What are the introductory statistics tasks that require the highest self-efficacy for community college students?

2021 United Stats Conference on Teaching Statistics (USCOTS)

Samantha Estrada PhD, Emily Santistevan, Erica Martinez,
Department of Psychology and Counseling University of Texas at Tyler

Dr. Samantha Estrada
University of Texas at Tyler

@estr2525

estr2525@gmail.com

Emily Santistevan
University of Texas at Tyler

Msantistevan @uttyler.edu

Erica Martinez
University of Texas at Tyler

Emartinez29 @uttyler.patriots.edu

STATISTICS SELF-EFFICACY

“confidence in one’s abilities to solve specific tasks related to statistics”

Finney and Schraw (p. 164, 2003)

Literature Review

- Current Statistics Self-Efficacy (CSSE) instrument was developed by Finney and Schraw (2003) and it the only tool currently available to assess students' self-efficacy to learn statistics.
- The items were developed from introductory statistical textbooks and reviewed thoroughly by statistical instructors.
- The psychometric properties of the scale have been previously studied with a population of graduate students (Lu et al., 2018).
- We are focusing on community college students

RESEARCH QUESTION

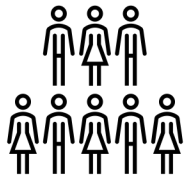
The research question for this study:

- **What is the hierarchical ordering of the items in the subscales of the CSSE?**

Data Collection

- **Community college students in the Rocky Mountain region of the US**
- **Introduction to statistics students**
- **N = 161**

DEMOGRAPHIC INFORMATION

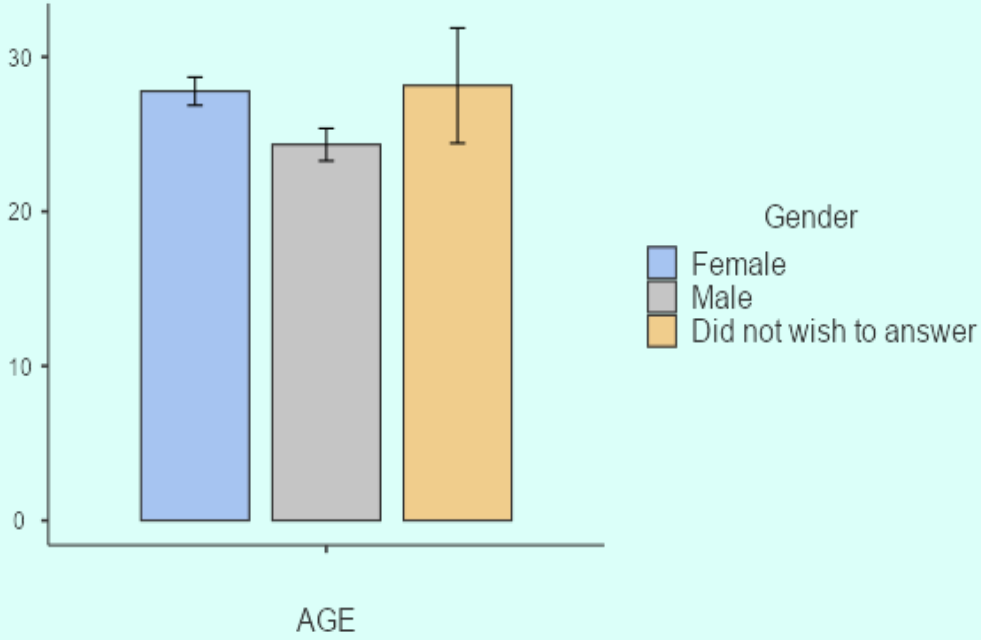


71.4%
FEMALE

21.1%
MALE

7.5%
DID NOT
RESPOND

AGE BY GENDER

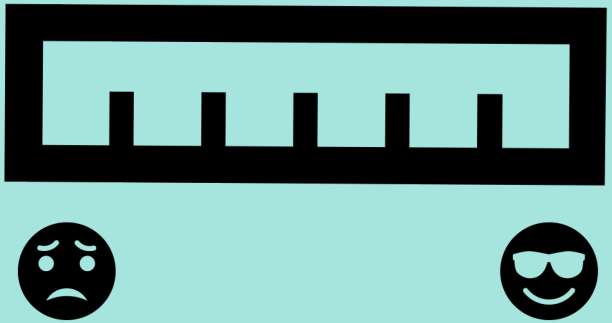


MEASURES

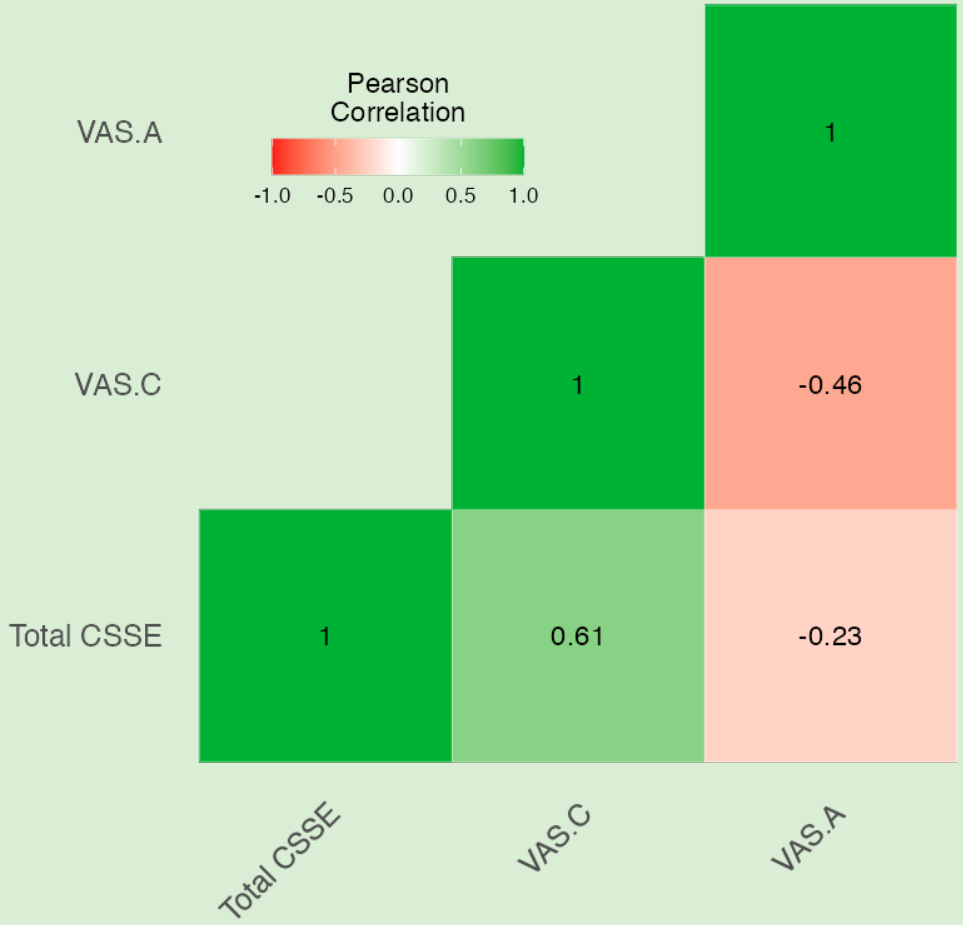
- **The Current Statistics Self-Efficacy (CSSE) instrument was developed by Finney and Schraw (2003) and it is a popular tool to assess student's self-efficacy to learn statistics.**
- **The CSSE uses a 14-item 6-point Likert scale ranging from 1 (no confidence at all) to 6 (complete confidence).**
- **Examples items:**
    - Distinguish between the objectives of descriptive versus inferential statistical procedures
    - Select the correct statistical procedure to be used to answer a research question

VAS

- **How confident are you in learning statistics?**
- **How anxious are you in learning statistics?**



Concurrent Validity



Rasch Analysis

8. Distinguish between a Type I error and a Type II error in hypothesis testing	2.29
11. Distinguish between the information given by the three measures of central tendency	2.02
9. Explain what the numeric value of the standard error is measuring	1.92
10. Distinguish between the objectives of descriptive versus inferential statistical procedures	1.69
3. Identify if a distribution is skewed when given the values of three measures of central tendency	1.58
7. Explain what the value of the standard deviation means in terms of the variable being measured	1.51
2. Interpret the probability value (p-value)from a statistical procedure	1.43
6. Identify the factors that influence power	1.42
12. Distinguish between a population parameter and a sample statistic	1.40
4. Select the correct statistical procedure to be used to answer a research question	1.39
5. Interpret the results of a statistical procedure in terms of the research question	1.00
14. Explain the difference between a sampling distribution and a population distribution	0.82
1. Identify the scale of measurement for a variable	0.45
13. Identify when the mean, median, and mode should be used as a measure of central tendency	0.35

Distinguish between a Type I error and a Type II error in hypothesis testing

- **Art of Stat website**
  - https://istats.shinyapps.io/power/
- **G*Power**
  - https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower
- **jPower in jamovi**
  - Limited to t-tests

How to use the CSSE in the classroom

- **Collecting data at the beginning of the semester vs end.**
- **Rasch is useful...**
    - Realistically you can focus on the category distributions to see which items are easiest to endorse vs difficult to endorse.
    - There might be a semester lag
    - Many introductory statistics course utilize software. Computer self-efficacy might be another issue not reflected in this study.

References

Chew, P., Dillon, D. B., & Swinbourne, A. L. (2018). An examination of the internal consistency and structure of the Statistical Anxiety Rating Scale (STARS). PloS one, 13(3), e0194195. https://doi.org/10.1371/journal.pone.0194195

Cui, S., Zhang, J., Guan, D., Zhao, X., & Si, J. (2019). Antecedents of statistics anxiety: An integrated account. Personality and Individual Differences, 144, 79-87.

Finney, S., & Schraw, G. (2003). Self-efficacy beliefs in college statistics courses. Contemporary Educational Psychology, 28, 161-186. doi:10.1016/ S0361- 476X(02)00015-2

Luttenberger, S., Wimmer, S., & Paechter, M. (2018). Spotlight on math anxiety. Psychology research and behavior management, 11, 311–322. https://doi.org/10.2147/PRBM.S141421

Vigil-Colet, A., Lorenzo-Seva, U., & Condon, L. (2008). Development and validation of the Statistical Anxiety Scale. Psicothema, 20(1), 174–180.