



DUE-2013392

SOMAS/DS: Measuring the Learning Environment, the Instructor, and the Student

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United States Conference on Teaching Statistics 2021

1 July 2021

SOMAS = Survey Of Motivational Attitudes towards Statistics

SOMADS = Survey Of Motivational Attitudes towards Data Science

Attitudes and Statistics

- BACKGROUND:
 - SERJ, November 2012, *Surveys Assessing Students' Attitudes Toward Statistics: A Systematic Review of Validity and Reliability*, by Meaghan M. Nolan, Tanya Beran, and Kent G. Hecker
- Candace Schau, J. Stevens, T. L. Dauphinee, A. DelVecchio created the **Survey of Attitudes Towards Statistics** (SATS – 28 / 36) in early 1990s
- 4 Constructs -> Affect, Cognitive Competence, Difficulty (Perceived easiness), Value
 - Suggest that one doesn't use Interest or Effort IF you are using the SATS
- 2006 – 2014 Work with SATS, Bond & Schau & others
 - **The SATS Project** collected Fall 2007 to Spring 2010 (Bond & Schau collected) (*Student/Instructor/Course*)
 - Many JSMs, USCOTS, and ICOTS sessions as well as Special Issue in SERJ, Nov. 2012.
- SOfIA '14 & '15
- Issues with SATS

ROSA '16 & 17 (Research On Statistics Attitudes)

Funded by membership initiative grant from American Statistical Association



- 3 Workshops
- 4 Models
 - Meta – Model
 - Students and Instructors models based on Expectancy Value Theory (EVT (Eccles (Parsons) et al., 1983; Eccles & Wigfield, 2020)
 - Environment Model
- Pilot-0 S-SOMAS
- Solid research team and
- After 3 tries, an NSF grant.



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Developing Validated Instruments to Measure Student/Faculty Attitudes in Undergraduate Statistics and Data Science Education

1. Develop instruments that measure undergraduate **students' attitudes** towards statistics and data science
2. Develop instruments that measure the learning **environment, instructor attitudes** about teaching introductory statistics and data science, and **pedagogical practices** that may impact students' attitudes, engagement, and/or achievement

4 instruments & 2 inventories to be developed

	Student Instrument	Instructor Instrument	Environment Inventory
Statistics	S-SOMAS	I-SOMAS	E-SOMAS
Data Science	S-SOMADS	I-SOMADS	E-SOMADS

SOMAS = Survey Of Motivational Attitudes towards Statistics

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Distinction between S, I, and E Surveys

Student Instruments

- Measures student attitudes toward statistics or data science
- Administered pre and post semester
- Can be administered longitudinally

Instructor Instruments

- Measures instructor attitudes toward teaching statistics or data science
- Administered perhaps once a year

Environment Inventories

- Measures institutional and course characteristics, learning environment, and enacted classroom behaviors (Pedagogy)
- Instructor completes for each course

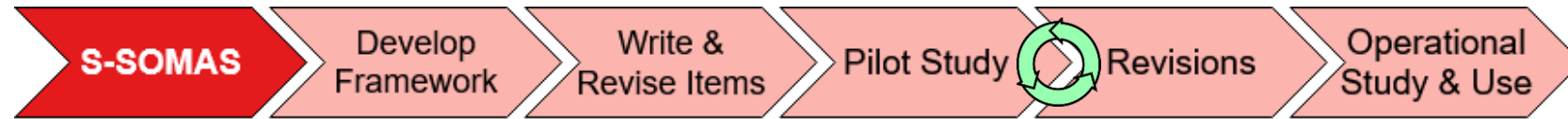
GOALS:

1. Develop instruments that measure undergraduate **students' attitudes** towards statistics and data science
2. Develop instruments that measure the learning **environment, instructor attitudes** about teaching introductory statistics and data science, and **pedagogical practices** that may impact students' attitudes, engagement, and/or achievement
- 3.
4. Create a **sustainable infrastructure** to facilitate data collection and dissemination (website development, survey deployment, individualized reports, public access to data, and dissemination of findings)

GOALS:

1. Develop instruments that measure undergraduate **students' attitudes** towards statistics and data science
2. Develop instruments that measure the learning **environment, instructor attitudes** about teaching introductory statistics and data science, and **pedagogical practices** that may impact students' attitudes, engagement, and/or achievement
3. Develop and rigorously **validate** the instruments including expert reviews, pilot surveys, instrument revision, measures of validity and reliability, and transparent reports on this process
4. Create a **sustainable infrastructure** to facilitate data collection and dissemination (website development, survey deployment, individualized reports, public access to data, and dissemination of findings)

Instrument Development Plan



Item Writing Process

- Drafts of items written
- Subject Matter Experts (SMEs) review and provide feedback
- Revision to items
- Data collection (Pilot 1)
- Data analysis (factor analysis)
- Focus groups
- Revisions to scales and items; more item writing
- More SME reviews, focus groups,
- Data collection (Pilot 2 / Final?)



What can you do to assist us?

SMEs for I-SOMAS/DS and S-SOMADS

- Knowledgeable of Data Science
- Knowledgeable of survey development
- Have a colleague in Psychology or Educational Psychology contact us.

Contact:

April Kerby-Helm (akerby@winona.edu)

Marjorie Bond (mebond@monmouthcollege.edu)

Focus Groups for I-SOMAS / DS

- Instructors of S or DS
- Two-year college instructors in either S or DS.
- On-line college instructors in either S or DS
- Instructors at various career points

Focus Groups for S-SOMADS

Help recruiting your students to participate in focus groups

What can you do to assist us?

Help us Administer Pilot Instruments

- Instructors of Introduction to Statistics courses
- Instructors of Introduction to Data Science courses
- Other S / DS courses
- Administrators of many sections / many instructors
- On-line, two-year, not just Math / Stat Departments

And we will need you when our final instruments need validated

Contact:

April Kerby-Helm (akerby@winona.edu)

Marjorie Bond (mebond@monmouthcollege.edu)

What can you do to assist?

Recruitment

Gift cards and honoraria for some activities,
and heartfelt thanks for other activities.

- Colleagues at your institution
- May attention to e-mails with the subject line:
MASDER: Motivational Attitudes in Statistics
and Data science Education Research

Contact:

April Kerby-Helm (akerby@winona.edu)

Marjorie Bond (mebond@monmouthcollege.edu)

MASDER Team



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The Motivational Attitudes in Statistics and Data Science Education Research (MASDER) team:

- Leyla Batakci *Elizabethtown College*
- Wendi Bolon *Monmouth College*
- Marjorie Bond *Monmouth College*
- April Kerby *Winona State University*
- Michael Posner *Villanova University*
- Alana Unfried *California State University, Monterey Bay*
- Douglas Whitaker *Mount Saint Vincent University*

Also: numerous undergraduate and graduate student assistants (including Matt Dunham); Research On Statistics Attitudes (ROSA) Working Group; USCOTS 2015 and 2017 Workshop participants; *many more!*

References

- Eccles, J. S., & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. *Contemporary Educational Psychology*, 61, 101859. <https://doi.org/10.1016/j.cedpsych.2020.101859>
- Eccles, J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectations, values, and academic behaviours. In *Achievement and achievement motives: Psychological and sociological approaches* (pp. 76–146).
- Nolan, M. M., Beran, T., & Hecker, K. G. (2012). Surveys assessing students' attitudes toward statistics: A systematic review of validity and reliability. *Statistics Education Research Journal*, 11(2), 103–123.
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- Unfried, A., Kerby, A., & Coffin, S. (2018). Developing a Student Survey of Motivational Attitudes Toward Statistics. *2018 JSM Proceedings*. Joint Statistical Meetings 2018, Vancouver, Canada.
- Whitaker, D., Unfried, A., & Bond, M. (2019a). Design and validation arguments for the Student Survey of Motivational Attitudes toward Statistics (S-SOMAS) instrument. In J. D. Bostic, E. E. Krupa, & J. C. Shih (Eds.), *Assessment in Mathematics Education Contexts: Theoretical Frameworks and New Directions* (1st ed., pp. 120–146). Routledge. <http://ec.msvu.ca/xmlui/handle/10587/2125>
- Whitaker, D., Unfried, A., & Bond, M. (2019b, May). *Challenges to Using and Interpreting the SATS-36 Instrument: Do you like statistics? Do your students like statistics? How do you know?* [Poster]. United States Conference on Teaching Statistics (USCOTS), State College, PA. <http://ec.msvu.ca:8080/xmlui/bitstream/handle/10587/2120/USCOTS%202019%20-%20SATS%20Poster%20-%20Print.pdf?sequence=1&isAllowed=y>
- Whitaker, D., Unfried, A., & Bond, M. (in press). Challenges associated with measuring attitudes using the SATS family of instruments. *Statistics Education Research Journal*.

Questions?
Live Q&A Thursday, July 1st
2:45pm-3:30pm ET



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