Sources of Science Self-Efficacy in Appalachian Students

Calah J. Ford, University of Kentucky
Dr. Ellen L. Usher, University of Kentucky
Social Cognitive Theory (Bandura, 1986)

Personal Factors

Environmental Factors

Behaviors
Self-Efficacy
(Bandura, 1997)

The beliefs people hold about their abilities
Self-Efficacy (Bandura, 1997)

The beliefs people hold about their abilities

The beliefs students hold about their science abilities
Sources of Self-Efficacy (Bandura, 1997)

- Enactive Mastery Experiences
- Vicarious Experiences
- Verbal Persuasions
- Physiological and Affective States
Development of Self-Efficacy Within Different Cultures

• Hispanic students report lower science self-efficacy than White students (Logfran, Smith, & Whiting, 2015)

• Difference in reported exposure to sources of math self-efficacy (Ahn, Usher, Butz, & Bong, 2016)
  • Korean and U.S. students’ math self-efficacy was predicted by vicarious experiences and social persuasions
  • Filipino students’ math self-efficacy was predicted by social persuasions from peers
Development of Self-Efficacy Within Rural Appalachia
Development of Self-Efficacy Through Age and Gender

- Decrease in reported exposure to sources of self-efficacy over time (Lofgran, Smith, & Whiting, 2015)

- Gender as a variable
  - (e.g., Britner, 2008; Britner, 2006; Chen & Usher, 2013; Kiran & Sungur, 2011; Lofgran, Smith, & Whiting, 2015)

- Women are underrepresented in hard sciences
  - (National Science Foundation, 2014)
1. How do students in rural Appalachia report exposure to the four sources of science self-efficacy and science self-efficacy? How are these variables correlated?

2. What is the relationship between science self-efficacy and reported exposure to sources of science self-efficacy?

3. What, if any, are the differences between grade level or gender in reported science self-efficacy and exposure to its sources?
Participants
N = 631

Gender
- Girls: 321
- Boys: 310

Grade Level
- Elementary (4-5 Grade): 233
- Middle (6-8 Grade): 159
- High (9-12 Grade): 239

Median Household Income
<$23,000
(2015 Census)

White
97%
(2015 Census)
Data Collection

Time 1
Sources of Science Self-Efficacy
(Spring 2013)

6 Mastery Experience Items
7 Vicarious Experience Items
6 Verbal Persuasions Items
6 Physiological State Items

1 (definitely false)
6 (definitely true)
6 Mastery Experience Items

7 Vicarious Experience Items

6 Verbal Persuasions Items

6 Physiological State Items

**Mastery Experiences:**

I do well on even the most difficult science assignments.

**Time 1 Sources of Science Self-Efficacy (Spring 2013)**

1 (definitely false) 6 (definitely true)
Data Collection

Time 1 Sources of Science Self-Efficacy (Spring 2013)

1 (definitely false)  6 (definitely true)

Vicarious Experiences:

Seeing adults do well in science helps me do better in science.
Verbal Persuasions:

Other students have told me that I'm good at learning science.

6 Verbal Persuasions Items

6 Mastery Experience Items

7 Vicarious Experience Items

6 Physiological State Items

Time 1
Sources of Science Self-Efficacy (Spring 2013)

1 (definitely false) 6 (definitely true)
Data Collection

Sources of Science Self-Efficacy
(Spring 2013)

6 Mastery Experience Items
7 Vicarious Experience Items
6 Verbal Persuasions Items

6 Physiological State Items

Physiological States:
Just being in science class makes me feel stressed and nervous.

1 (definitely false)
6 (definitely true)
Science Self-Efficacy:
In general, how confident are you in your abilities in science?

1 (not at all confident) to 6 (completely confident)

Time 2
Science Self-Efficacy
(Fall 2013)
### Results: Research Question 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Science Self-Efficacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mastery Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Vicarious Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Social Persuasions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Physiological States</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 (definitely false)  6 (definitely true)

*p < .05, **p < .01.
## Results: Research Question 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Science Self-Efficacy</td>
<td>4.48</td>
<td>1.29</td>
</tr>
<tr>
<td>2. Mastery Experience</td>
<td>4.35</td>
<td>1.18</td>
</tr>
<tr>
<td>3. Vicarious Experience</td>
<td>3.95</td>
<td>1.09</td>
</tr>
<tr>
<td>4. Social Persuasions</td>
<td>3.64</td>
<td>1.29</td>
</tr>
<tr>
<td>5. Physiological States</td>
<td>2.37</td>
<td>1.24</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01.

1 (definitely false)   6 (definitely true)
# Results: Research Question 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Science Self-Efficacy</td>
<td>4.48</td>
<td>1.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mastery Experience</td>
<td>4.35</td>
<td>1.18</td>
<td>.567**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Vicarious Experience</td>
<td>3.95</td>
<td>1.09</td>
<td>.390** .628**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Social Persuasions</td>
<td>3.64</td>
<td>1.29</td>
<td>.484** .724** .668**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Physiological States</td>
<td>2.37</td>
<td>1.24</td>
<td>-.328** -.396** -.142** -.240**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 (definitely false) 6 (definitely true)*

*p < .05, ** p < .01.*
## Results: Research Question 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Science Self-Efficacy</td>
<td>4.48</td>
<td>1.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mastery Experience</td>
<td>4.35</td>
<td>1.18</td>
<td>.567**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Vicarious Experience</td>
<td>3.95</td>
<td>1.09</td>
<td>.390**</td>
<td>.628**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Social Persuasions</td>
<td>3.64</td>
<td>1.29</td>
<td>.484**</td>
<td>.724**</td>
<td>.668**</td>
<td></td>
</tr>
<tr>
<td>5. Physiological States</td>
<td>2.37</td>
<td>1.24</td>
<td>.328**</td>
<td>.396**</td>
<td>.142**</td>
<td>.240**</td>
</tr>
</tbody>
</table>

1 (definitely false)  6 (definitely true)

*p < .05, ** p < .01.
Results: Research Question 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Science Self-Efficacy</td>
<td>4.48</td>
<td>1.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mastery Experience</td>
<td>4.35</td>
<td>1.18</td>
<td>.567**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Vicarious Experience</td>
<td>3.95</td>
<td>1.09</td>
<td>.390**</td>
<td>.628**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Social Persuasions</td>
<td>3.64</td>
<td>1.29</td>
<td>.484**</td>
<td>.724**</td>
<td>.668**</td>
<td></td>
</tr>
<tr>
<td>5. Physiological States</td>
<td>2.37</td>
<td>1.24</td>
<td>-.328**</td>
<td>-.396**</td>
<td>-.142**</td>
<td>-.240**</td>
</tr>
</tbody>
</table>

1 (definitely false) 6 (definitely true)

*p < .05, ** p < .01.
## Results: Research Question 2

### Dependent Variable: Science Self-Efficacy

<table>
<thead>
<tr>
<th>Variables</th>
<th>$\beta$</th>
<th>Structure Coefficient</th>
<th>Uniqueness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Experience (β)</td>
<td>.379***</td>
<td>.963</td>
<td>18.1%</td>
</tr>
<tr>
<td>Vicarious Experience (β)</td>
<td>.057</td>
<td>.638</td>
<td>0.6%</td>
</tr>
<tr>
<td>Social Persuasions (β)</td>
<td>.141*</td>
<td>.806</td>
<td>2.7%</td>
</tr>
<tr>
<td>Physiological State (β)</td>
<td>-.113*</td>
<td>-.539</td>
<td>3.0%</td>
</tr>
<tr>
<td><strong>R²</strong></td>
<td>.331***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* $^*p < .05.$ $^{**}p < .01.$ $^{***}p < .001$
Results: Research Question 3 - Gender

Note. *p < .05. **p < .01. ***p < .001
Results: Research Question 3-Grade Level

Note. *p < .05. **p < .01. ***p < .001
Discussion, Limitations and Future Directions
Thank you.
For access to this presentation and a full list of references, please visit p2omotivationlab.org/research


References


