V0F 2021 Schield ASA 1

UNM Offers New Confounder-Based Statistical Literacy Course

Milo Schield, Univ. New Mexico
Fellow: American Statistical Association
Member: International Statistical Institute
US Rep: International Statistical Literacy Project
President: National Numeracy Network

JSM Online August 11, 2021
Paper: www.StatLit.org/pdf/2021-Schield-ASA.pdf
www.StatLit.org/pdf/2021-Schield-ASA-Slides.pdf
www.StatLit.org/pdf/2021-Schield-ASA-Slides-Speed.pdf

V0F 2021 Schield ASA 2

Presentation has Two Main Parts

1. What is new about Math 1300?
   a. How does Math 1300 relate to a traditional introductory statistical inference course?
   b. What textbook is being used?
   c. Does it satisfy a math requirement in the UNM core curriculum and in the New Mexico general education curriculum?
2. How were these goals achieved?

Part 1 V0F 2021 Schield ASA 3

Statistical Literacy: MATH 1300 in the UNM Catalog

Statistical Literacy

UNIVERSITY CATALOG

MATH 1300 (3)
Participants will study the social statistics encountered by consumers. Investigate the story behind the statistics. Study the influences on social statistics. Study the techniques used to control these influences. Strong focus on confounding.

Meets New Mexico General Education Curriculum Area 2: Mathematics and Statistics.

Part 1 V0F 2021 Schield ASA 4

UNM Math 1300: Quick Summary

Less than 30% overlap with traditional statistics

Holistic: Studies all influences on a statistic: confounding, assembly, randomness & error

Statistical: Study design, Cornfield conditions, confounder-influence on statistical significance

GAISE 2016: MV regression: standardization

Ordinary English: conditional probability

Applied/literary: Analyze one or two cases/week

Part 1 V0F 2021 Schield ASA 5

UNM Math 1300: Big Ideas

Association is not [always] causation; Disparity is not [always] discrimination

Crude association: An association that does not take anything else into account; a mixed-fruit (apples & oranges) comparison.

To take into account (to control for) a confounder is to adjust (balance) the confounder mixture.

Part 1 V0F 2021 Schield ASA 6

UNM Math 1300: Student Learning Outcomes

1. Distinguish association from causation; form two-group comparisons using ordinary English.
2. Identify and evaluate kinds of statistical influence: confounding, assembly, randomness and error.
3. Can identify, evaluate and use techniques to take control of – or control for – these influences.
4. Can describe and compare rates and percentages using ordinary English
5. Can analyze and evaluate the statistics in the everyday media, press releases and journal articles.

Confounder-Based Statistical Literacy Textbook

Getting New Course Approved at UNM

New course approval is no small matter

These slides summarize the steps involved in getting statistical literacy approved:

1. by the Mathematics-Statistics Department
2. for the UNM core curriculum
3. by the NM Higher Education Department for the general education curriculum
4. For entry in the UNM catalog.

Consultant Responsibilities

Starting in fall 2018, the consultant's job was to:

- Generate syllabus & description for the course
- Generate Student Learning Outcomes (SLOs)
- Identify how SLOs would be assessed
- Generate sample assessment & budget load
- Connect SLOs to UNM curriculum goals
- Get approved as a core course at UNM
- Get approved for Gen Ed in New Mexico.

New Course Approval: Document Categories

This process took 18 months to complete.
The 11 documents are presented in four groups:

1a: New Course request (Form B)
1b: Catalog description
1c: Syllabus

2a: Add common course number
2b: Students Learning Outcomes (SLOs)

New Course Approval: Document Categories

3a: General Education: Add a course
3b: Assessing Student Learning Outcomes
3c: Goals and Student Learning Outcomes
3d: Sample Assessment

4a: New Course Signoff (Form C)
4b: Budgetary Load Implications

New Course Request Form B: 1a Overview

Allow 6 months to complete the approval process.

Attach the following:

- Precise complete catalog listing of the new course. This must include the course subject code, and course number, long title, credit hour value and course description.
- Course syllabus and bibliography.

New Course Request Form B
1a Justification and Impact

Justification: Students in non-STEM majors need a statistics course that studies everyday statistics as evidence in arguments. This course complements the existing Intro Statistics course: MATH 1350.

Impact: If other departments decide to require Statistical Literacy, this could lead to an increase in the number of sections that need to be offered after the first two years.

C. Course Fees & Status: No fees; elective.

New Course MATH 1300:
1c Syllabus (2)

Goals To help students think critically about statistics as evidence in arguments: to see the story behind the story. To help students see value in becoming statistically literate.

Required Text: *Statistical Literacy 2021* by Schield. Registration in the online forum.

Grading Components Requirements:
Chapter Exercises (7@3%) 21%,
Forum writing (10-16 cases) 20%; Project and Attendance 9%;
Exams (two) 18%; Final Exam 30%; Course Evaluations 2%

New Course MATH 1300:
1c Syllabus Schedule by Week

1: Ch 1 Statistics in Arguments. Take CARE
2: Ch 2 Forming comparisons. control influences
3: Evaluate news stories; review homework
4: Ch 3 Understanding Measurements
5: Ch 4 Percent and percentage grammar
6: Ch 5 Reading ratios in tables and graphs
7: Evaluate news stories; review homework
8: Review Ch 1-4. Exam 1

New Course MATH 1300:
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9: Ch 6 Compare ratios
10 Ch 7 Interpret difficult ratios, Medical tests.
11 Evaluate news stories and Exam #1
12 Review Ch 4-6. **Exam 2: Ch 4-6.**
13 Ch 8 Samples, significance and confounding
14 Evaluate news stories, Review homework,
15 Evaluate news stories. Review Exam 2
16 Review Ch 1-4, Ch 5-8.
17 Final Exam Ch 1-8.
Note: UNM semester is 17 weeks

New Course MATH 1300:
4a Form C: Program Change

New Course: Statistical Literacy

Reasons for Request: *To serve the changing needs of our diverse student body. To help them read, interpret and evaluate the statistics used in arguments and the everyday news. To offer our students an alternative to our traditional statistical inference course.*

Does this change affect in a significant way, any other departmental programs/branch campuses? NO

Statistical Literacy NM HED:
2b Student Learning Outcomes (1)

To: New Mexico Higher Education Department.

Here are five student learning outcomes. They encompass most of what is covered in a confounder-based statistical literacy course. They can be readily assessed.

- *1. Can distinguish association from causation in reality and in using ordinary English. Can use ordinary English to form arithmetic descriptions and comparisons of statistics.*

Statistical Literacy NM HED: 2b Student Learning Outcomes (2)

2. Can identify and evaluate known influences (confounding, assembly, randomness and error) on a statistic. Can think hypothetically about influences that are unknown or unmeasured.

3. Can identify, evaluate and use various techniques to take control of – or control for – these influences. These techniques include the physical control of randomness to determine statistical significance and the mental control for the influence of measured confounders on a statistic, a statistical association and statistical significance.

Statistical Literacy NM HED: 2b Student Learning Outcomes (3)

4. Can use ordinary English to describe and compare ratios as presented in statements, tables and graphs using percent, percentage, rate and chance grammars.

5. Can evaluate the strength of evidence provided by statistics in the everyday media, in press releases and in journal articles.

Statistical Literacy NM HED: 3a Gen Ed Add Course

C. Learning Outcomes

[*Same five as the Student Learning Outcomes: SLOs*]

Show how the course connects to three of the New Mexico Higher Education general education skills. These three were chosen:

- Critical Thinking,
- Quantitative Reasoning, and
- Communications

Statistical Literacy NM HED: 3a Gen Ed Add Course

In this box, provide a narrative that explains how the proposed course addresses the outcomes of this essential skill. 250 – 400 words. [See paper for StatLit response.]

Skill #1: Critical Thinking. *Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning/Conclusion*

Statistical Literacy NM HED: 3a Gen Ed Add Course

Skill #2: Quantitative Reasoning.
Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models

Skill #3: Communication.
Genre and Medium Awareness, Application and Versatility; Strategies for Understanding and Evaluating Messages; and Evaluation and Production of Arguments.

Statistical Literacy NM HED: 3b: Assessment of SLOs

Methods of assessment:

- *Multiple choice questions in exercises and tests*
- *Writing one-line statements that describe or compare counts, average, rates & percents.*
- *Writing well-reasoned arguments in analyzing news stories tables and graphs (online)*

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Confounder-Based Statistical Literacy Textbook

Statistical Literacy: A New Discipline

"Schield's approach to statistical literacy helps Capella students think critically while satisfying Capella's general education requirement in mathematical and logical reasoning." Dr. Valerie Perkins, Dean of Capella's School of Undergraduate Studies.

"I am convinced that the standard first course in statistics, which focuses on getting to significance testing and confidence intervals, isn't an appropriate aim for a lot of students. I think Schield's approach to statistical literacy is much closer to what is needed by journalists, by policy makers, by those in business, commerce or management and by most people in everyday life." Peter Holmes, Royal Statistical Society Centre for Statistical Education.

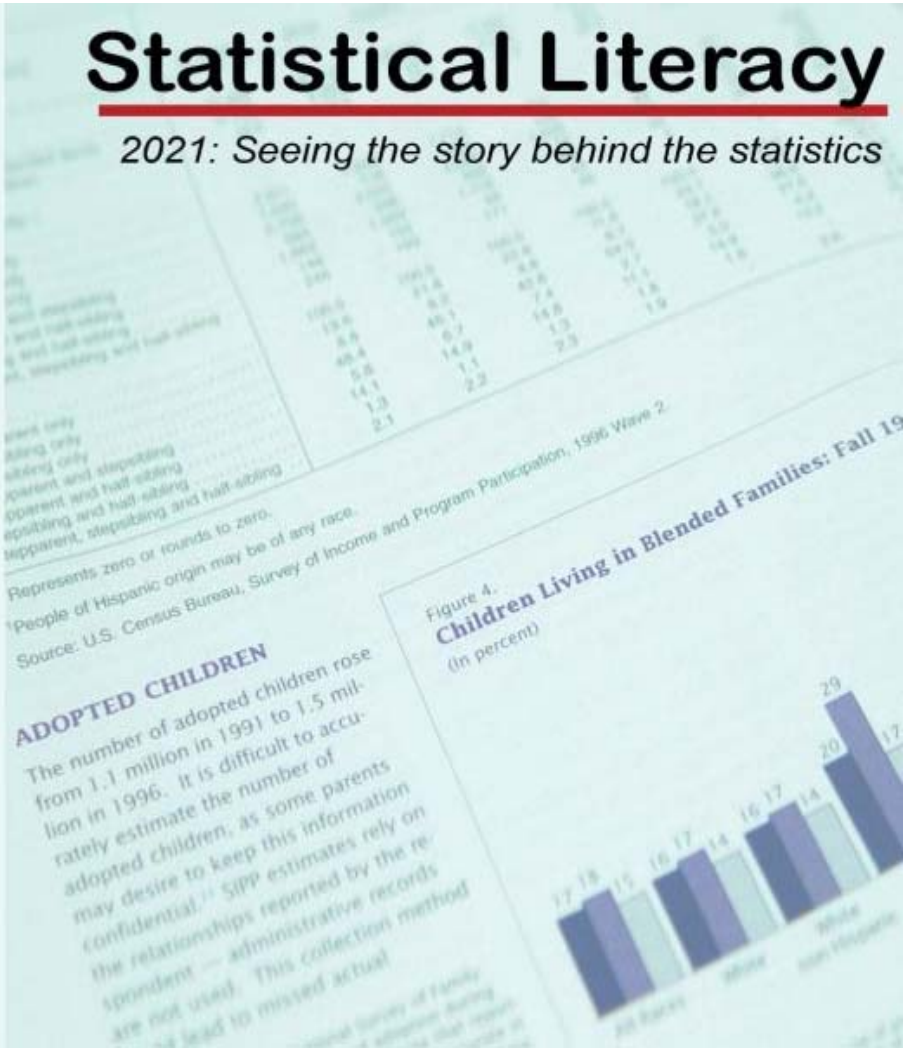
"A small educational movement advocating statistical literacy has emerged. Professor Milo Schield, Director of the W. M. Keck Statistical Literacy Project, at Augsburg College in Minneapolis, is the movement's leading voice." Dr. Joel Best, author of *More Damned Lies and Statistics.*

Milo Schield

Dr. Milo Schield is a consultant with the University of New Mexico. His Ph.D. in Space Physics is from Rice University.

Schield is a Fellow of the American Statistical Association (ASA), the US Coordinator for the International Statistical Literacy Project (ISLP) and the President of the National Numeracy Network (NNN).

Statistical Literacy 2021 s



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