Abstracts for all Sessions

All events are held in Wells Hall, unless otherwise noted

The Quantitative Literacy Demands of Nonfiction Texts Used in ELA Classrooms
Ellen Agnello, The University of Connecticut

Abstract
The Common Core State Standards (CCSS) call for major shifts in English Language Arts (ELA) teaching, such as changing the focus from fiction to nonfiction text. ELA teachers report that they are now asked to teach nonfiction text at least 50% of the time (Stotsky, 2012). The CCSS do not clearly specify what is meant by nonfiction, leaving it up to ELA teachers, many of whom lack training in teaching nonfiction text, to determine which texts to teach and how to teach them (Stotsky, 2012). Nonfiction text subgenres pose a variety of demands on readers. Many are nonlinear and contain multiple modes of representation, such as graphs and tables, which require readers to possess knowledge of a range of sign complexes and the phenomena they represent (Roth, 2002). This session will explore the types of nonfiction texts ELA teachers are currently using and the quantitative demands they pose on readers.

What Can Cognitive Demand Help Us Learn About QL Tasks?
Kathryn Appenzeller, Michigan State University

Abstract
Quantitative literacy courses are increasingly prevalent around the country with much discussion on what counts as content. Different terms (e.g., numeracy, quantitative reasoning) and definitions circulate these discussions. Equally important, and perhaps less discussed in the field of quantitative literacy, is the ways in which students use mathematical thinking to complete QL tasks. I use cognitive demand to understand how QL tasks may provide students with different experiences of similar content. In this presentation, I provide results of analyzing tasks from two texts through the lens of cognitive demand, which allows us to understand the potential mathematical thinking students may use to complete a task. The results of my analysis further our understanding of similarities and differences in how quantitative literacy tasks are presented to and experienced by students. It provides insight into nuanced differences of tasks to spark discussions about the types of tasks students experience in QL courses.

A Mathematics and Social Justice Course: What Could Its Curriculum Be?
Hyman Bass, Elena Crosley, and Matthew Dahlgren, University of Michigan

Abstract
America has a long history of social injustice, and these issues are now particularly divisive. Mathematics is importantly implicated in some of these issues, in ways not widely known or appreciated. What is there for an educated citizen to understand about these interactions of mathematics and social justice? Specifically, How could a course of instruction be designed to meaningfully engage with these interactions? That is the question we open for discussion, to share ideas and resources. We will begin with a brief survey of a course we designed and piloted in response to this question. Insofar as the course is a mix of civics education and mathematics education, we foregrounded and prioritized the former, while maintaining substantial and diverse mathematics content. Among the topics treated are: "Voter Fraud;" Social Choice (the Electoral College); Gerrymandering; Bank lending practices (Redlining); Payday loans; Bias in hiring; and the "School to Prison Pipeline."

Quantitative Reasoning Course: Resources and Challenges
Nadia Benakli and Ariane Masuda, New York City College of Technology

Abstract
The City University of New York (CUNY) implemented a general education Common Core called Pathways across all its colleges in Fall 2013. To comply with the requirements of this new system, a Quantitative Reasoning course was created at City Tech. Since then, the course has benefited from a series of initiatives that were taken to better support our students' needs. In this talk we will present some of these initiatives.

1) The Quantitative Reasoning Fellowship program hires graduate students, from different majors, with strong quantitative expertise. The fellows run tutorial workshops for students, and they also work closely with instructors developing projects and modules on information and statistical literacy.

2) In Spring 2018, a couple of instructors experimented with a new textbook that focused on the discovery learning that required students to actively participate in class. The new approach exploited the importance of numeracy and literacy skills in many real life situations.

Quantitative Literacy and Global Warming
Jeffrey Bennett, Big Kid Science

Abstract
This facilitated discussion will focus on connections between QL/QR and the multi-disciplinary issues of global warming, and in particular on how we can address this topic in QL/QR courses. I will begin by presenting a brief overview of the science and economics of global warming, based on my book *A Global Warming Primer* (www.globalwarmingprimer.com); I will focus on key QL/QR connections such as those involved in the logical/critical thinking behind the basic science, the numerical and statistical data that provide the evidence for human-caused global warming, and the economic issues that underlie the search for solutions to this important problem. I'll then open it up to discussion of how we can integrate these ideas into QL/QR courses.

Applying Genre Theory and Žižekian Philosophy to Explore the Possible Evolution of Quantitative Reasoning
David Bowers, Michigan State University

Abstract
In the spirit of creative and interdisciplinary inquiry, motivated by notions of forever modifying our work and field for the better, we will explore conceptual apparatuses from the fields of philosophy and artistic expression and the insight they might provide for noticing and responding to features of quantitative reasoning and quantitative literacy that might otherwise operate below the level of consciousness. Conceptual tools from Žižekian philosophy and genre theory will be introduced, and will then be used to engage in discussion around what they lead us to notice about the current state of QR/QL, our idealized vision of what QR/QL could be, and tentative exploration of hypothetical paths from the former to the latter.

Quantitative Assessment for New Students: Effectively Measuring QL Across the Curriculum
Matt Brown, Earlham College

Abstract
Earlham College Quantitative Assessment for New Students, or QANS for short, is a new, online adaptive assessment that is designed to give advisers a snapshot of a student's preparedness for the quantitative components of most entry level courses across the curriculum. The questions were designed and validity was measured by a national assessment company that oversees many statewide standardized exams. The result is a quick, effective method to evaluate a student's quantitative literacy across the curriculum and identify skill gaps that could be impediments to a student's success.

Quantitative Literacy Should Not Be Optional
Gail Burrill, Michigan State University

Abstract
Despite curriculum standards that emphasize statistics as a core curriculum content area and the work of Steen and others in the early 2000's, quantitative literacy never became part of the mainstream curriculum for all students. Even the growing popularity of Advanced Placement Statistics does not really address issues of quantitative literacy. NCTM has made a promising beginning in its recent publication Catalyzing Change, which includes the recommendation that quantitative literacy should be considered an essential component of the high school curriculum for all students graduating from high school. And as students continue schooling to prepare for careers, the need for quantitative thinking and reasoning only increases, particularly in this era that is awash with data. What are some of the opportunities and challenges we face as we try to make this recommendation a reality for both secondary and postsecondary work?

Using the Gini Coefficient and Other Measures of Inequality in a Quantitative Literacy Context
Michael Catalano, Dakota Wesleyan University

Abstract
Inequality has been increasingly in the news over the past decade, which saw the emergence of the Occupy Wall Street movement and the 99 percenters, and the surprising traction of the Bernie Sanders campaign. In 2009, the article *Measuring Resource Inequality – The Gini Coefficient* appeared in *Numeracy* and only recently fell off the list of the top ten most popular papers for the journal as measured by average daily downloads; this article considered how the Gini coefficient could be incorporated as a topic in calculus as well as lower level courses to promote both quantitative literacy and an awareness of social justice issues. The present paper presentation is linked to a perspective article planned for the January 2019 issue of *Numeracy*, and will consider the evolving societal discussion of inequality as well as additional ideas and resources for bringing that discussion into a quantitative literacy context.

Quantitative Literacy (QL) and *Numeracy*: A Discipline-Based Education Research Perspective from the Geosciences
Meghan Cook and Victor J. Ricchezza, University of South Florida

Abstract

Madison's argument for quantitative literacy (QL) as "everybody's orphan" implies QL instruction requires a contextual component (e.g., disciplinary education). We will explain how discipline-based education research (DBER) follows the same reasoning across a broader spectrum of instructional topics, and thus DBER is intrinsically well-suited to in-discipline QL instruction. We will discuss - from our perspectives as educators and graduate candidates in the geosciences - the challenges (and triumphs) we've encountered in adapting QL to geoscience-DBER. Additionally, we will summarize a scan of recent *Numeracy* articles to categorize them as either natural and social sciences, or mathematics and statistics as a means to understanding the prevalence of QL in DBER. The intended goal of the session is a candid discussion on current best educational practices concerning QL. We are specifically interested in how DBER practitioners in non-geoscience fields have worked to integrate QL into their curricula.

The Promises of Numeracy and the Potential to Overpromise
Jeffrey Craig, University of Arizona

Abstract

In 1979, Harvey Graff wrote a book positing the existence of a "literacy myth." He argued that this myth was built from the ways people had articulated a faith in literacy to change the world. He proposed that the myth was sustained by a history of promises made about the potency of literacy. In a recent publication, I produced an historical analysis of our numeracy discourse and concluded that we have collectively made and remade at least three distinct promises about numeracy: that it better reflects contemporary life, that it empowers, and that innumeracy bears costs. After introducing that study and Graff's ideas in more detail, I want to consider what relevance Graff's ideas might have for numeracy scholarship.

QL Conceptualization—From Theory to Classroom
David Deville, Northern Arizona University

Abstract

Undergraduate QR courses are torn between competing conceptualizations of QL – mathematical and integrative. This session briefly describes these conceptualizations and presents evidence that students identify content from integrative QR courses as more applicable and relevant to their personal needs. This evidence is presented primarily through interview dialogue observed during a thesis research project, and includes student perspectives from both mathematical and integrative QR courses. Further, this session draws a parallel between a measure of QL competencies demanded by curricular materials and the conceptualization informing those materials. This session argues that integrative QR courses can offer more compelling course content while providing students with an enhanced opportunity to develop QL skills.

Building Information Literacy Practices into Numeracy Instruction: A Student-Centered Investigation into College Access
Ander Erickson, UW Tacoma

Abstract
This facilitated session will begin with an introduction to information-based mathematics activities – problems that require students to seek out, evaluate, and make use of information outside of the classroom – and a theoretical argument that these activities play a crucial role in empowering students to work critically with the quantitative arguments that they will encounter in their everyday lives. After presenting an example of an information-based mathematics activity that helped secondary school students explore inequities around college access, attendees will have the opportunity to engage with the activity themselves and to work as a group to begin the development of a novel activity that they can implement in their own classrooms.

Quantitative Reasoning for High School Juniors and Seniors
Greg Foley, Ohio University

Abstract
Advanced Quantitative Reasoning is a course for high school junior and seniors designed to develop quantitative literacy, statistical reasoning, and mathematical proficiency. The heart of the course is its problems, explorations, investigations, and projects. AQR students engage with traditional high school mathematics plus statistics, probability, and modeling. They investigate statistical questions and evaluate claims based on statistics. They interpret and apply quantitative information to make real-world decisions. AQR aligns with the Common Core State Standards and with NCTM's (2018) *Catalyzing Change*. AQR progresses through four units of material that build on one another and that draw on and strengthen students' prior mathematical knowledge: (a) number and quantity, (b) statistics and probability, (c) modeling and quantitative reasoning, (d) modeling with geometry. Begun with small-scale pilot testing in two classrooms in 2009–2010, AQR is now being studied at hundreds of high schools by some 14,000 students.

The Quantitative Reasoning for College Science (QuaRCS) Assessment: Emerging Themes from 5 Years of Data
Kate Follette, Amherst College

Abstract
The Quantitative Reasoning for College Science (QuaRCS) Assessment is a validated assessment instrument that was designed to measure changes in students' quantitative reasoning skills, attitudes toward mathematics, and ability to accurately assess their own quantitative abilities. It has been administered to more than 5,000 students at a variety of institutions at the start and end of a semester of general education college science instruction. I will begin by briefly summarizing our published work surrounding validation of the instrument and identification of underlying attitudinal factors (composite variables identified via factor analysis) that predict 50% of the variation in students' scores on the assessment. I will then discuss more recent unpublished work, including: (1) Development and validation of an abbreviated version of the assessment (The QuaRCS Light), which results in marked improvements in students' ability to maintain a high effort level throughout the assessment and has broad implications for QR assessments in general, and (2) Our efforts to revise the attitudinal portion of the assessment to better assess math anxiety level, another key factor in student performance on numerical assessments.

Collaborative Quantitative Literacy Projects in an Intermediate Macroeconomics course and in a First-Year Seminar at Worcester State University
Maria Fung, Worcester State University

Abstract
Teams of students from two different courses—an intermediate macroeconomics course and a first-year seminar on quantitative literacy—worked with each other on three different projects centered on GDP, unemployment rate, and inflation rates. They used Google documents to share their work with their partners from the other course and to provide detailed feedback. As a result of this collaboration, teams revised and expanded their work. The semester culminated in presentations on specific countries, where these concepts (GDP, unemployment rate, and inflation rate) were applied quantitatively.

How to Write papers for *Numeracy*: An Editor's Perspective
Nathan Grawe, Carleton College, and Michael Catalano, Dakota Wesleyan University

Abstract
Authors sometimes lament, "I wish editors would just tell us what they are looking for!" This session is intended to do just that. Drawing on more than 200 published pieces in the journal and his experience guiding papers through the publication process, *Numeracy* co-editors Nathan Grawe and Michael Catalano will talk through the elements of successful submissions to the journal, including discussions of: powerful abstracts, clear organization, effective communication of results, insightful discussion sections, and productive citations (i.e. those which advance the conversation within the discipline by making meaningful connections to the ideas that have come before us). In addition to examining paper elements, Nathan and Michael will discuss successful paper types such as descriptions of new QL/QR programs, assessments of teaching interventions, discussions of previous *Numeracy* publications, notes on teaching tools, and book reviews. We will have plenty of time for Q&A at the end of the session.

Toward an Integrated and Collaborative QR Teaching Model in SOC 101
Sarah L. Hoiland and Felipe Pimentel, Hostos Community College

Abstract
Teaching quantitative reasoning (QR) at community colleges provides opportunities to reach large numbers of students and to select sociologically meaningful data sets that speak to students' own lived experiences. This presentation will 1) outline the QR materials developed through the NICE Program, 2) describe the change from one high stakes assignment to multiple low-stakes assignments, 3) demonstrate the result of collaboration with a brief (5 min.) teaching demonstration; and 4) present preliminary assessment results, including subjective perceptions of numeracy, from co-teaching SOC 101 (4 sections total) in Fall 2018.

Data Literacy—A Piece of the QL Puzzle?
Mark Isaacson, Augsburg College

Abstract
Data Literacy is a term being used more and more in a variety of contexts. In 2018, Gartner, a large IT consulting organization named Data Literacy as one the top 4 themes at its annual Business Analytics conference. How do Data Literacy and the needs of employers today fit into the larger puzzle of Quantitative Literacy and the efforts of educators? This presentation will outline how data literacy is being used by a wider audience and present some ideas for including these skills in the QR classroom.

Learning Data Science at the Library: Lesson Plans on Data Literacy Skills
Charissa Jefferson, California State University-Northridge, Diego Mendez-Carbajo, Illinois Wesleyan
University, Katrina Stierholz, Federal Reserve Bank

Abstract
This facilitated discussion focuses on the development of data literacy skills through the delivery of hands-on library instructional sessions. We start by placing the Association of College and Research Libraries' (ACRL) Framework for Information Literacy for Higher Education (Frames) in a practical instructional context. Next, we guide participants through a hands-on activity where a library instruction lesson plan focused on data literacy is demonstrated. We conclude the session by discussing the individual components of a lesson plan and outlining avenues to contribute to this line of work.

An Inclusive Framework for QR
McKenzie Lamb, Ripon College

Abstract
Ripon College has recently designed a novel framework for a QR course, one that is inclusive enough, in theory, for any faculty member on campus to teach it. At the same time, our framework is specific enough to guide instructors and to allow for meaningful assessment. Rather than organizing our course around quantitative methods, we have designed a new framework based on numerical comparisons. This organizing principle is motivated by the observation that numbers presented without context are not meaningful, and the real value that numbers add to an argument is that they can be compared to each other in a precise way. In addition to describing the evolution of our new QR framework, I will describe both student and faculty responses and outcomes.

Using Data Nuggets to Facilitate Quantitative Reasoning in Science
May Lee, Elizabeth Schultheis, and Melissa Kjelvik, Michigan State University

Abstract
Although quantitative reasoning is an inherent aspect of scientific practices, students at the elementary, secondary, and post-secondary levels still struggle to quantitatively reason about data. To begin addressing this concern, the Data Nuggets project was developed with the goal of helping K-16 students interpret and explain authentic data in the life sciences. Our on-going research examines how students' quantitative reasoning is affected by their engagement with Data Nuggets activities. In this session, we will first introduce Data Nuggets and present preliminary findings from our research on its implementation in secondary classrooms; afterward, participants will have an opportunity to go through one of the activities and discuss best teaching practices for implementing Data Nuggets in secondary and post-secondary classrooms.

Assessing Perceived Ability and Attitude in a Quantitative Literacy Course
Becky Matz, Nicholas Rekuski, and Rachael Lund, Michigan State University

Abstract
Students' attitudes toward a course have been shown to relate to performance, and students often exhibit particularly negative attitudes about traditional mathematics courses. As the quantitative literacy courses at Michigan State University are relatively new, it is important to understand how students perceive the courses, particularly if their prior mathematics experience consists solely of traditional mathematics courses. Here, we report results from pre/post surveys of student attitudes and perceived abilities in two iterations of one course using items based on the Subjective Numeracy Scale as well as Wismath and Worrell's attitude questionnaire. We additionally report on the relationships between student responses and course performance, student comparisons to prior mathematics courses, and changes to student confidence in mathematics. These analyses support a cycle of continuous improvement in quantitative literacy, with the goal that the courses help improve student confidence and comfort with mathematics.

Quantitative and Scientific Literacies: Collaborations Driving General Education Curricular Reform
Vincent Melfi, Gabriel Ording, and Luke Tunstall, Michigan State University

Abstract
In a post-truth environment, to foster students' capacities to participate as engaged citizens, undergraduate general education curricula must enhance both Scientific and Quantitative Literacies. Michigan State University is leveraging the intersection between SL and QL to collaboratively reform its QL courses and its general education non-majors science curricula, creating an intentionally scaffolded sequence of courses that span the non-majors undergraduate experience. These are institutionally required courses taken by over two-thirds of the students at MSU. The success of reform efforts of this magnitude require faculty buy-in and assessment of student learning outcomes. How is MSU accomplishing this and how might lessons learned be applied at other institutions facing similar challenges?

Mississippi Semester: New Social Justice Approach to Teaching Empirical Reasoning in Context
Premilla Nadasen, Fatima Koli, Alisa Rod, and David F. Weiman, Barnard College

Abstract
Our contribution centers on a novel pedagogic experiment at Barnard College that the instructor, Professor Premilla Nadasen, calls collaborative, community-engaged learning through research and advocacy. Students in the course, entitled Mississippi Semester, have partnered with the Mississippi Low-Income Child-Care Initiative (MLICCI) – an advocacy organization of women on welfare and child-care providers based in Biloxi, MS – and Barnard's Empirical Reasoning Center (ERC), which assists students in developing research design and data analysis skills. Working closely with members of MLICCI and drawing on the experience of comparable organizations across the country, students specify the relevant criteria to include in an index gauging women's economic security. To apply this measure to the Mississippi case, they then participated in workshops with an ERC graduate fellow to review the relevant county-level data from the Census's American Community Survey and to consider alternative

empirical strategies to combine them into a single metric of economic security. In the workshops they also learned the rudiments of GIS analysis and literally mapped the regional variation in women's economic security across the state to determine high and low need areas.

With this background analysis they embarked on a field study to enrich their understanding of the actual experiences and expressed needs of MLICCI members and to identify effective strategies for advocacy work. Instead of simply relying on their quantitative economic security index, they collected additional qualitative data through surveys, focus groups and open-ended conversations. They then used this additional evidence to critically assess and re-calibrate their measures of economic security, as well as to probe into the underlying causes of these women's precarious conditions, such as domestic violence, punitive criminal justice policies, de facto segregation etc. In the end they combined their quantitative and discursive analyses into compelling, representative narratives that provided the MLICCI members and themselves with potent tools for advocacy work.

Knowing Self or "Unskilled and Unaware of It?" How Numeracy Contradicts the Behavioral Sciences' Consensus About Human Self-Assessment
Ed Nuhfer, University of Wyoming (retired)

Abstract

For twenty years, the behavioral science literature characterized people as generally unable to assess their competence and many as "unskilled and unaware of it" (Dunning-Kruger Effect). This discouraged professors from teaching metacognitive self-assessment or using it for measuring students' learning. Further, weaponizing the "Effect" allowed users to deprecate groups through othering. However, if peoples' self-assessments of their competence are generally accurate, this argues for hearing others' self-evaluations as genuinely informed disclosures. Two recent papers in Numeracy confirm how beliefs that "people can't self-assess" seem to derive mostly from the prevalent literature's, employing unique graphs that lead to interpreting random noise and mathematical artifacts as measures of human self-assessment. We examine the artifacts, ways to overcome them, and then conclude our discussion with a focus on the implications of using self-assessment measures for teaching and for encouraging respectful dialogue with others.

Innumeracy in the Lab and in the Wild
Ellen Peters, Ohio State University

Abstract

Innumeracy is rampant in the United States and has been linked with worse decision-making skills and worse outcomes in health and finances. However, objective numeracy (being good at math) is not the only important factor. Beliefs in one's numeric abilities (i.e., subjective numeracy) should have independent effects on behavioral persistence and engagement with numeric information, with subsequent effects on outcomes, but little research exists.

In today's talk, we'll discuss what past studies have revealed about the importance of being objectively numerate. I'll then present the results of recent ongoing studies concerning the additional importance of subjective numeracy. Objective and subjective numeracy capture distinct psychological constructs that support different aspects of judgment and decision processes. We can measure them or manipulate them and it appears that both numeracies have effects on decision outcomes and processes.

Teaching Quantitative Literacy to Non-Traditional Students with Math Anxiety
Nicholas Rekuski, Michigan State University

Abstract
Math anxiety among non-traditional students is much more difficult to reduce than math anxiety among traditional students. This means when working with non-traditional students, we need non-traditional teaching techniques. In other words, group work, starter problems, reading assignments, reflective writings, and extra help sessions are not enough to relieve math anxiety in these students. This session is meant to address that problem. We will begin by explaining why the above techniques above are insufficient in the case of non-traditional students. This will be followed by techniques that the presenter found useful in his Quantitative Literacy classroom. We will end the session by considering students' reception.

Emerging Issues in Mathematics Pathways
Connie Richardson, Charles A. Dana Center

Abstract
Mathematics pathways have gained broad acceptance across the country and from the professional associations but we are not finished. It is now time to ensure that we are engaging in a process of continuous improvement. In this session, you will take stock of your institution's current progress with pathways implementation (including co-requisite supports). Come engage with tools and resources to move you forward toward normative practice, with pathways structures and classroom enhancements that provide your students with the mathematical content and learner strategies aligned with their future goals.

The Scanlon Effect: Reducing adverse outcomes tends to increase race-based disparities
Milo Schield, Augsburg College

Abstract
Race-based disparities are of great interest and concern in the US today. When they are measured by comparing large percentages, they tend to be small. When they are measured as a ratio of small percentages they tend to be large. In trying to reduce these large race-based ratios, the U.S. Departments of Education and Justice have recommended reducing adverse outcomes. Jim Scanlon noted that reducing adverse outcomes tended to increase large race-based ratios. He has spoken and written widely on this effect and its significance, hence the name "Scanlon effect". This paper identifies the necessary conditions for the Scanlon effect. It examines school data that illustrates this effect.

Quantitative Literacy Skills Across Disciplines in Community College Education
Monika Sikand, Bronx Community College of the City University of New York

Abstract
Quantitative Literacy/Quantitative Reasoning (QL/QR) skills are relevant across all disciplines. This paper presents the assessment results of student performance in three different skill sets associated with quantitative literacy – representation of mathematical numbers, graphical interpretation of numbers, and critical reasoning and analysis of numbers. A lesson plan assessing these three skill sets was administered to minority representing undergraduates in community college STEM education. The lesson plan was created as a result of a faculty training in NSF funded, Numeracy Infusion of College Educators (NICE) program at City University of New York. The underrepresented students from various disciplines such as Media, Business, Education, Liberal Arts, Psychology in Bronx Community College were administered this lesson plan. The students learned to use scientific notation, proper representation of numbers in graphs, and critical analysis of numerical information. The students were encouraged to apply these skill sets in their degree majors. This paper also presents the techniques and pedagogy used in infusing numeracy in classroom teaching. The assessment of these quantitative literacy skill sets in this lesson plan administered to undergraduates from various disciplines presents the need to embed quantitative literacy skills in teaching courses across disciplines in higher education.

Numeracy Proxies and Practices: Studies in Approximations of the "Real"
Luke Tunstall, Michigan State University

Abstract
Assessment is a persistent concern for those teaching or administering coursework in numeracy. Among other things, one issue is that the ways in which we interact with and act on quantitative information is different when we are not being assessed on that interaction. Though assessments of any construct offer only proxies for that construct, assessments of numeracy are especially tenuous, as the setting and assessment itself fundamentally obfuscate the construct of interest. In this presentation, I present a theoretical overview of the issue of construct validity, and then use that lens to share findings from recent work, where I have analyzed numeracy items from the Programme for International Assessment of Adult Competencies (PIAAC), as well as interviewed students about those specific items. I raise and discuss both theoretical and practical questions for the numeracy community to consider.

Numeracy Skills Needed for QR Success in General Chemistry
Deborah R. Walker, The University of Texas at Austin, and Diana Mason, University of North Texas

Abstract
Success in first-semester general chemistry, a known 'high-risk' course, is being studied as a continuing research endeavor by the NSA Texas team to evaluate college-ready students' number sense ability needed for course success. Results indicate that lacking basic arithmetical skills (Cohen's d = 2.22) may be hampering students' numeracy ability more than the highly touted algebraic skill set (Cohen's d = 0.206) usually associated with success in CHEM I. Informed decisions indicate that basic arithmetic skills have deteriorated or at a minimum become dormant over years possibly due to dependency on e calculating devices. Without foundational arithmetic skills, advancing QL/QR abilities may be limited. Presented will be the results of a two-year study of n = 3,266 students from eight higher education institutions in Texas based on data gathered from the MUST (arithmetic) and DAT (algebra) diagnostic instruments.

Using Survey Research to Teach Quantitative Reasoning
Esther Wilder, Lehman College and the Graduate Center (CUNY), Dahlia Remler, Baruch College and the Graduate Center (CUNY)

Abstract
Survey research provides the ideal context for teaching students how to engage in scientific inquiry. It also serves as an important tool for strengthening students' QR skills (e.g., preparing and interpreting frequency distributions, cross-tabulations, tables and graphs). Since 2016, survey research has been the central pedagogical tool in six sections of a sophomore/junior sociology course at Lehman College. Students articulate research questions, administer a collaboratively designed survey, analyze the resulting data set, and prepare term papers that incorporate empirical results. Preliminary assessments show that this approach is effective in teaching fundamental QR competencies, teaching survey research skills, promoting students' interest in research, and increasing their comfort with data-related tasks. Focus groups revealed that allowing students to choose their own topics made them especially vested in the project. Our presentation will conclude with a discussion of the challenges we have encountered and suggestions for the development of similar programs elsewhere.

Visualizing Outlier Analysis to Detect Gerrymandering with an Agent-Based Model
Anne Yust, Eugene Lang College at The New School

Abstract
As more advanced mathematical arguments become the forefront of prominent court cases questioning the legality of partisan gerrymandering, the need for easily-accessible educational tools imminently rises. Specifically, the quantitative argument of outlier analysis has recently been used to provide evidence of partisan gerrymandering in existing and proposed district maps. I will provide an introductory overview of the social and mathematical context of partisan gerrymandering and redistricting more generally. Then, I'll demonstrate the interactive agent-based model I created in NetLogo to visualize the quantitative argument of outlier analysis. I will close by presenting some analysis of the model's output and ideas for model use and further extensions. If attendees would like to download the model in advance of the presentation, you can find the model and a link to the NetLogo platform here: http://ccl.northwestern.edu/netlogo/models/community/redistrictingPackNCrack.