American Honda Foundation
Augsburg Grant Proposal: Statistical Literacy

1a. Proposed Project: Fund production, evaluation and dissemination involving Statistical Literacy.

1b. Project title (#17): Statistical Literacy.

1c. Type of Program (#18): This is a pilot program

1d. Grant request (#19). a) Amount of Request: $75,000. b) Total Program Budget: $67,500. c) Start date: August 1, 2020. d) End date: July 30, 2021

2. Description (#21): The ultimate goal of this project is to help students improve their critical thinking about social statistics used as evidence in arguments they encounter in the everyday media. This project is based on a statistical literacy course that is radically different. The goals of this grant are (1). To develop course exercises and teacher training materials. The course exercises will be used and evaluated by students at the University of New Mexico. (2) To obtain student and teacher analysis and evaluation. (3) To disseminate these evaluations at a national conference and in a special issue of a national publication. This new course is ready for rapid deployment with no additional cost. The teacher reviews will help other teachers adopt this course more quickly.

2A. Executive Summary:

Who and Where: This project will involve 400 students at the University of New Mexico, and 40 students at Augsburg University. It will also involve 30 statistical educators as reviewers, two as producers and one UNM teacher as a reviewer of student results at the University of New Mexico.

What: (1) The producers will produce student exercises, class projects and teacher training materials. (2) Students will evaluate the course materials. Teachers will review statistical literacy as a discipline and as a course. They will review the syllabus, the textbook and the student exercises. The UNM teacher will review the student results at the University of New Mexico. All reviewers will submit their results as publishable papers. (3) Selected papers will be published in a special issue of Numeracy: a peer-reviewed publication of the National Numeracy Network (NNN).

When: The course will be taught at the University of New Mexico and at Augsburg University in both the fall and the spring. The student exercises and teacher training materials will be developed in the summer of 2020. The editing of the special issue of Numeracy will be done in the summer of 2021.

Why: Students want to be engaged in social, political and environmental issues. These typically involve statistics. All too many of today's students are statistically illiterate. They treat these statistics as though they were just numbers. They don't realize that social statistics are numbers in context. They don't realize that social statistics can be influenced.

Even worse, they don't know how to read a table or graph involving rates or percentages. They don't know how to form a comparison of rates or percentages. Still worse, they have difficulty separating an association from causation. They mistakenly presume that if two things are linked then that is proof that this statistical association is evidence of a causal connection.

This project involves a statistical literacy course: a course that involves critical thinking about statistics as evidence in arguments. This course if very different; it has less than a 30% overlap with the traditional introductory statistics course. This grant will prepare this new course for rapid deployment to high schools, to two-year colleges and to four-year colleges throughout the US and the world.

PROBLEM 1: STUDENT ILLITERACY

Today's students are statistically illiterate. That wasn't a big problem in prior generations where data was limited. Statistical illiteracy is a problem for today's generation where data is common. Being statistically illiterate inhibits students' ability to think critically about today's social issues. Students end up as either cynical (never trust a statistic) or naive (assume every statistic is true and strong).

Statistical illiteracy is a major problem in America. The inability to identify or critique arguments involving statistics is a major reason why our political debates have become so polarized. Each side selects statistics that support its position. If our citizens are statistically illiterate, they have no way to critique or evaluate what is being said.   If our country is to argue more productively, citizens need to become statistically literate. Just because an argument mentions that "studies show X", does not mean that this claim is immune to change after taking into account related factors.

The typical statistics course (whether taught in college or in high school) does almost nothing to address statistical illiteracy.   It is focused on randomness. Today's students need a different course – an argument-based statistical literacy course – to help them deal effectively with current social problems.

STEM & ENVIRONMENT

Many of today's social problems involve STEM and the environment. Many of the environmental issues involve one or more of the STEM fields. For example, the statistics on greenhouse gases is strongly influenced by whether or not water vapor is considered to be a greenhouse gas. Whatever the social or environmental problem, it seems that there is always a quantitative aspect.

ARGUMENT-BASED STATISTICAL LITERACY

Argument based statistical literacy is a radically different course with a very strong focus on observational studies and confounding. There is less than a 30% overlap with traditional statistics courses.

Argument-based statistical literacy is arguably not just a new course – it is a new discipline!   It is really a quantitative rhetoric course: a critical thinking course focused on using statistics as evidence.

This new course/discipline is arguably the biggest change in math-stats in decades. Most of the changes have been in pedagogy, in tools (calculators, computers) or in techniques (resampling).

Such a course has been developed. It was initially funded in 2001 by a $500,000 grant from the W. M. Keck Foundation to Augsburg University "to support the development of statistical literacy as an interdisciplinary curriculum in the liberal arts." Milo Schield was the project director. His statistical literacy course has been taught and refined at Augsburg University for over 15 years.

Dr. Schield is an intellectual entrepreneur. He has used his background in mathematics and science along with his experience in teaching critical thinking to create a radically different kind of course. He has argued[1] that such a course should be taught in high schools as an alternative to Algebra 2 for college bound students who prefer non-quantitative majors such as English, Music, History, Art, etc.

Schield has promoted statistical literacy via his unique website: www.StatLit.org. With over 350,000 visits and 450,000 downloads in 2018, his website is Google rated as the world's number one website dedicated to statistical literacy. Schield has promoted statistical literacy by giving hundreds of talks in the US and over 30 talks overseas in 20 countries on every continent except Antarctica.

Wiley Publishers have agreed to publish Schield's textbook: *Statistical Literacy for Decision Makers*. Schield's statistical literacy course was adopted by the University of New Mexico in early 2020 and is being included in their core education program. It will be taught starting with the fall of 2020.

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[1] Schield (2004): Quantitative Literacy and School Mathematics: Percentages and Fractions. Mathematical Association of America (MAA).

SCIENCE LITERACY

Traditionally science literacy has focused on repetition: laboratory experiments. Today, much of what citizens read about science in the news involves 'studies'. The phrase 'studies show' occurs almost ten times as often in the media as it did in 1990. The observational sciences (epidemiology, geology, anthropology, space physics and parts of health and medicine) have become the paradigm for science literacy. This course provides a foundation in the philosophy of science with its focus on evaluating the results of observational studies.

PROBLEM #2: LACK OF TEACHER TRAINING

Unfortunately, rapid dissemination is very unlikely. The obstacles are formidable. The content of traditional statistics has changed very little since the early 1950s. Statistical literacy is a radical change. The difference in content is huge. But this is not the biggest difference. Traditional statistics is like mathematics: deductive thinking. Statistical literacy involves critical thinking: strength of evidence, alternative explanations, etc. Statistical literacy is best seen as quantitative rhetoric. Traditional statistics is like a math course: the words are often incidental. Statistical literacy is like a literature or history course: the words are essential. Training mathematicians how to teach a critical thinking course is extremely difficult. It is like training accountants or school teachers to become successful in sales or in motivational training. Math teachers will need training materials to help them be effective in teaching a critical thinking course.

GRANT ACTIVITIES

This grant involves three activities: production, evaluation and dissemination.
1. Production: To develop new materials for students and for teacher training, and to test these materials at the University of New Mexico and at Augsburg University,
2. Evaluation: To have teachers review statistical literacy as a new discipline and course.
3. Dissemination: The results will be disseminated in papers, in conference presentations and in a special issue of the peer-reviewed quantitative literacy journal: *Numeracy*.

CONCLUSION

The ultimate goal of this grant is to support the rapid deployment of this course and the teacher training. Introducing this course at the high school and college level will mark the most dramatic change in the mathematics curriculum in decades. It will take a concerted effort to make this change.

Students, educated citizens and decision-makers need this course – a modern course focused on social statistics. A course that will help them evaluate everyday statistics so they can make better personal, business and social decisions. If successful, this grant will help produce future citizens who can raise the quality of questions and arguments that involve statistics as evidence – and hopefully improve the quality of political and social debate worldwide!

Yes, giving a grant to support this kind of activity may be unconventional. But this project is unconventional. It will take a different approach in order to achieve its full potential.

2B. The Course

Statistical literacy is different – very different. Here are some of the student misconceptions that are addressed:

- Students don't realize that statistical associations can be influenced by what is taken into account.
  - Students don't understand how the worst hospital (highest patient death rate) may be the best hospital (lowest patient death rate) once patient condition is taken into account.

- o Students don't understand how the average SAT score in 1990 was the same as in 1980, yet SAT scores increased by at least 10 points for every racial and ethnic group.
- Students don't realize that statistics can be influenced by choices in making comparisons, in forming ratios and in comparing ratios.
    - o Students don't understand how the auto death rate can be *higher* in Hawaii than in Arkansas by mile, but the same data gives a *lower* auto death rate in Hawaii than Arkansas by vehicle.[2]
    - o Students don't understand how CO_2 can be 74% of all man-made greenhouse gases, but only 3.2% of CO_2 is man-made.
- Students don't realize that social statistics depend on how one defines or interprets words.
    - o The US has a higher infant death rate than Japan, but in Japan, an infant is not counted as being born until they have signs of breathing whereas in the US breathing is not necessary.
    - o Students mistakenly think that if a medical test is 99% accurate, then a positive outcome is 99% accurate in predicting the disease. They don't realize that if 1% of the population has the disease, then only 50% of those with positive test results will actually have the disease.
- Students don't realize that English is used in very precise ways when dealing with social statistics. Students mistakenly think
    - o Action verbs imply causation. E.g., Eating nuts cuts cancer risk.
    - o 'The percentage of men who smoke' is the same as 'the percentage of men among smokers.'
    - o If X deaths are attributed to obesity, this means these deaths are caused by obesity.
- Students don't realize that social statistics can be influenced by randomness.
    - o Students don't realize that being the most outstanding college athlete in the nation may be due to coincidence. All too often the athlete featured on the cover of Sports Illustrated doesn't perform as well afterward. Why? They were best by luck. A repeat is difficult.
- Students don't realize that social statistics can be influenced by bias or error.
    - o Knowing who was surveyed is at least as important as are the survey results.
    - o Social pressures and slanted questions can easily influence survey and poll results.
    - o They don't realize that a political poll (of a future result) is very different from a survey.

2C. HOW: Grant Elements and Activities

This project has three activities: production, evaluation and dissemination.

- *Production* includes the production of student exercises and projects for students in large classrooms (50-60 students per classroom) and the production of teacher training materials.

    - Marc Isaacson will be responsible for developing student exercises and activities. Doing this requires that he be able to teach the Statistical Literacy course at Augsburg. Currently that course is not scheduled to be taught in fall 2020 while Schield is on sabbatical. Part of the budget is a payment to Augsburg University to hire an adjunct to teach one of Isaacson's classes, so Isaacson can teach the statistical literacy course.

    - The project PI, Milo Schield, will create the teacher-training materials to help math teachers teach a critical thinking course. This will involve a series of short essays and/or

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[2] www.statlit.org/pdf/2010SchieldASA.pdf

audio or video clips. These will be made freely available and hosted on the web. A small amount is set aside for technical support.

- *Evaluation* includes teacher and student evaluations of the course and course materials and student evaluations of the course and course materials.

  - Recruiting teachers (23): Schield will be responsible for recruiting teachers (high school and college teachers who teach traditional introductory statistics. He has already obtained expressions of interest from almost a dozen teachers. A call for participants will be distributed through four channels: the National Numeracy Network membership, the statistical educators that are members of the American Statistical Association, and the statistical educators that are member of the Quantitative Literacy Special Interest Group of the Mathematical Association of America. Schield has recruited similar number of teachers in the past and does not see this as a problem.

  - Teacher reviews will be generated by the teachers. These teacher reviewers are given various papers, the textbook and the teacher-training materials. Their job is to review various papers arguing that statistical literacy is substantially different from traditional statistics and to review the Schield textbook that is based on an argument/confounder basis. They then critique both the materials and the goals of statistical literacy. Is statistical literacy really a statistics course? A prominent statistical educator, David Moore, raised this question. The final step for the reviewers is to generate written, publishable summaries of their reviews and critiques

  - Student reviews will be compiled into a publishable paper by Dr. Erik Erhardt from the classes taking the new statistical literacy course at the University of New Mexico.

- *Dissemination* takes two forms: verbal and written.
  - The verbal dissemination involves given presentations at the annual meeting of the National Numeracy Network (NNN). Six teachers will be selected to make verbal presentation of their evaluations. Ideally, this would include two from the University of New Mexico.
  - The written dissemination involves compiling papers for a special issue of the NNN journal *Numeracy* on statistical literacy.   The editor of *Numeracy* is very open to publishing a special issue on Argument-Based Statistical Literacy. Marc Isaacson and Milo Schield would be editors.   The editors would select those papers to be included in the special issue of this peer-reviewed journal.

3. Long Term Goals (#24):

To help students
- read, interpret and evaluate the statistics in statements, tables and graphs
- read, interpret and evaluate the statistics in news stories, press releases and journal articles
- become sensitive to the various kinds of influence on a social statistic
- think hypothetically about how a statistic might have been constructed or influenced
- appreciate the need and the value of being educated in each of the above activities

To help math-stat teachers:
- get better at teaching statistical sensitivity to a variety of influences

- teach critical thinking involving statistics and strength of evidence
- see that confounding is more important for most students than randomness
- see value in teaching confounder-based statistical literacy

4. Short-term Measureable Outcomes (#25)

For the students, a primary outcome is the result of a longitudinal survey taken before and after the course. This nationally validated survey (SATS)[3] involves four components: student affect, student attitudes about their cognitive competence, student attitudes about the value of statistics in the personal and professional life, and student attitudes about the difficulty of the material.

This project will also collect student data from student exercises: multiple choice exercises, one-line descriptions and comparisons of statistics, critiques of news stories. This project will also collect data from those teaching this course. Statistical analysis will involve traditional t-tests and chi-squared tests. This data will be disseminated at a national conference and published in a peer-reviewed journal.

5. Data Collection and Evaluation (#26)

This project will collect student data from student exercises: multiple choice exercises, one-line descriptions and comparisons of statistics, critiques of news stories. It will use a nationally validated SATS assessment to compare students' attitudes before and after taking this course. This project will also collect data from those teaching this course. Statistical analysis will involve traditional t-tests and chi-squared tests. This data will be disseminated at a national conference and published in a peer-reviewed journal.

6. Plan for growth (#27)

This web-based course is ready for rapid deployment. The University of New Mexico is planning to offer four sections in fall 2020 and expand thereafter depending on the feedback from the teachers, and the buy-in from other departments. The principal investigator has been contacted by high school teachers looking for an alternative to AP statistics. Once it has been successfully taught at the secondary level, it would be much easier for other school teachers to teach it. Based on the experience of this core group, this course will be in a good position to be adopted by a wide variety of colleges and universities throughout the US. Achieving this goal would mark one of the most important changes in higher education in decades.

7. Past Results: (#28)

This course has been under development at Augsburg University for many years. At Augsburg, the class sizes are small: around 20-25 students. Students have said they found the course to be very valuable.[4]

8. Top Three PROS and CONS (#29)

Top three pros: (1) Involves STEM (Math/Stats), Literacy and the environment, (3) is creative, imaginative and forward looking, and (3) it will have a big impact on youth for decades to come.
Top three cons: (1) Involves more 'seeing' than 'doing'; (2) one semester isn't enough time to really improve a student's critical thinking, and (3) a conservative risk-avoiding grantee may not want to fund such a speculative project.

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[3] SATS: Survey of Attitudes toward Statistics. https://www.evaluationandstatistics.com/
[4] http://www.statlit.org/pdf/2008SchieldASA.pdf

9. Number of people you expect to serve (#30)

475: 400 students at the University of New Mexico, 40 students at Augsburg University, and 35 teachers.

10. Ages of those served. (#31)

In this pilot study, those served are limited to college students who are predominantly between 18 and 23. As it grows, it should be taught in high schools (ages 16-18) and in graduate programs (ages 24-27).

11. Description of communities served by this program and benefits to those communities (#32)
Communities served by this program:
- College students in non-STEM majors that see statistical literacy as a doorway to obtaining a STEM major or minor.
- High school students that don't want to take AP calculus or AP statistics, but are interested in social issues involving data.
- ESL students (high school or college) who need to take a quantitative course but for whom English is a second language.

All of these are future citizens, decision makers and social leaders. The benefit for students is in knowing how to read, interpret and evaluate social statistics as evidence for – or against – social policies. The benefit for society is in having a more-educated citizenry.

In summary, today's students are faced with social problems, health solutions and environmental issues. Many – if not most – of these will involve statistical data. In each case, reading, interpreting and evaluating the associated statistics is essential in order to make good decisions as individuals, social leaders and citizens. Being able to read, interpret and evaluate social statistics should raise the level of discourse and result in arguments that may be more socially productive.

12. Ethnic Breakdown of those served (33):

The students taking statistical literacy at the University of New Mexico should mirror the demographics of all students: Hispanic (48%), White (33%), American Indian (6%), Asian (4%), and Black (3%).[5] Similarly, here is the breakdown at Augsburg University: White (52%), Black or African American (7%), Asian (6%), and Hispanic or Latino (3%).[6] Since the number of New Mexico students (400) is much larger than the number of Augsburg students (40), use the New Mexico demographics.

13. How does this project match the seven characteristics of Honda thinking?
- Imaginative: Math stat teachers are accustomed to proofs and deductive thinking with right-wrong answers. Using these teachers to teach critical thinking about social statistics is very imaginative.
- Creative. There is no other course like this in the world today. Wired Magazine (Oct 2010) named statistical literacy as the most important course students should have taken in college. "Statistical literacy has risen to the top of my advocacy list, right alongside numeracy, and perhaps even ahead of 'algebra for all'." M.Shaughnessy, NCTM President.
- Youthful: Today's youth want to work on big social issues. Most issues involve science and statistics. Detecting fake news is a skill they need to navigate the deep waters of misinformation.
- Forward thinking: As big data becomes increasingly available, future generations of students will need even more training on how to evaluate the statistics generated from big data.
- Scientific: "Studies show" has become an integral part of science. Medical journals such as JAMA feature observational studies more often than they feature scientific studies and clinical trials.

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[5] www.collegefactual.com/colleges/university-of-new-mexico-main-campus/student-life/diversity/chart-ethnic-diversity.html
[6] https://datausa.io/profile/university/augsburg-college

- Humanistic: Social statistics are – by their nature – humanistic. Students in non-quantitative majors often see mathematics as in-human. Statistical literacy remedies that.
- Innovative: Teaching statistical literacy involves hypothetical thinking: new method of thinking. How might a group or measurement have been defined? What might have been taken into account?

14. How does this project address Honda's other priorities?
- Funding Priority: (1) Youth education (2) STEM focus, (3) Literacy: The textbook is designed with a literacy focus for students in STEM and non-STEM majors. Literacy is what this course is all about.
- Youth-focused: Parts of this course can be offered at the secondary level. Schield (2008) argued this course could be an alternative to Algebra 2 for college-bound students in non-quantitative majors.
- Impact: Most college graduates take a statistics or research-methods course. If half of those who take traditional statistics would take statistical literacy instead, the impact would be huge! Half of all college students are in non-quantitative majors: majors that don't require a quantitative course as part of the major. Becoming statistically literate is something that will help them in their discipline and in their lives as consumers and citizens.
- High potential for success with minimal duplication of effort. This project had initial funding of $500,000 from the W. M. Keck Foundation. The course and the associated teaching materials have been student tested extensively by the PI in small classes at Augsburg University. Schield (2004). This course is ready for rapid dissemination.
- Dedicated to improving the human condition of all mankind. Improving the quality of political debate – much less the quality of critical thinking – would be highly welcomed by many citizens.
- Financial and administrative soundness. Augsburg University has the administrative and financial controls needed. The project PI has the experience needed to manage this project.
- Relative importance to the public. Improving the quality of public debate is of critical importance to all citizens. This project can arguably do more to improve the quality of political discussion than almost any other educational activity. The timing on this project is critical. Education is very slow to change. Funding this project may double or even quadruple the yearly adoption rate of statistical literacy in high schools and colleges.

Schield, Milo (2004). Statistical Literacy and Liberal Education at Augsburg College. AAC&U *Peer Review*. Copy at www.statlit.org/pdf/2004SchieldAACU.pdf

Schield, Milo (2008). Quantitative Literacy and School Mathematics: Percentages and Fractions. *Calculation vs. Context*. Mathematical Assoc of America. www.statlit.org/pdf/2008SchieldMAA.pdf

Source: https://www.honda.com/community/applying-for-a-grant

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Academic History:

Iowa State University (B.S. Physics); University of Illinois, Urbana (MS. Physics); Rice University (PhD. Space Physics).

Professional Experience:

- Business experience: Consultant with a national CPA firm; Sr. Operations Research Analyst with a large national property-casualty company. President of two start-up ventures.
- Academic experience: Full-time in the Dept. of Business and MIS at Augsburg University since 1985. Tenured in 1990. Full-Professor in 2000.   Taught critical thinking for ten years. Taught statistics for 30 years. Taught Statistical Literacy for 20 years.

Books:

- Wiley (John Wiley & Sons) has contracted to publish Schield's textbook: *Statistical Literacy for Decision Makers*. Final copy is due to Wiley January 2020.

Publications:

- Over 70 statistical literacy publications (received over 950 citations per Google Scholar). Selected list on next page.   Complete list at www.StatLit.org/Schield-pubs.htm

Qualification and Skills:

- Editor of www.StatLit.org: Google rated as the largest website dedicated to statistical literacy with 340,000 visits and 460,000 downloads in 2018.
- 38 talks outside the United States in 18 countries on six continents (all except Antarctica)
- Organized 16 sessions on statistical literacy at the annual meetings of the ASA.
- Past-Chair of the Department of Business Administration at Augsburg University.
- Conducted teacher training in Statistical Literacy at Palomar CC and Keene State College.

Awards and Honors

- 1998: Created first argument-based (confounder-based) Statistical Literacy course.
- 2001: Principal investigator on a $500,000 grant from the W. M. Keck Foundation "to support the development of statistical literacy as an interdisciplinary curriculum in the liberal arts".
- 2003: Named the "leading voice" of the Statistical Literacy movement by Dr. Joel Best in his book, *More Damned Lies and Statistics*.
- 2004: Invited to submit "Statistical Literacy and Liberal Education at Augsburg College" for publication in the AAC&U journal: *Peer Review*. www.StatLit.org/pdf/2004SchieldAACU.pdf
- 2014: Named the US Representative of the International Statistical Literacy Project (ISLP)
- 2015: Elected member of the International Statistical Institute (ISI)
- 2016: Invited to give a Statistical Literacy workshop at the IASE Invited Roundtable in Berlin.
- 2017: Invited to contribute a paper to a special issue on Statistical Literacy in the *Statistics Education Research Journal* (SERJ). www.StatLit.org/pdf/2017-Schield-SERJ.pdf
- 2018: Invited to present at the International Conference on Teaching Statistics (ICOTS) in Japan.
- 2018: Named a Fellow in the American Statistical Association (ASA)
- 2019: Elected president of the National Numeracy Network (NNN)
- 2020: Consultant with the University of New Mexico.

Milo Schield

Professor in Business Administration
Augsburg University

Nine of Schield's Statistical Literacy papers: all invited or peer-reviewed.

Schield, Milo (2017). "GAISE 2016 Promotes Statistical Literacy" published in the *Statistics Education Research Journal* (SERJ). **13 citations.**   Copy at www.StatLit.org/pdf/2017-Schield-SERJ.pdf

Schield, Milo (2016). "Stat 102: Social Statistics for Decision Makers". Invited Roundtable Berlin. International Association Statistical Educators. **3 citations.** www.statlit.org/pdf/2016-Schield-IASE.pdf

Schield, Milo (2010). "Statistical literacy: A new mission for data producers." Statistical Journal of the International Association of Official Statistics (SJIAOS)   Volume 27: Pages 173-183. **28 citations.** Copy at www.statlit.org/pdf/2011SchieldSJIAOS.pdf

Schield, Milo (2008). "Quantitative Literacy and School Mathematics: Percentages and Fractions". Published by the Mathematical Association of America in *Calculation vs. Context: Quantitative Literacy And Its Implications for Teacher Education*. **24 citations** Copy www.statlit.org/pdf/2008SchieldMAA.pdf

Schield, Milo (2006). "Understanding Confounding from Lurking Variables using Graphs". ASA *STATS* Magazine. **20 citations**.   Copy at www.statlit.org/pdf/2006SchieldSTATS.pdf

Schield, Milo (2005). "Information Literacy, Statistical Literacy and Data Literacy". *IQ (*IASSIST Quarterly), Published in 2005. **158 citations**. Copy at www.statlit.org/pdf/2004-Schield-IASSIST.pdf

Schield, Milo (2004b). Statistical Literacy Curriculum Design. *IASE Curricular Development in Statistics Education, Sweden.* **44 citations.**   Copy at www.statlit.org/pdf/2004SchieldIASE.pdf

Schield, Milo (2004). "Statistical Literacy and Liberal Education at Augsburg College" Published in the AAC&U journal: *Peer Review*. **27 citations**.   Copy at www.StatLit.org/pdf/2004SchieldAACU.pdf

Schield, Milo (1999).   "Statistical Literacy: Thinking Critically About Statistics". Published in the APDU Journal *Of Significance*. **77 citations.** Copy at www.statlit.org/pdf/1999SchieldAPDU.pdf

Citations per Google Scholar as of Jan 28, 2020.

$75,000	**Total Budget**	
$7,500	Augsburg overhead	10%
$67,500	**Net after Overhead**	

Start   July 1, 2020   End   June 30, 2021

$21,500   A.   COURSE DEVELOPMENT AND TEACHER TRAINING.

Erik Erhardt (Univ New Mexico):   Review of project at the University of New Mexico
$2,000   May, 2021   Verbal presentation at NNN meeting; written paper in Numeracy
This will involve 400 students taking Statistical Literacy.

Course development at Augsburg University
$7,500   To Augsburg for fielding MIS 264 in Fall 2020 to be taught by Marc Isaacson

To Augsburg Faculty
$6,000   7-8/2020   Milo Schield. Develop teacher training materials.
$2,000   Aug, 2020   Marc Isaacson, Develop teaching materials, exercises, projects
$2,000   May, 2021   Marc Isaacson, Dissemination: Editor special issue of *Numeracy*

Teacher training Audio/Video
$2,000   For tech support: web audio and/or video

$46,000   B. TEACHER REVIEWS OF STATISITICAL LITERACY AS A DISCIPLINE AND AS A COURSE
Teacher Reviews
$40,000   Teacher stipends (40 at $1,000)
Stipends for reviewing concept, course and teaching materials, and
presenting this in a publishable paper.

$3,000   Textbooks (50 @$60) plus shipping to participants

$3,000   Stipend ($600@): Five teachers present at NNN national meeting
Allan Rossman, Larry Lesser, Marc Isaacson, Erik UNM, UNM TA

$0   Project coordination, conduct surveys, report results
Project PI: Milo Schield
Select teachers; coordinate teacher training
Coordinate project; provide regular reports
Get IRB approval for project surveys
Conduct surveys of students and teachers
Travel to NNN national conference
Report results at a national conference

$0   Net Remaining