A Review Of Metacognition in Science Education: Combating Procrastination and Increasing Student Efficacy

Laura Beebe, Thanmayi Palegar, Muhammad Shuib
SC 297C, The Penn State Eberly College of Science

Abstract
Metacognition and self-regulated learning have become rapidly growing areas of study in pedagogical research, especially with respect to science education in college. According to a 2009 study, teaching strategies that attempt to encourage student metacognitive and self-regulated learning are some of the most effective approaches, with a mean effect size of 0.67 (Zohar and Barzilai). Highly connected to metacognition is the notion of student self-efficacy, which influences student learning and performance. Dealing with academic procrastination, the intentional delay of completing academic activities in a timely fashion, is a widespread problem for 30-60% of undergraduates which can lead to a decrease in optimal performance (Rabin et al). According to a study conducted by the University of Freiburg (Wäschle et al), self-efficacy and procrastination are directly correlated. The higher the student’s self-efficacy, the lower the tendency of the student to procrastinate and vice versa. Here, we provide a review of recent literature relating metacognition and its link to procrastination in order to devise effective strategies for raising student self-efficacy and promoting high academic performance.

Introduction

• Metacognitive counters to procrastination

Method of Study

A growing field

Surveying procrastination
• Self-reporting on various scales: plan/organize, shift, initiate, task monitor, emotional control, working memory, organization, IQ, depression, impulse control

Correlating self-efficacy and procrastination
• Self-monitoring protocol measuring procrastination, goal achievement, cognitive strategy use

Results

The uncorrected mean models for dependent variables.

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Uncorrected mean model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Procrastination¹</td>
<td>2.89</td>
</tr>
<tr>
<td>Self-efficacy²</td>
<td>2.71</td>
</tr>
<tr>
<td>Mastery goals³</td>
<td>0.19</td>
</tr>
<tr>
<td>Personal utility goals³</td>
<td>0.30</td>
</tr>
<tr>
<td>Elaboration⁴</td>
<td>3.00</td>
</tr>
<tr>
<td>Organization⁴</td>
<td>2.88</td>
</tr>
<tr>
<td>Behavioral strategies⁴</td>
<td>2.29</td>
</tr>
<tr>
<td>Goal achievement⁴</td>
<td>3.22</td>
</tr>
</tbody>
</table>

The mean represents an average person’s mean value across the 14 points of measurement. The ICC represents the proportion of variance between persons.

¹ Based on a five-point rating scale (1–5).
² Number of goals with this attribute.
³ Zero order correlations between the dependent variables averaged across all points of measurement and persons.

Discussion and Applications

• Procrastination and self-efficacy are directly correlated

For students:
• Recognize the connection between self-efficacy and procrastination
• Be aware of knowledge gaps, seek remediation

For instructors:
• Provide encouragement at semester’s outset and when beginning difficult material

For supplemental teaching staff (LA’s, TA’s, etc.):
• Seek out hesitant students for targeted help

References and Acknowledgments


Thank you to Dr. Bortiatynski and the Center for Excellence in Science Education.