that the main effect of gender was marginally significant $F(1, 195) = 3.15$, $p = .078$. Males ($M = 4.25$, $SD = .72$) reported being more competitive than females ($M = 4.12$, $SD = .76$). There was also a significant interaction between gender and the instructions $F(2,195) = 6.64$, $p = .002$. Males who received the social instructions reported being more competitive ($M = 4.36$, $SD = .63$) than females who received the social instructions ($M = 3.86$, $SD = 1.0$), $t(195) = 3.01$, $p = .00$. Females with the academic instructions reported being more competitive ($M = 4.32$, $SD = .46$) than males with the academic instructions ($M = 4.00$, $SD = .77$), $t(195) = 1.87$, $p = .06$. Males with the control instructions ($M = 4.40$, $SD = .68$) reported being more competitive than males who received the academic focus instructions ($M = 4.0$, $SD = .77$), $t(195) = 2.51$ $p = .01$. Males with the social focus instructions ($M = 4.36$, $SD = .63$) also reported being more competitive than males who received the academic focus instructions ($M = 4.0$, $SD = .77$), $t(195) = 2.26$, $p = .03$. On the other hand, females who received the academic focus instructions ($M = 4.31$, $SD = .46$) felt more

competitive than females who received the social focus instructions ($M = 3.86$, $SD = 1.0$) where $t(195) = 2.65$, $p = .01$. There were no other main effects for instructions, gender, or time in *FIRST* (ps > .05), nor were there any other interactions (ps > .05). When males are being primed with the social focus instructions they are reporting being more competitive than their counterparts (whether other males in different priming conditions or females). Females, on the other hand, report being more competitive when they are primed with an academic focus than males with the same prime and other females.. These findings suggest that the amount of competitiveness felt by participants differs at the end of these season based on their gender and the prime they received..

Comparing the Beginning and End of *FIRST* Season. A repeated measures (ANOVA) was ran with the Competition scale at the beginning (Time 1) and end of the season (Time 2) as the within-participants factor and the instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as the between participants factors. There were no significant differences in competition between the beginning of the season and the end, ps > .05.

Other Social Networking Measures

These measures give us insight on the amount of time the participants spend with friends, on Facebook and at *FIRST*. It also gives us an approximation of how many Facebook, school, and *FIRST* friends the participant has.

Beginning of the *FIRST* Season. A paired T-test was ran with the amount of time the participants spent socializing between *FIRST* friends and the amount of time the participants spent working on the *FIRST* competition as factors. The test showed a significant finding between the two factors $t(380) = 11.4$, $p = .00$, the participants spent more time on the *FIRST* competition ($M = 18.8$, $SD = 12.6$) than socializing with friends in *FIRST* ($M = 9.69$, $SD = 12.7$). Thus the participants at the beginning of the season are spending more time competing than socializing within *FIRST*.

A second paired T-test was ran with the amount of time the participant's spent socializing between *FIRST* friends and the amount of time the participant's spent socializing with friends from school. The test

showed a significant finding between the two factors $t(388) = 3.83$, $p = .00$. The participants spent more time

socializing with friends in school ($M = 12.9$, $SD = 15.1$) than socializing with friends in *FIRST* ($M = 9.73$, $SD =$

12.6). Thus, at the beginning of the season those in *FIRST* are spending more time with friends from school than

with their friends in *FIRST*.

To examine if the instructions given to the participant, the participants' gender, or the amount of time

spent in *FIRST* Robotics influenced the number of friends the participant reported having in *FIRST* at the

beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance

(ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and

time in *FIRST* (A few months, 1 year or more) as factors. The test showed that the main effect of time in *FIRST*

was marginally significant $F(1,178) = 3.10$, $p = .08$. Participants with only a couple months in *FIRST* reported

having more friends in *FIRST* than ($M = 27.8$, $SD = 4.2$) participants with a year or more in *FIRST* ($M = 17.1$,

$SD = 4.4$). There were no other main effects for instructions, gender, or time in *FIRST* (ps > .05), nor were there

any other interactions (ps > .05). Thus those with more experience in *FIRST* are reporting having fewer friends

than participants who are new to *FIRST*.

To examine if the instructions given to the participant, the participants' gender, or the amount of time

spent in *FIRST* Robotics influenced the amount of time the participant spent with *FIRST* friends at the

beginning of the *FIRST* season (Time 1), the data were analyzed using a three-way analysis of variance

(ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and

time in *FIRST* (A few months, 1 year or more) as factors. There were two significant findings, the first, was the

main effect of gender $F(1,177) = 4.11$, $p = .04$. Males reported spending less time with friends in *FIRST* ($M =$

7.50, $SD = 7.74$) than females ($M = 10.52$, $SD = 11.536$). The second of the findings was a significant

interaction between the instructions and time in *FIRST* $F(2,177) = 3.45$, $p = .034$. Participants with a couple

months experience in *FIRST* who received the academic focus instructions reported spending more time with

friends in *FIRST* ($M = 11.6$, $SD = 13.3$) than those with the same time in *FIRST* who received the control

instructions ($M = 6.47$, $SD = 5.7$) where $t(177) = 1.21$, $p = .02$.   Those who received the control instructions

with a couple months in *FIRST* ($M = 6.47$, $SD = 5.65$)   reported spending less time with friends than those who received the control instructions with a year or more in *FIRST* ($M = 10.6$, $SD = 11.3$), $t(177) = 1.98$, $p = .05$. There were no other main effects for instructions, gender, or time in *FIRST* (ps > .05), nor were there any other interactions (ps > .05). Overall, we can see priming is having a different effect than expected.   Participants with the academic focus prime are actually spending more time with their *FIRST* friends. Also participants who have been in *FIRST* longer reported spending more time with their *FIRST* friends than those who are new to *FIRST*.

In addition, we were interested in whether the amount of friends participants reported having in *FIRST*, the amount of time they spent with their *FIRST* friends, and the amount of time they spent working on their *FIRST* competition influenced how likely participants were to engage in prosocial (or helping) behaviors. There was a significant positive correlation between the number of friends in *FIRST* and the amount of prosocial behavior, such that the more friends a person had in *FIRST*, then the more likely they were to engage in prosocial behavior, $r = .38$, $p =. 00$. In addition, there was a significant, albeit weak, positive correlation between the amount of time participants spend with their *FIRST* friends and their likelihood to engage in prosocial behaviors, such that the more time spent with *FIRST* friends then the more likely they were to engage in prosocial behavior, $r = .19$, $p = .00$. Lastly, there was a significant positive correlation between the amount of time participants spent on the *FIRST* Competition and their likelihood to engage in prosocial behaviors, such that the more time spent on the *FIRST* competition the more likely they were to engage in prosocial behavior, $r = .251$; $p = .00$.

End of the *FIRST* Season. A paired T-test was conducted with the amount of time the participant's spent socializing between *FIRST* friends and the amount of time the participant's spent working on the *FIRST* competition as factors. The test showed a significant finding between the two factors $t(239) = 11.5$, $p= .00$. The participants spent more time on the *FIRST* competition ($M = 17.9$, $SD = 18.4$) than socializing with friends in *FIRST* ($M = 7.29$, $SD = 13.2$). Once again the result participants are reporting spending more time on the competition aspect of *FIRST* than socializing.

A second paired T-test was ran with the amount of time the participant's spent socializing between *FIRST* friends and the amount of time the participant's spent socializing with friends from school. The test showed a significant finding between the two factors $t(388) = 5.87$, $p = .00$. The participants spent more time socializing with friends in school ($M = 11.7$, $SD = 16.2$) than socializing with friends in *FIRST* ($M = 7.26$, $SD = 13.1$). This result matches the one at time one showing that participants are spending more time with friends at school than friends in *FIRST*. Overall between the results of t- tests, it can be seen that participants are viewing *FIRST* as more of a competition than a means of social networking.

To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the number of friends the participant reported having in *FIRST* at the end of the *FIRST* season (Time 2), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. There were no significant main effects or interactions between the data and factors (ps>.05).

To examine if the instructions given to the participant, the participants' gender, or the amount of time spent in *FIRST* Robotics influenced the amount of time the participant spent with *FIRST* friends at the end of the *FIRST* season (Time 2), the data were analyzed using a three-way analysis of variance (ANOVA) with the survey instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as factors. The tested showed a significant interaction between the instructions and time in *FIRST* $F(2,197) = 3.0$, $p = .05$. Participants with a couple months in *FIRST* with the social focus instructions reported spending more time with their *FIRST* friends ($M = 13.7$, $SD = 28.1$) than participants with the same amount of time in *FIRST* with the academic focus instructions ($M = 4.12$, $SD = 6.6$) where $t(197) = 3.12$, $p = .002$. Again, participants with a couple months in *FIRST* with the social focus instructions reported spending more time with their *FIRST* friends ($M = 13.7$, $SD = 28.1$) than participants with the same amount of time in *FIRST* with the control instructions ($M = 8.36$, $SD = 10.8$) where $t(197) = 2.17$, $p = .03$. The main

result of this section is that the mindset priming is having a more long-term effect on those participants who are new (or rookies) to *FIRST*.

As with the beginning of the season, we were also interested in whether the number of friends participants reported having in *FIRST*, the amount of time they spent in *FIRST*, and the amount of time they spent on the *FIRST* competition correlated with the amount of prosocial behavior they engaged in. Like the beginning of the season, there were significant and positive correlations for all three of these factors on prosocial behavior. The more friends participants reported having in *FIRST* then the more likely they were to engage in prosocial behavior, $r = .23$, $p = .00$. Likewise the more time the participants spent in *FIRST* then the more likely they were to engage in prosocial behavior $r = .25$, $p = .00$. Once again, the more time participants spent on the *FIRST* competition then the more likely they were to engage in prosocial behavior, $r = .35$, $p = .00$.

Comparing the Beginning and End of *FIRST* Season. A repeated measures (ANOVA) was ran with the amount of friends in *FIRST* at the beginning (Time 1) and end of the season (Time 2) as the within-participants factor and the instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as the between participants factors. There were no statistically significant results.

A repeated measures ANOVA was ran with the amount of time the participant spent with friends in *FIRST* at the beginning (Time 1) and end of the season (Time 2) as the within-participants factor and the instructions (Academic Focus, Social Focus, Control), gender (male, female), and time in *FIRST* (A few months, 1 year or more) as the between participants factors. When looking to see if there were differences between the beginning and end of the season, there was a significant interaction between the gender of the participant and the amount of time they spent with their *FIRST* friends, $F(2,173) = 4.37$, $p = .04$. Females at the beginning of the season reported spending more time with their FIRST friends ($M = 10.5$, $SD = 1.2$) than females at the end of the season ($M = 6.10$, $SD = 1.7$) where $t(173) = 2.00$, $p = .05$. There was also a significant interaction between the instructions given to the participant, the amount of time they spent with their *FIRST* friends, and the participant's time in *FIRST* $F(2, 173) = 3.40$, $p = .04$. Participants who are new to first with the

social focus instructions reported spending less time with *FIRST* friends at the beginning of the season ($M =$ 8.15, $SD =$ 1.7) than at the end of the season ($M =$ 15.3, $SD =$ 2.5), where $t(173) =$ 2.25, $p =$ .03. Furthermore participants who are new to *FIRST* with the academic focus instructions reported spending more time with *FIRST* friends at the beginning of the season ($M =$ 12.0, $SD =$ 1.7) than at the end of the season ($M =$ 4.90, $SD =$ 2.5), where $t(173) =$ 2.25, $p =$ .03. Overall, these findings suggest that the mindset primes have more of an effect on those who are new to FIRST than those who have been in *FIRST* for a longer period of time. Moreover, the type of mindset participants are given early on in the season influences the social networking participants engage in. More specifically, when given an academic focus, participants, over the course of *FIRST*, spend less time socializing. However, when given a social focus, participants, over the course of *FIRST* spend more time socializing. Thus, the type of emphasis that *FIRST* and *FIRST* mentors given about the program to participants can significant impact how they view *FIRST*, the amount they learn, and the extent to which they social network and socialize.

Discussion

Three hypotheses were proposed: 1) Mindset priming (via the different instructions: academic, social, control) will have an effect upon the participant's responses in the survey, 2) Due to gender stereotypes and stereotype threat, we predict that females given an academic prime will report learning less in *FIRST*, and males given a social prime will report socializing less in *FIRST*, and 3) *FIRST* will overall have a positive impact on the participant's academic and social networking experience.

Social Outcomes

One of the primary concerns with this study was whether *FIRST* was having a positive effect on the participant's social experience. We conducted a number of analyses that examined different social factors such as social self-efficacy, collective self-esteem, and social skills. Overall, the results show that priming the participant with the goal of being social had a significant effect in social networking over the *FIRST* season. For instance, participants who were primed with the social focus reported socializing significantly more with their *FIRST* friends than those who were primed with the academic focus or neutral prime. This result can be linked

to self- discrepancy theory which states that not only do we follow our own beliefs but we are influenced by others beliefs of those significant to us (Higgins, 1999). Priming participants to believe that *FIRST* has social networking ideals ultimately led to that participants pursuing these ideals and making them their own. The transition of ideals was not present at the beginning of the *FIRST* season, but it was significant at the end of the *FIRST* season. This coincides with our two of our hypothesis; participants significant to this result are being affected positively in regards to social networking and are responding in unison with our mindset priming.

When observing more of the social outcomes of our survey, we took into account the gender of the participant and his or her responses. When the social focus was primed, we found that females were more positively influenced than males. Females also felt more socially connected in *FIRST* and reported better social skills over the time they participated in the *FIRST* season. This finding concurs with our hypothesis and goes along with the research of Gilligan, who found that females in early adolescence tend to develop large social networks. It was also observed that the academic focus prime seemed to hinder social networking in *FIRST*, especially for male participant. This last finding shows that *FIRST* may not be able to represent itself as both a positive social and academic environment, adding disclaim to our hypothesis that *FIRST* is creating a positive social and academic environment for the participants.

Academic Outcomes

In addition to observing social outcomes regarding mindset priming, we were also interested in whether the mindset primes influenced the academic self-reported learning outcomes of the *FIRST* participants. We found two very different outcomes that piqued our interest. One of the outcomes was concurrent with what we predicted in our hypothesis regarding females and academic primes. The other outcome we did not predict but was still related to our gender hypothesis.

First, when assessing self-reported learning, females reported learning less in *FIRST* than the males, especially at the end of the season. This finding was concurrent with our hypothesis. Regardless of whether females were primed in the academic, social, or neutral mindset, they reported learning less or feeling less confident about what they learned in *FIRST*. Because the mindset prime was not a factor in the responses

females reported, this suggests that when females participate in *FIRST* there is evidence of stereotype threat because females are aware of the difficulty of the STEM subjects involved in *FIRST*. This effect would be similar to the study by Spencer et. al (1999) where they found that simply by being aware of the difficulty of the math test was enough to heighten female anxiety and confirm negative stereotype threat. Additionally, males outnumber females in FIRST. Simply being in the minority and being aware of that fact may also make females feel the pressure of negative stereotypes. However, one way to reduce stereotype threat is to even out the male to female ratio. If more females join *FIRST* there would be a smaller minority.

The second outcome that we observed was when looking at academic self-efficacy early on in the season females had significantly *lower* academic self-efficacy than males, regardless of their prime. However, by the end of the season females showed significantly *higher* academic self-efficacy than males. Thus, while females may not have consciously felt that they were learning during their time in *FIRST*, they believed they were more capable academically by the end of the *FIRST* season. While FIRST shows evidence of stereotype threat because of the rigorous STEM subjects and the fact that males outnumber females, the trend of responses show that *FIRST* is making females more confident the longer they participate in *FIRST*. Females can sometimes be less prepared in math and science than males in their high school years ((De Welde, Laursen & Thiry, 2007, p. 3). One of the ways to reduce stereotype threat can simply be repetition and practice of skills. By participating in FIRST perhaps females will be more confident in their academic skills after having a successful season with their team.

Limitations

In our study there were some potential limitations that could have affected the data we collected. In regards to our sample size, more than half of the original participants took part in our survey for the second time. Although this is a fair number in psychology studies, it is not the hundred percent that would have been ideal. Another limitation of our study was that it relied on the participant's self-reported data. Perhaps future research could measure implicit responses or behavioral analysis, rather than explicit responses ones for greater accuracy of results.

Future Research / Conclusion

There are a few things we found that will need future research. From above future research should measure implicit responses or use behavioral analysis, instead of relying on participants self-reported data.   In terms of the social skills developed while participating in *FIRST*, early in the season there were no differences in the social skills between participants. However, by the end of the *FIRST* season females reported better social skills than males, regardless of the focus they were primed with. According to this finding future research may need to compare how male and female participants are socializing amongst their *FIRST* friends. In addition, future research should be done to observe the competitive nature of *FIRST* and its potential affects to social networking. One thing we found in our analyses was that participants consistently reported spending more time on the *FIRST* competition than socializing with friends in *FIRST*, both at the beginning and end of the seasons.

Throughout the study we consistently found that priming participants with an academic focus prime was hindering the social networking aspect of *FIRST*. On the other hand, using a social focus prime produced no negative results in the sense of academics, only positive results in sense of social networking. These findings are something *FIRST* may look to use in the future when trying to increase social networking between its participants. Another significant finding to add to this claim is that those who are new to *FIRST* are significantly more affected by the primes we proposed. So, one thing *FIRST* may do is to try and hold conferences for those who are new to the organization. The goal of these conferences would be, for example, to emphasize to participants that FIRST is focused on social networking. This kind of setup can be changed as the organization takes on new directions. Overall, long term priming is having an effect upon participants and can be something *FIRST* can take advantage of to a positive direction.

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Appendix A – *FIRST* Survey

FIRST Survey

Control Focus:

Instructions: We are interested in learning more about your experiences in FIRST. Please answer all questions as honestly as possible. Your data will not be linked directly to you. **Reminder**: we will be asking you to complete a survey again at the end of the FIRST season. Thank you for participating! *Disclaimer: The questions you will answer come from standardized questions measuring different aspects. These questions do not in any way represent any values or attitudes for FIRST.*

Academic Focus: One of the key goals of FIRST is to inspire young people to become interested in and leaders in science and technology.   In particular, FIRST hopes to aid and increase participant's knowledge of science and technology, and provide hands-on experience to enhance academic learning about science, engineering, and technology. Recent studies show that participating in FIRST the likelihood that participants will study science and technology in college, graduate school, and opt for careers in science, engineering, and technology fields. Based on this goal to increase your learning and academic knowledge of science, engineering, and technology , we are interested in learning more about your experiences in FIRST. Please answer all questions as honestly as possible, your data will not be linked directly to you. REMINDER: we will be asking you to complete a survey again at the end of the FIRST season. Thank you for participating! *Disclaimer: The questions you will answer come from standardized questions measuring different aspects. These questions do not in any way represent any values or attitudes for FIRST.*

Social Focus: One of the key goals of *FIRST* is to help the young people involved develop social networks. In particular, *FIRST* hopes to increase participants self-esteem, self-confidence, communication skills, and leadership skills to help make them more well-rounded and thoughtful, contributing citizens. Based on this goal to increase your social networks, we are interested in learning more about your experiences in *FIRST*. Please answer all questions as honestly as possible, your data will not be linked directly to you. *Disclaimer: The questions you will answer come from standardized questions measuring different aspects. These questions do not in any way represent any values or attitudes for FIRST.*

Section 1: Learning and Academics
Instructions: In this section, you will answer questions about attitudes towards your academic performance.

1. How well can you get teachers to help you when you get stuck on your schoolwork?

1	2	3	4	5
Not Very Well				Very Well

2. How well can you study when there are other interesting things to do?

1	2	3	4	5
Not Very Well				Very Well

3. How well can you study a chapter for a test?

1	2	3	4	5
Not Very Well				Very Well

4. How well do you succeed in finishing all your homework every day?

1	2	3	4	5
Not Very Well				Very Well

5. How well can you pay attention during every class?

1	2	3	4	5
Not Very Well				Very Well

6. How well do you succeed in passing all your subjects?

1	2	3	4	5
Not Very Well				Very Well

7. How well do you succeed in satisfying your parents with your school work?

1	2	3	4	5
Not Very Well				Very Well

8. How well do you succeed in passing a test?

1	2	3	4	5
Not Very Well				Very Well

Section 2: Classmates and Friends

Instructions: In this section, you will answer questions about attitudes towards your classmates and friends.

1.How well can you express your opinions when your classmates disagree with you?

1	2	3	4	5
Not Very Well				Very Well

2.How well can you become friends with others?

1	2	3	4	5
Not Very Well				Very Well

3.How well can you have a chat with an unfamiliar person?

1	2	3	4	5
Not Very Well				Very Well

4.How well can you work in harmony with your classmates?

1	2	3	4	5
Not Very Well				Very Well

5.How well can you tell others that they are doing something that you don't like?

1	2	3	4	5
Not Very Well				Very Well

6.How well can you tell a funny event to a group of youth?

1	2	3	4	5
Not Very Well				Very Well

7.How well do you succeed in staying friends with others?

1	2	3	4	5
Not Very Well				Very Well

8.How well do you succeed in preventing quarrels with others?

1	2	3	4	5
Not Very Well				Very Well

Section 3: FIRST
Instructions: In this section, you will answer questions about your attitudes about participating in FIRST.

1. When participating in FIRST, I have a sense that I am part of a larger community.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

R2. When participating in FIRST, I don't feel that others are concerned about me as a person.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

3. When participating in FIRST I know that other people care about what happens to me.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

R4. I don't feel like I could share my problems with anyone in FIRST if I had to.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

R5. I feel alone when I am participating in FIRST.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

R6. I do not feel connected to people participating in FIRST.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

7. I feel more connected to the world by participating in FIRST.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

R8. I do not feel that other people are paying much attention to me while I participate in FIRST.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

R9. What I have done in FIRST has not had an impact on people.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

R10. I am not paying attention to what other people are doing in FIRST.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
Disagree   Agree

R11. FIRST does not really allow me to glimpse into other people's lives.

1	2	3	4	5	6	7
Disagree						Agree

12. I am highly aware of other people in FIRST.

1	2	3	4	5	6	7
Disagree						Agree

OTHER SCALE

13. Participating in FIRST has helped me decide I want to further study science, engineering, and/or technology academically (e.g., college or graduate school)

1	2	3	4	5	6	7
Disagree						Agree

14. FIRST has helped me learn valuable technical skills I would not have learned in the classroom

1	2	3	4	5	6	7
Disagree						Agree

15. Participating in FIRST has increased my desire to study robotics academically (e.g., college or graduate school).

1	2	3	4	5	6	7
Disagree						Agree

16. Participating in FIRST has helped me learn more about engineering design than I would have learned elsewhere.

1	2	3	4	5	6	7
Disagree						Agree

17. Participating in FIRST has taught me more about mechanics than I would have learned in the classroom.

1	2	3	4	5	6	7
Disagree						Agree

18. FIRST has helped me socially by helping me make new friends.

1	2	3	4	5	6	7
Disagree						Agree

19. I often help my FIRST teammates.

1	2	3	4	5	6	7
Disagree						Agree

20. I often see others in FIRST helping their teammates.

1	2	3	4	5	6	7
Disagree						Agree

21. I often see others in FIRST helping others who are **not** their teammates.

1	2	3	4	5	6	7
Disagree						Agree

22. If another FIRST team requested my help, I would help them.

1	2	3	4	5	6	7
Disagree						Agree

23. I communicate with my FIRST teammates about FIRST and the competition frequently.

1	2	3	4	5	6	7
Disagree						Agree

24. I communicate with my FIRST teammates about things unrelated to FIRST frequently.

1	2	3	4	5	6	7
Disagree						Agree

25. I communicate with members from other FIRST teams frequently.

1	2	3	4	5	6	7
Disagree						Agree

26. I regret not communicating more with other FIRST teams.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Disagree   Agree

27. I socialize and hang out with my friends from FIRST while **not** working on the competition.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Disagree   Agree

28. If we were not competing, I would be more likely to communicate and socialize with other FIRST teams.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Disagree   Agree

29. What is your favorite aspect about FIRST? (Please circle your response)

Learning about Robots   Building Robots   Interacting with Others

Competing with Others   Other_____

Section 4: Social Behaviors

Instructions: In this section, you will answer questions about how you handle different social situations.

1. I tell jokes and get other classmates to laugh

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

R2. I try to get other classmates to do things my way when working on a group project

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

3. I stick up for other people when somebody says something nasty behind their backs

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

R4. I forget to return things that other people loan me

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

5. I ask other people to go places with me

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

6. I help other people with their homework when they ask me for help

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

7. I listen when other people want to talk about a problem

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

R8. I laugh at other people when they make mistakes

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

R9. When I want to do something, I try to talk other people into doing it, even if they don't want to

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

10. I make sure that everyone gets a turn when I am involved in a group activity

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Does not describe me at all   Describes me totally

11. I ask other people for advice

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

R12. I ignore other people when I am not interested in what they are talking about

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

R13. I lie to get out of trouble

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

R14. I make up things to impress other people

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

15. I offer to share something with other people when I know that they would like it

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

R16. I hit other people when they make me mad

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

17. I tell classmates I'm sorry when I know I have hurt their feelings

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

18. I tell the truth when I have done something wrong and other people are being blamed for it

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

R19. I talk more than others when I am with a group of people

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

R20. I throw things when I get angry

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

21. I thank other people when they have done something nice for me

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

22. I do my share when working with a group of classmates

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

R23. I call classmates bad names to their faces when I am angry

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

24. I tell other people how I really feel about things

1	2	3	4	5	6	7

Does not describe me at all   Describes me totally

Section 5: Group Memberships

Instructions: We are all members of different social groups. Some social groups pertain to gender, race, religion, ethnicity, socioeconomic class, and personal interests (e.g., robots). We would like you to

consider your memberships in social groups, and respond to the following statements on the basis of how you feel about those groups and your memberships in them.

1. I am a worthy member of the social groups I belong to.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

R2. I often regret that I belong to some of the social groups I do.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

3. Overall, my social groups are considered good by others.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

R4. Overall, my group memberships have very little to do with how I feel about myself.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

R5. I feel I don't have much to offer to the social groups I belong to.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

6. In general, I'm glad to be a member of the social groups I belong to.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

R7. Most people consider my social groups, on the average, to be more ineffective than other social groups.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

8. The social groups I belong to are an important reflection of who I am.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

9. I am a cooperative participant in the social groups I belong to.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

R10. Overall, I often feel that the social groups of which I am a member are not worthwhile.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

11. In general, others respect the social groups that I am a member of.

    1   2   3   4   5   6   7

Strongly Disagree   Strongly Agree

R12. The social groups I belong to are unimportant to my sense of what kind of a person I am.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Strongly Disagree   Strongly Agree

R13. I often feel I'm a useless member of my social groups.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Strongly Disagree   Strongly Agree

14. I feel good about the social groups I belong to.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Strongly Disagree   Strongly Agree

R15. In general, others think that the social groups I am a member of are unworthy.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Strongly Disagree   Strongly Agree

16. In general, belonging to social groups is an important part of my self image.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Strongly Disagree   Strongly Agree

Section 6: Personality Traits

Instructions: In this section, please indicate the degree to which the following traits describe YOU.

1. aggressive

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

2. arrogant

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

3. athletic

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

4. calm

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

5. caring

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

6. compassionate

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

7. competitive

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

8. complaining

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

9. confident

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

10. dependent

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

not at all   very much

11. emotional

1	2	3	4	5	6	7
not at all						very much

12.   faithful

1	2	3	4	5	6	7
not at all						very much

13.   feminine

1	2	3	4	5	6	7
not at all						very much

14.   good

1	2	3	4	5	6	7
not at all						very much

15.   happy

1	2	3	4	5	6	7
not at all						very much

16.   insensitive

1	2	3	4	5	6	7
not at all						very much

17.   intelligent

1	2	3	4	5	6	7
not at all						very much

18.   interesting

1	2	3	4	5	6	7
not at all						very much

19.   lucky

1	2	3	4	5	6	7
not at all						very much

20.   masculine

1	2	3	4	5	6	7
not at all						very much

21.   moody

1	2	3	4	5	6	7
not at all						very much

22.   outspoken

1	2	3	4	5	6	7
not at all						very much

23.   powerful

1	2	3	4	5	6	7
not at all						very much

24.   attractive

1	2	3	4	5	6	7
not at all						very much

25.   sensitive

1	2	3	4	5	6	7
not at all						very much

26.   selfish

1	2	3	4	5	6	7
not at all						very much

27.   shy

1	2	3	4	5	6	7
not at all						very much

28.   strong

1	2	3	4	5	6	7
not at all						very much

29.   stubborn

1	2	3	4	5	6	7
not at all						very much

30. sweet

1	2	3	4	5	6	7
not at all						very much

31. talkative

1	2	3	4	5	6	7
not at all						very much

32. weak

1	2	3	4	5	6	7
not at all						very much

Section 7: Competition

Instructions: In this section, you will answer questions about your attitudes towards competition.

1. I enjoy competition because it gives me a chance to discover my abilities.

1	2	3	4	5
Strongly Disagree				Strongly Agree

R2. Competition does not increase my awareness and understanding of myself and others.

1	2	3	4	5
Strongly Disagree				Strongly Agree

3. Competition can lead to the formation of friendship with others

1	2	3	4	5
Strongly Disagree				Strongly Agree

4. I like competition because it teaches me a lot about myself

1	2	3	4	5
Strongly Disagree				Strongly Agree

R5. Competition does not help me develop my abilities more.

1	2	3	4	5
Strongly Disagree				Strongly Agree

6. I enjoy competition because it brings me and my competitors closer to together as human beings.

1	2	3	4	5
Strongly Disagree				Strongly Agree

7. I enjoy competition because it helps me to develop my own potentials more fully than if I engaged in these activities alone.

1	2	3	4	5
Strongly Disagree				Strongly Agree

8. What, if any, sports or athletic competitions are you involved in?

9. How active do you consider yourself to be in athletic sports and competitions?

1	2	3	4	5	6	7
Not at all						Very much

Section 8: Friends and Activities

Instructions: In this section, you will answer questions about your friends and your activities outside of FIRST.

1. Approximately how many friends do you have on Facebook? If you are not on Facebook, please enter zero. _____

2. Approximately how many hours per week do you spend on Facebook. If you are not on Facebook, please enter zero. _____

3. Approximately how many friends do you have at school? _____

4. Approximately how many hours per week do you spend socializing (or hanging out) with your friends from school? _____

5. Approximately how many friends do you have at FIRST? _____

6. Approximately how many hours per week do you spend socializing (or hanging out) with your friends from FIRST? _____

7. Approximately how many hours per week do you spend working with your FIRST team on the competition? _____

8. Approximately how many hours per week do you spend helping others (e.g., with schoolwork or community service)? _____

Section 9: Websites
   Instructions: In this section, you will answer questions about the websites you use for the competition.

1. Have you heard of and used ThinkTank?
         Yes   No
1a. If you have used ThinkTank, how frequently do you visit this page?
         1   2   3   4   5   6   7
Not Frequently   Very Frequently
1b. If you have used ThinkTank, what features do you like *most* about this website?

1c. If you have used ThinkThank, what features do you like *least* about this website?

2. Have you heard of and used Chief Delphi?
         Yes   No
2a. If you have used Chief Delphi, how frequently do you visit this page?
         1   2   3   4   5   6   7
Not Frequently   Very Frequently
2b. If you have used Chief Delphi, what features do you like *most* about this website?

2c. If you have used Chief Delphi, what features do you like *least* about this website?

3. Have you used the FIRST website?
         Yes   No

3a. If you have used the FIRST website, how frequently do you visit this page?
         1   2   3   4   5   6   7
Not Frequently   Very Frequently
3b. If you have used the FIRST website, what features do you like *most* about this website?

3c. If you have used the FIRST website, what features do you like *least* about this website?

4. Rank order the usefulness of the different websites for your FIRST Project (1 = most useful; 3 = least useful):
ThinkTank _____
Chief Delphi _____
FIRST _____
5. Are there any other websites you use? If so, what are they?

6. Are there any web resources that are not provided that you would like to see in the future?

Section 10: Demographics

1. Gender (please circle):

         Male   Female

2. Ethnicity (please circle):

        African American/Black

        Asian/Pacific Islander/South Asian

            Please specify. _____

        Caucasian/White

        Latino/Hispanic

            Please specify. _____

        Middle Eastern

            Please specify. _____

        Native American/Alaska Native

        Biracial/Mixed race.

            Please specify. _____

        Other. Please specify. _____

3. Age (in years) _____

4. Year in School (Please circle your response):

Freshman in High School	Sophomore in High School	Junior in High School	Senior in High School
Freshman in College	Sophomore in College	Junior in College	Senior in College

5. How long have you been involved in FIRST? (Please Circle)

A few months	six months	1 Year	2 Years 3+ Years

6. FIRST Team No.: _____

7. FIRST Team Title: _____

8. FIRST Team Location: _____

9. FIRST Team size:

      _____ students

      _____ mentors

10. Team has been participating annually in FIRST Robotics competitions since: _____(Year)

11. My position in the FIRST team is: _____

12. Email Address (so we can contact you to complete the second survey) _____