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

Marjorie Bond
Monmouth College

Leyla Batakci
Elizabethtown College

Wendine Bolon
Monmouth College

April Kerby-Helm
Winona State University

Alana Unfried
California State University, Monterey Bay

Douglas Whitaker
Mount Saint Vincent University

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:
  • 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.
  • SOflA ’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.
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

<table>
<thead>
<tr>
<th></th>
<th>Student Instrument</th>
<th>Instructor Instrument</th>
<th>Environment Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics</td>
<td>S-SOMAS</td>
<td>I-SOMAS</td>
<td>E-SOMAS</td>
</tr>
<tr>
<td>Data Science</td>
<td>S-SOMADS</td>
<td>I-SOMADS</td>
<td>E-SOMADS</td>
</tr>
</tbody>
</table>

SOMAS = Survey Of Motivational Attitudes towards Statistics

SOMADS = Survey Of Motivational Attitudes towards Data Science
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. 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)
**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.

**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

Contact:
April Kerby-Helm (akerby@winona.edu)
Marjorie Bond (mebond@monmouthcollege.edu)
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

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

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

Contact:
April Kerby-Helm (akerby@winona.edu)
Marjorie Bond (mebond@monmouthcollege.edu)
MASDER Team

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


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

Marjorie Bond
Monmouth College

Leyla Batakci
Elizabethtown College

Wendine Bolon
Monmouth College

April Kerby-Helm
Winona State University

Alana Unfried
California State University, Monterey Bay

Douglas Whitaker
Mount Saint Vincent University

United States Conference on Teaching Statistics 2021
1 July 2021