Abstract & Background

More men than women hold faculty positions in STEM fields (Ceci & Williams, 2007), which may be a function of women being less likely than men to thrive in STEM fields in college. We report preliminary results of a longitudinal study that followed first-year college students indicating an interest in STEM on their college applications through their first two years at Rice. The purpose of this research was to examine the predictors of selecting a STEM major at the end of the second year in college and performance in STEM, operationalized as STEM GPA. Results show no gender differences in the likelihood to leave the STEM major, or STEM GPA. There were significant gender differences favoring men for self-efficacy for STEM for most time points. Women were also more likely to report negative STEM experiences than were men.

Method

Sample items for the predictor measures are below:

- **STEM Self-Efficacy** (8 items; T1, T2, T4, T5; α’s around .90):
  1. I am certain I can understand most difficult material presented in the course readings in my STEM classes.
  2. I expect to do well in my STEM classes.

- **STEM Attainment Value** (based on Eccles et al., 1984; 4 items; T1 – T5; α’s around .70)
  1. I consider myself a person who does well in STEM disciplines
  2. I seem to be always thinking of topics related to STEM, even when I’m not in class or studying.

- **STEM Intrinsic Value** (based on Eccles et al., 1984; 4 items; T1-T5; α’s around .85)
  1. I enjoy my STEM courses more than other courses I have taken.
  2. I prefer working on homework related to my STEM courses more than any other homework.

- **STEM Positive Experiences** (based on Seymour, 1995; 9 items; T2-T5; α’s around .75)
  1. Observing student role models made me feel confident that I could do well in a STEM major.
  2. My STEM courses confirmed my goal of pursuing a STEM-related career.

- **STEM Negative Experiences** (based on Seymour, 1995; 11 items; T2-T5; α’s around .85)
  1. I questioned my long-term goals involving STEM (e.g., graduate school or career plans).
  2. I thought a lot about the sacrifices I would have to make to pursue a degree and career in a STEM field.

Study Design and Participants

<table>
<thead>
<tr>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Time 4</th>
<th>Time 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>August, 2007</td>
<td>December, 2007</td>
<td>April, 2008</td>
<td>December, 2008</td>
<td>April, 2009</td>
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<tr>
<td>N=161</td>
<td>N=133</td>
<td>N=127</td>
<td>N=108</td>
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<td>(104 men)</td>
<td>(84 men 49 women)</td>
<td>(81 men 46 women)</td>
<td>(69 men 39 women)</td>
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</tbody>
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- **Sample** = incoming freshman with interest in STEM.
  - Email sent to 460; 161 responded for a 35% response rate for Time 1.

Participants paid $50 at the end of each academic year for participation in all waves of data collection and signing a transcript release form.

Results

Results - Gender

- **For STEM majors, no gender differences in outcome variables (STEM GPA and likelihood to leave the STEM major).**

- **No gender differences in some predictor variables: Attainment and Intrinsic Value and Positive experiences in STEM.**

- **Gender differences STEM Self-efficacy favoring men for all time points, except Time 5. Mean levels increase slightly for women; decrease for men.**

- **Women were more likely to endorse statements about negative experiences related to STEM at the end of Year 1 and Year 2 (STEM Majors)**

Results - Performance

Very few left the STEM major: Of the 102 completing the study, 14 reported being non-STEM. Those who left the STEM major had significantly lower STEM GPAs than those staying. They were less likely to report positive experiences in STEM.

**Predictors on Performance in STEM:**

- **Attainment Value** significantly related to STEM performance (average $r = .35, p < .05$).

- **Self-efficacy** significantly related to STEM performance (average $r = .37, p < .05$).

- **Negative experiences in STEM** are significantly correlated with STEM performance (average $r = -.27, p < .05$.

- **Positive experiences in STEM** are significantly correlated with STEM performance at the end of the second year only

- **Intrinsic Value** is not significantly related to STEM Performance

Conclusions

No gender differences in important STEM outcomes (grades & commitment to STEM)

But, women more likely to report negative experiences related to STEM, and these negative experiences are significantly correlated with outcomes.

Women are also more likely to report lower self-efficacy for STEM, especially early in their academic careers.

These differences in STEM-related attitudes may eventually lead to attrition from STEM, even though they do not seem to affect STEM performance.

References

