SIGMAA-QL Newsletter

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A Tribute to Lynn Steen

Milo Schield

Editor's Note: This year we lost Lynn Steen, one of the founders of the quantitative literacy community. His obituary can be found at the website: `http://www.statlit.org/pdf/2015-Lynn-Steen-Obit.pdf` *This eulogy has been reprinted with the permission of the author.*

Lynn Steen (1941-2015) established the foundations for quantitative literacy (numeracy). He saw numeracy as a social good: "Numeracy lies at the intersection of statistics, mathematics and democracy. Like statistics, numeracy is centered on interpretation of data; like mathematics, numeracy builds on arithmetic and logic. But the unique niche filled by numeracy is to support citizens in making decisions informed by evidence." (Steen, 2003). He saw context as essential to QL:"The essence of QL is to use mathematical and logical thinking in context." (Steen, 2004)

Lynn helped me get started in Quantitative Literacy. I first met him in 1999 at AMATYC. In 2000, he supported my Keck grant proposal. He invited me to present at three conferences: ICME-9 (2000), PKAL/Snowbird (2001), and Wingspread (2008). He invited me to write for two publications: Peer Review (2004) and Calculation vs. Context (2009).

After reading his obituary, I realized that Lynn and I shared something in common: we both studied physics and philosophy as undergraduates. In both disciplines, context is essential. This may have left us with a common desire to integrate the elements of our mathematical disciplines into the context of everyday life. Perhaps that is why Lynn asked me to participate in the founding of the quantitative literacy movement.

Thank you Lynn Steen. I miss you.

Bibliography

Lynn Arthur Steen, (2003) Data, Shapes, Symbols: Achieving Balance in School Mathematics *Quantitative Literacy: Why Literacy Matters for Schools and Colleges* pp. 53-74, 2003

Lynn Arthur Steen, (2004) *Achieving Quantitative Literacy: An Urgent Challenge for Higher Education* Mathematics Association of America, No. 62, Washington, DC, 2004.

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Panel Discussion on Quantitative Literacy and Democracy

Victor Piercey

This August, the 100th anniversary of the Mathematics Association of America was observed at MathFest in Washington D.C. The location was ideal for SIGMAA QL to host a panel discussion on Quantitative Literacy and Democracy. The panelists were Maura Mast, Rob Root, and Lily Khadjavi.

Throughout the panel, all participants emphasized the importance of quantitative literacy for the democratic process. It was pointed out that we should expect quantitative information as part of any well-crafted argument. As this is not the case among the population today, and indeed given the general anxiety that is inspired by math, the quantitative literacy community faces important challenges as well as opportunities.

The panelists pointed out opportunities that exist in several unexplored areas for quantitative literacy. One area is K-12 education. We should strive to infuse quantitative literacy throughout math instruction in primary and secondary schools. Another opportunity to consider is quantitative literacy among STEM education. There is an assumption that STEM students and professionals are quantitatively literate, an assumption that is often not true.

An important point raised by all of the panelists and contributing members of the audience was the need for a "quantitative literacy across the curriculum" movement. It is no more reasonable to expect a single course to lead to sufficiently improved quantitative literacy than it is to expect a single course to lead to sufficiently improved writing. Given the importance of quantitative literacy in democracy, as well as the inherent interdisciplinary nature of quantitative literacy, numerical and quantitative information should be addressed in multiple courses at multiple levels.

The panel discussion was well attended with a very engaged audience. Overall, the quantitative literacy community should be inspired by the ideas and opportunities that were shared.

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Ripped from the Headlines

Federal Reserve Decisions and Quantitative Literacy

Luke Tunstall

It is well-documented that many students view topics in finance as something they need not worry about yet – there will always be time in the future for saving, for paying off debt, etc. Given this problematic line of thinking, educators interested in numeracy should find ways to intersperse pecuniary topics throughout the courses they teach. Those that arise from the news are especially engaging.

A recent topic that is likely to fly under students' radars is the increase in short-term interest rates for loans from the Federal Reserve. A recent article from CNN (see below) underscores that this is a complex topic for students. The bulleted list below includes terminology and quotes that many students might struggle with:

- The Federal Reserve
- Mortgage rates
- The "central bank"
- That investors "were pleased" over the news
- "Wages...have also started to pick up recently"
- "The Fed raised its expectations for growth next year to 2.4%, up from 2.3%."
- "The Fed target for inflation is 2%."

With this in mind, note there are a number of ways that one could broach the topic within a numeracy-oriented course. If the time one has is less than ten minutes, perhaps showing the video from the article and giving a brief explanation of the key points is in order. If one has more time, then a full

case study would be illuminating. The following is one means of doing a case study. Students – before class – read one or two articles on the topic, developing questions as they come up. Their questions might be related to terminology, tone, loan concepts, etc. Then in class, students investigate subsets of these questions, with the intent of giving a brief report to their peers. With this knowledge in hand, students can reread the article to ensure they understand the key points.

Regardless of the details of the lesson plan, the key idea of a case study is to engage students in tackling artifacts. The article from CNN is full of quantitative information, and the more comfortable students are in reading such pieces, the more confident they are likely to be in interpreting other quantitative arguments in the future.

The article can be found at `http://money.cnn.com/2015/12/16/news/economy/federal-reserve-interest-rate-hike/`

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Editorial

QL: The Next Across-the-Curriculum Movement

by Victor Piercey

My institution, Ferris State University, is home to one of the best Pharmacy programs in the state of Michigan. Students are selected from among the finest Pre-Pharmacy students statewide. These students have experienced a rigorous preparatory curriculum that includes Calculus. Nevertheless, faculty in our College of Pharmacy have observed that these students have difficulty with basic mathematical concepts, such as ratios and unit conversions. This does not demonstrate a lack of mathematical ability so much as a deficiency in quantitative literacy.

At the panel discussion at MathFest this year, one of the points made was that quantitative literacy should be the next "across the curriculum" movement. Some skills are so fundamental that they need to find their way across the curriculum of higher education, including general education courses as well as courses in academic programs. The "writing-across-the-curriculum" movement exemplifies what this would look like if successful.

To understand why quantitative literacy is appropriate for such an initiative, consider first why writing was so successful. Faculty in writing-intensive disciplines such as history noticed that their students' writing skills did not improve very much after a first year English composition course. Employers and graduate programs reported similar observations. The flaw was not with the students, but with the assumption that a single course is sufficient for such an important skill. Improvement with writing is a slow and iterative process. It takes practice, feedback, and time. Significant improvement doesn't take place over a single semester, but with consistent attention it may take place over the course of a four-year degree program.

Quantitative literacy shares these attributes with writing. When we speak of quantitative literacy, we are not talking about a body of content. Rather, we are invoking habits of mind. Specifically, quantitative literacy rests on an inclination to endow quantitative information with meaning. Habits of mind are slow to develop and require consistent illustration and encouragement. As with writing, a single course will not do. The use of quantitative information, endowed with meaning, must be visited and revisited throughout a students' academic experience. With this in mind, it is not surprising that strong students in Ferris' Pharmacy program continue to struggle with quantitative aspects of their chosen profession.

In order to accomplish this, interdisciplinary collaboration is indispensable. As a community, we must work with faculty in other disciplines to identify opportunities to include quantitative literacy. This may require some imagination as well as reflection. As an example, consider history. According to conventional knowledge, approximately 11 million people perished in the Holocaust. How was this figure estimated? What evidence was used? What was the percentage break-down among different categories of individuals who were killed? What does this tell us? This one figure raises questions that provide ample opportunities to explore real meaning in quantitative information.

Interdisciplinary collaboration is a two-way street. Exploring opportunities for quantitative literacy

with faculty in disciplines outside of math should lead to exploration for opportunities within mathematics, especially in more traditional courses. When we try to use applications in these courses, they are often contrived examples that are relegated to the end of an exercise set that result in more angst among students than illumination. Input from other disciplines may help us to construct more realistic applications, including the construction of ill-posed problems that can lead to enlightening discussions. For example, consider the following scenario inspired by Tunstall's article above. If we had an adjustable rate mortgage, how could we model our outstanding balance as a function of time? This is a problem that could be posed in several mathematics courses from Pre-calculus to Stochastic Processes. Moreover, it is based on something real, with meaning. There are challenges – we cannot know with certainty the trajectory of interest rates. This requires assumptions. These assumptions have consequences for our model. The challenges posed by this realistic question are quite rich.

As a community, let us invite other disciplines into a large-scale collaborative for quantitative literacy across the curriculum. The National Numeracy Network is an interdisciplinary group dedicated to quantitative literacy. Together, SIGMAA QL and the National Numeracy Network can make real progress in developing a more quantitatively literate population, prepared for the demands of the twenty-first century workforce and for citizenship in a twenty-first century democracy.

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Election Results

This October, SIGMAA QL held elections for the 2016 executive board. We had one candidate for Chair-Elect who won with unanimous support, and three candidates for Secretary-Treasurer. The new Chair-Elect will be Victor Piercey and the new Secretary-Treasurer will be Catherine Crockett. John Curran will take over duties as Webmaster and Newsletter Editor.

Please join us in congratulating our new SIGMAA QL executive board members!

Upcoming Events

Joint Mathematics Meetings

Seattle, WA, January 6–9, 2016
Washington State Convention Center

MAA Invited Address
Wednesday, January 6 3:20–4:10 PM
Ballroom 6BC, Washington State Convention Center

Katherine D. Crowley will speak on Mathematics and Policy: Strategies for Effective Advocacy Link to full description.

MAA Session on Incorporating the History of Mathematics into Developmental Math Courses
Saturday, January 9 8:00–11:35 AM
Yakima 2, Yakima Level One, Washington State Convention Center

Organized by Van Herd and Amy Shell-Gellasch Link to full description.

MAA Session on Quantitative Literacy in the K-16 Curriculum
Wednesday, January 6 2:15–4:50 PM
Room 619, Washington State Convention Center

Organized by Aaron Montgomery, Gary Franchy, Gizem Karaali, Andrew Miller, and Victor Piercey Link to full description.

Minicourses

- Minicourse 12, Humanistic Mathematics, presented by Gizem Karaali and Eric Marland.
- Minicourse 14, Teaching Quantitative Reasoning with Common Sense and Common Knowledge, presented by Maura Mast and Ethan Bolker.

Link to full description.

SIGMAA on Quantitative Literacy Reception and Business Meeting
Thursday January 7, 5:30–6:45 PM
Yakima 1 and 2, Yakima Level One, Washington State Convention Center

We will hold a joint reception with SIGMAA STAT-ED at 5:30 and our annual business meeting will take place at 6:00 in Yakima 2 at 6:00. Our annual business meeting is usually followed by an informal reception at a local watering hole.

MathFest 2016

Columbus, OH, August 3–6 2016

The SIGMAA's contribution to the schedule will be determined at the business meeting in Seattle listed above.