7-2016

Effects of Growth Mindset Training on Undergraduate Statistics Students

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Abstract

Undergraduate introductory statistics courses have experienced numerous changes in the past century, for instance, increased enrollment and diversification of students required to take the courses. Promising research has been conducted on mathematical mindsets, however, no research is available for introductory statistics courses. This presentation addresses the effect of growth mindset training on students in mathematics.

Keywords

college students, attitude, research, intellect, performance

Disciplines

Higher Education | Statistics and Probability

Comments

Presented at the 13th International Congress on Mathematical Education held in Hamburg, Germany, in July 2016.

EFFECTS OF GROWTH MINDSET TRAINING ON UNDERGRADUATE STATISTICS STUDENTS

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Introductory Statistics & Mindsets

- Intro stats courses have experienced numerous changes in the past century (Onwuegbuzie & Wilson, 2003)
  - Increased enrollment
  - Diversification of students required to take the course
- Promising research has been conducted on mathematical mindsets
- No research is available for introductory statistics courses

Mindset Theory

- Builds on attribution theory (Weiner, 1985)
- Mindsets are metacognitive processes that an individual holds concerning beliefs about their cognitive abilities (Boekaerts et al., 2003; Burns & Isbell, 2007; Mangels et al., 2006)
- Influence affective reactions and behaviors.

What is a Mindset?

- Growth Mindset
  - Intelligence is not fixed, but malleable
- Fixed or Mindset
  - Intelligence is fixed and unchangeable
  - Little one can do to improve intelligence
- Mindsets are domain specific
- Students with fixed mindsets towards math have "a significant disadvantage" (Dweck, 2008, p. 1)

Gender and Mathematics

- Mathematics has historically utilized a talent-driven approach (Good, Rattan, & Dweck, 2012)
- A stereotype that males are more capable than females (Dweck, 2008; Good et al., 2012)
- This combination can have detrimental effects on females
- Fortunately, student's mindsets can be altered.

Population and Sample

- Undergrad students enrolled in intro stats between August 2014 and May 2015 at a small, liberal arts college in the US
- 121 students enrolled, 52.9% response rate
- 64 students in the sample, 32 females and 32 males

Instruments

Implemented pre and post semester.

- Student Attitudes Towards Statistics – 36© (SATS) (Schau, 2003)
  - Assessed student attitude
- The Comprehensive Assessment of Outcomes in a first Statistics course (CAOS) (Assessment Resource Tools for Improving Statistical Thinking, 2005)
  - Measured mastery of statistical concepts

Growth Mindset Treatments

- Designed from successful research
- Four, 15-minute growth mindset training sessions during class time
- Goal: help students understand how the brain functions biologically with a focus on the malleability of intelligence.

Posttest SATS© Scores by Gender Controlling for Pretest SATS©

Statistically significant results for ***effort*** and ***value***.

	Male (n = 32)	Female (n = 32)	MSE	F value	p-value	η_P^2
Affect	4.599	4.177	0.037	0.035	.851	0.001
Cognitive Competence	4.890	4.776	0.058	0.207	.651	0.003
Difficulty	3.900	3.567	0.140	0.408	.525	0.007
Effort	4.940	5.570	4.065	4.407	.040*	0.067~
Interest	4.289	4.141	1.298	1.678	.200	0.027~
Value	4.812	5.059	3.788	9.402	.003*	0.134~

* denotes significant difference at .05; ~ denotes small or medium effect size

Posttest Mastery by Gender Controlling for Pretest Scores

- Females increased mastery of statistical concepts at a statistically significant greater rate than males.
- An examination of previous semesters showed no difference.

	Male (n = 32)	Female (n = 32)	MSE	F value	p-value	η_P^2
CAOS	.562	.583	0.063	5.296	.025*	0.080~

* denotes significant difference at .05; ~ denotes small or medium effect size

Conclusion

- Growth mindset training is a promising method to address the underrepresentation of females in mathematics and other STEM fields (science, technology, engineering, and mathematics).
- Replication is necessary to learn more

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