Introduction

Background

- Goal: Programs aim to encourage pursuit of STEM+C careers among female & underserved students 1, 2
  - Curated Pathway to Innovation (iSTEM)
  - Web app for middle schoolers to learn about and foster interest in computer programming
- Difficulty: Interest usually decreases during middle school if no intervention takes place 3-4
- Decline may be due to
  - Lack of informal STEM experience (iSTEM) 5
  - Low Science Achievement Value (SAV) 6

Literature

- Constructs are limited to influence in the following ways:
  - SAV → Resources and Parental Education 7, 8
  - Resources and Parental Education → iSTEM 9
  - iSTEM → Interest 10
  - Interest → Aspirations 11

Purpose: To explore the relationship between iSTEM, Resource Variables, and Interest and Aspiration in CP

Research Questions

1. Can “iSTEM” be modeled as a single latent factor model?
2. How do students’ iSTEM scores vary based on their resources? (i.e., material, social, time, parental ed.)
3. Is there an indirect effect of iSTEM on aspirations by way of interest? (b) Are the effects still significant after accounting for resources?

Method

Data: Survey responses pulled from the CPI project.

Participants: N = 636, Mean age = 13.5 years, 43.4% female, 45.4% URM, 15 sites in US

Data Preparation

- Compute average scale scores
- Define and dichotomize resource variables

To Address...

- RQ 1 - Confirmatory Factor Analysis (CFA)
- RQ 2 - ANOVA
- RQ 3 - Structural Equation Model, Mediation Analysis

Software: R Studio (LAVAAN package)

Result

Research Question 1

Figure 1. Students’ Response to iSTEM Survey Items in Percentage

Example Survey Question: Outside of school, have you been to/participated in a science themed museum; science camp; robotics camp or class?

Confirmatory Factor Model Result

- Survey items loaded well; model fit is sufficient

Research Question 2

Figure 2. Factor Loadings of the iSTEM Single Factor Model

Fit-Index

<table>
<thead>
<tr>
<th>CF1</th>
<th>RMSEA</th>
<th>SRMR</th>
<th>CFI</th>
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</thead>
<tbody>
<tr>
<td>0.986</td>
<td>0.06</td>
<td>0.055</td>
<td>0.675</td>
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</tbody>
</table>

- Lack of informal STEM experience

Research Question 3

Figure 3. Frequency Count of Responses to Resource Survey Items

Table 1. ANOVA on iSTEM and Resource Variables

<table>
<thead>
<tr>
<th>Resource Variable</th>
<th>Estimated Marginal Mean</th>
<th>p</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paternal Ed. Known</td>
<td>0.267</td>
<td>1.99</td>
<td>.001*</td>
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Table 3. Regression Coefficient and Standard Errors For Mediation Pathways

<table>
<thead>
<tr>
<th>Paths</th>
<th>Standardized Coefficient (SE)</th>
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<tbody>
<tr>
<td>iSTEM</td>
<td>0.229 (0.038)*</td>
</tr>
<tr>
<td>Indirect Effects</td>
<td>0.115 (0.024)*</td>
</tr>
<tr>
<td>STEM → Interest → Aspiration</td>
<td>0.183 (0.038)*</td>
</tr>
<tr>
<td>STEM → Aspiration (A → B)</td>
<td>0.626 (0.024)*</td>
</tr>
<tr>
<td>STEM → Aspiration (C)</td>
<td>0.114 (0.030)*</td>
</tr>
</tbody>
</table>

- iSTEM’s direct effect AND indirect effect on Aspiration are significant, indicating a partial mediation model

Table 4. ANOVA on iSTEM and Resource Variables

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Discussion

- Results suggest positive answers to the research questions
- iSTEM Experience is correlated with, and has direct and indirect effects on CP Interest and Aspirations

Implications

- iSTEM Experience to combat declining interest
- Limitations
- Many “I don’t know” responses for Parental Education; cannot analyze socioeconomic status

Future Directions

- Further experimental or quasi-experimental work

To establish that information STEM experience results in more positive attitudes towards STEM+C careers

References


Acknowledgement

- Learning Analytics and Measurement in Behavioral Sciences (LAMBS) Lab
- Bettina Spencer, Ph.D., Saint Mary’s College
- Paul Brenner, Ph.D., University of Notre Dame