OLD DOMINION UNIVERSITY

Supplemental Instruction, Calibration, and Self-Efficacy: A Path Model Analysis

Dissertation Proposal Defense

Jennifer Grimm

May 29, 2018

Introduction

Background

- Many college students struggle to earn STEM degrees due to inability to pass entry-level courses & poor self-regulated learning (SRL) (Usher, 2008)
- In response, many institutions have adopted Supplemental Instruction (SI) programs (Elam, 2016)
  - Goals of SI
  - How SI Works

The Problem: Practical Implications

- Correlations between SI attendance & increased course grades/reduced DFW rates (e.g., Blanc et al., 1983; Rabitoy et al., 2015)
- Limited research on SI & SRL constructs of self-efficacy and calibration
  - Improvements could lead to long-term increases in student learning, retention, & persistence (Jarvela & Jarvenoja, 2011; Schunk & Pajares, 2005)
  - Potential mediating effects on students' final course grades

The Problem: Empirical Significance

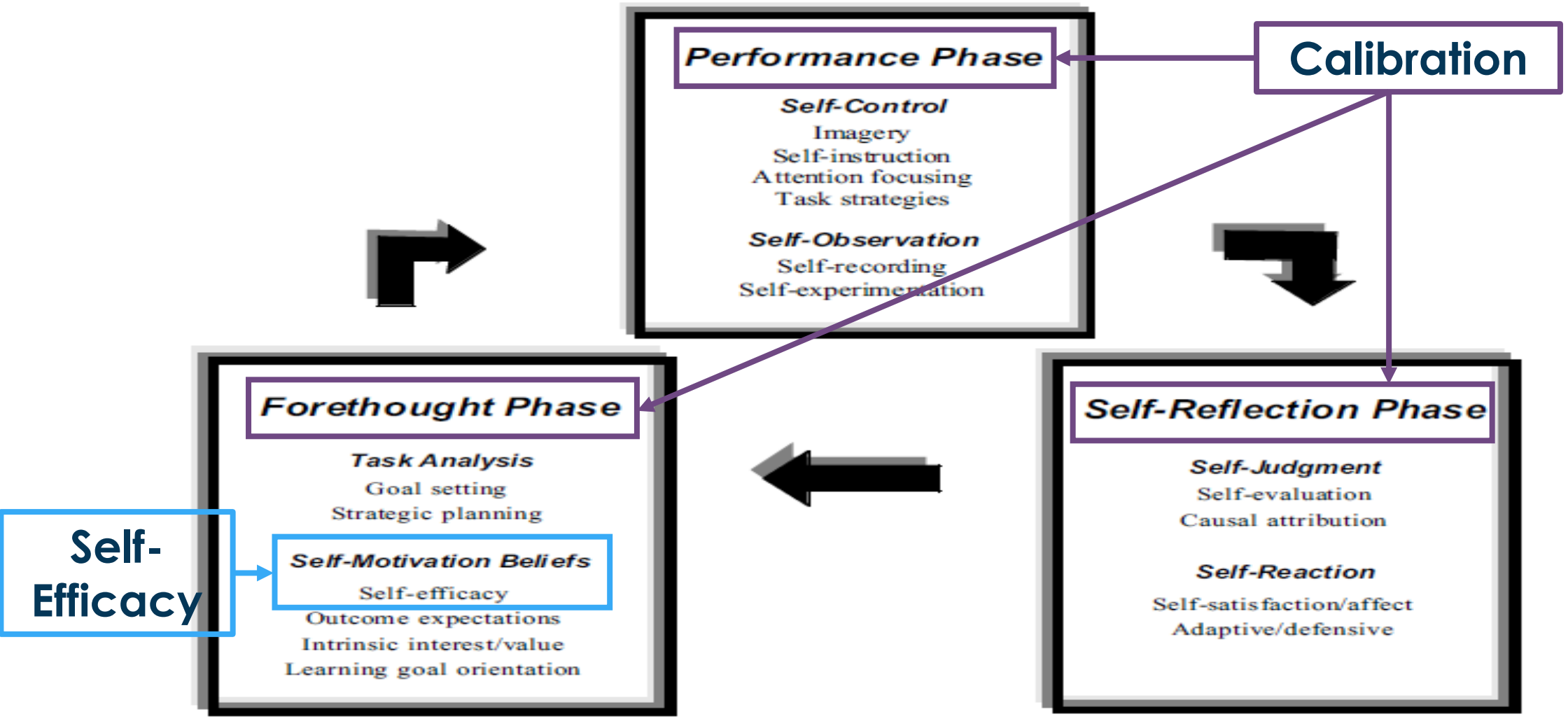
- Add to the few empirical studies that have examined correlations between SI & self-efficacy
- May be the first study to situate calibration within SI, academic support program, or help-seeking contexts
- Add to the limited empirical literature examining how self-efficacy & calibration interact with/influence one another

Purpose Statement

Examine connections between SI and self-efficacy & calibration

- Investigate if students' pre-existing self-efficacy beliefs & calibration accuracy predict their decisions to attend SI sessions throughout the semester
- Explore if SI attendance has a direct effect on changes in students' final self-efficacy & calibration and subsequent indirect effects on students' final course grades

Theoretical Framework: Zimmerman's (2002) Theory of Self-Regulated Learning



Literature Review

Research on SI & SRL/Self-Efficacy (1 of 2)

- **SRL Study Findings**
  - Several unable to find a statistically significant impact of SI attendance on students' SRL capabilities (e.g., Garcia, 2006)
  - Ning & Downing (2010): Significant gains for SI participants in information processing & motivation
  - Mack (2007): Significant differences in motivation & resource management
- **Self-Efficacy Study Findings**
  - Some found no statistically significant differences in self-efficacy between SI and non-SI participants (e.g., Visor et al., 1992)
  - Studies with significant results revealed modest (Hizer, 2010; Hurley, 2010) or delayed effects (Watters & Ginns, 1997) of SI attendance on self-efficacy

Research on SI & SRL/Self-Efficacy (2 of 2)

Limitations

- Examined programs that did not follow the SI model (Garcia, 2006; Grier, 2004)
- Administration of only a pre-test (McGee, 2005) or post-test (Fisher, 1997)
- Varying definitions for SI groups
- Not intentional in selecting SRL constructs most likely influenced by SI
- Used instruments that are not domain-specific to measure students' self-efficacy (e.g., McGee, 2005)

Research on Calibration

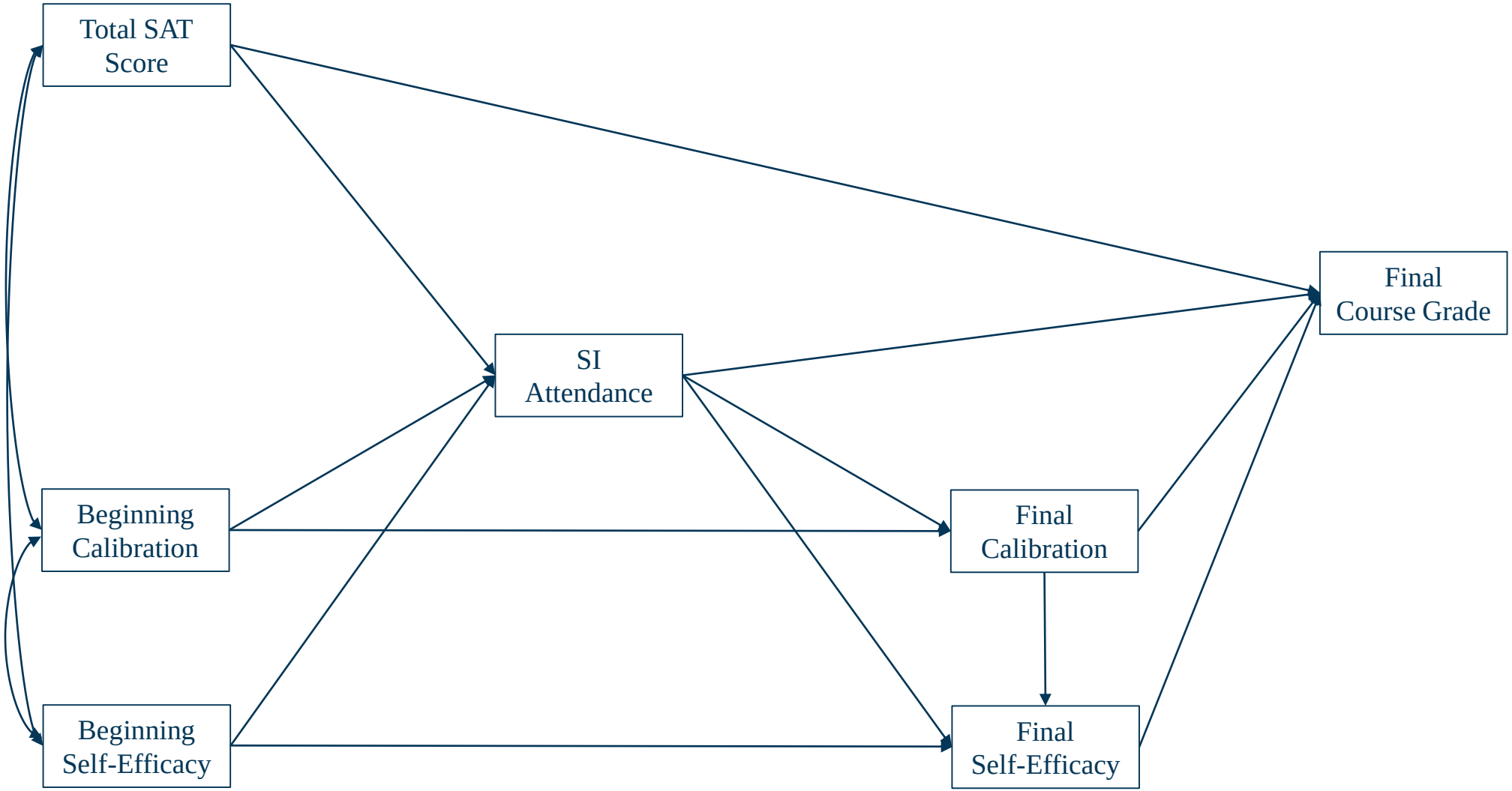
- Why Study SI & Calibration?
  - No known studies on calibration & SI, academic support programs, or help seeking
  - Test hypothesis of Visor et al. (1992): SI participants saw a decrease in self-efficacy because of their increased ability to calibrate
- Calibration Research:
  - Interventions developed to improve calibration & academic performance have had mixed results (e.g., Bol et al., 2012)
  - Hacker & Bol (in press): Interventions that target all three phases of SRL will be more successful at improving calibration & academic performance (e.g., Bol et al., 2012)
- Calibration & Self-Efficacy Research
  - Positive significant relationships found between calibration accuracy & self-efficacy (e.g., Nietfeld et al., 2006)
  - Modest metacognitive monitoring interventions can improve students' calibration accuracy, self-efficacy, & academic performance (Nietfeld et al., 2006)

Methodology

Research Questions

1. To what extent do students' self-efficacy beliefs and calibration accuracy at the beginning of a general biology course predict their SI attendance during the semester?
2. Controlling for pretest differences, to what extent does SI attendance predict final calibration accuracy, self-efficacy, and course grades at the end of a general biology course?

Research Design: Hypothesized Path Model



Participants

- Students enrolled in general biology course in fall 2018
  - 3 sections taught by 1 instructor & supported by 2 SI leaders
  - Fall 2017: 579 students; mostly Caucasian & African-American, female, & freshmen/sophomores; 29% attended SI
- University has achieved SI Program Certification by the International Center for SI

Measures

- **Beginning Calibration & Final Calibration**
  - "On a scale of 0-100%, predict your grade for this exam."
  - Compare responses with first & final exam grades for absolute accuracy measures (Schraw, 2009)
- **Beginning Self-Efficacy & Final Self-Efficacy**
  - Academic efficacy scale from Patterns of Adaptive Learning Scale (PALS; Midgley et al., 2000)
  - Five questions with 5-point Likert scale responses
  - Coefficient alpha of 0.78 (Midgley et al., 2000) & construct validity verified by other studies (Anderman & Midgley, 1997; Midgley et al., 1995)
- **SI Attendance**: Captured electronically by SI leaders
- **Final Course Grade**: Obtained from instructor on 0-100% scale
- **Total SAT**: Obtained from assessment office; score range of 400-1200

Procedure

- Pretest: Calibration & self-efficacy questions
  - Administer 1 week prior to first exam – electronic reminder emails & during class
  - Incentives: extra credit & gift card drawing
  - Notification letter
- Collect attendance during SI sessions
- Posttest: Calibration & self-efficacy questions
- Collect final course grades, total SAT scores, & demographic variables

Data Analysis

- Descriptive Statistics
- Path Analysis
  - Robust maximum likelihood estimation using Mplus (v 7.3; Byrne, 2012)
  - Cutoff value of $p < .05$ and only significant paths will be displayed
  - Use fit statistics to assess model fit (Byrne, 2012; Hu & Bentler, 1999; Kline, 2016)
    - Chi-square (x^2): Want to be small & insignificant
    - Tucker Lewis Index (TLI): > .95
    - Root mean square error of approximation (RMSEA): < .06
    - Standardized root mean square residual (SRMR): < .05
  - Engage in model generating if original model is rejected by releasing one path at a time (Byrne, 2012; Loehlin, 1998)

Limitations

- **Threats to Internal Validity**
  - Self-selection bias
  - Social desirability
  - Two SI leaders
  - Possible attrition & low SI attendance

- **Threat to External Validity:**
  - Single institution, one course

OLD DOMINION UNIVERSITY

Supplemental Instruction, Calibration, and Self-Efficacy: A Path Model Analysis

Thank You!
Questions?