

Quantitative Reasoning Learning Community

Friday, October 26, 2018

12:10-1:00 p.m.

Attendees: Jack Phelan; Yi-Wen Chiu; Gita Kolluru; Jianbiao Pan; Paul Choboter;
Michael Latner

Excused: Bruno Giberti

Meeting began at 12:12 p.m.

INTRODUCTION

JACK: The university had not really encountered quantitative reasoning (QR) in a formal way prior to 2016. It is not included in the language in our ULOs. Nationwide, there's a dedicated focus and need for this area. We tend to call it "critical thinking with numerical evidence." It is part of our WASC 5 Core Competencies and it is a dedicated area for us to consider in terms of development, assessment, and evaluation.

In 2016, we developed a starter rubric and started to receive more input. We designed this rubric to work across learning for lower division and upper division students. We anticipated that first- and second-year students would end at emerging proficiency. Our goal is that the time a student is, using WASC terminology, "at or near graduation" that he or she is at the "Proficiency" level. For Cal Poly, that means assessing student work in one or two quarters before they graduate.

Let's start the conversation by discussing the article I sent you by Susan Elrod ("Quantitative Reasoning: The Next 'Across the Curriculum' Movement"). She actually taught at Cal Poly for a while and had been an assessment director and is now a provost. Her article talks about quantitative reasoning beyond math. It's being able to think critically about numerical evidence and come up with a determination.

She was with Cal Poly, then an assessment director, and now a provost. It's not about the right answer but the thinking of looking at numerical results and evidence. Ultimately, it's beyond math.

GITA: I agreed with a lot in the article. It's fairly easy to apply to biology, especially at upper level, because it's interpreting data in different areas and generating statistical analyses. Problem identification reminds me of hypothesis generation. Outside of the sciences, I don't know how that would translate.

PAUL: I am glad this area is something the university is being held to assessing. It is not just about formulas but understanding the numbers. I am glad that we are placing this skill at a higher level. I have

asked to be the chair of the GE Area B working group, and I could see a lot of crossover in GE to address these issues.

QUANTITATIVE REASONING AND IME

JIANBIAO: It is such a critical time to be doing this work along with GE. It is one thing to be built into disciplines, but it is not currently in the GE PLOs, which is a problem. One of the lower division projects was a simulation of how students could buy a home later in their life. Students had to map, based on their career aspiration, where they'd be living, what their potential pay could be, and consider financing options when it came to renting versus purchasing a home. Then, they had to write about where they wanted to be. This Learn by Doing project comes back to that definition as to what QR means. In lower division Area B (LDB) courses, we do that. We also talk about the challenge of less presentation/lecture and how do we make it a real-world scenario to make it topical and engaging.

JACK: Does this QR rubric seem to align with IME?

JIANBIAO: They align with our PLOs very well. I think that it is already there.

JACK: That's good that there's already that overlap. What is the writing component in IME?

JIANBIAO: Our presentations are team-based and then the group writes a final report. For our assessment, we rely on the Writing Proficiency Exam (WPE). That's one of the components for our assessment. We mainly assess at that "close to graduation" level with their senior project. Every student has to present not only to our faculty but also to the Industrial Advisory Board.

JACK: The last big assessment piece would relate to oral communication. It was so different, at times difficult, to find those artifacts. Statistics, for example, was so involved with persuasion and using numerical evidence to make a case. We had to videotape a lot. Oral communication is beyond poise. In engineering, do you assess in terms of persuasion, content, and evidence, too?

JIANBIAO: Students have two hours to present, which tends to be limited. We ask each team to make a video. The video is posted online, and we give the link to each member on the advisory board to watch the videos before they come to the final presentation meeting. During the face-to-face time, students will have 5 minutes to summarize their project and then have to defend their project in front of the board.

GITA: That is really interesting. We don't have any type of oral defense or presentation.

JIANBIAO: We try to let the third party help prevent any sort of bias. The faculty advisor has a relationship with the student already and might be too subjective. We let outside board deal with that. Then we try to reduce that bias.

QUANTITATIVE REASONING AND MATH

PAUL: In our department, students present with their faculty advisor. They write a paper, which is signed by the student and advisor. We informally organize a select few senior project to present to the next generation – it's not evaluated and just for a small minority. We try to present at the big research symposium. It's now 100+ posters over one day, but it's dependent on the advisor.

GITA: Having that presentation is a great opportunity to evaluate oral communication and quantitative reasoning.

JACK: We partner with architecture, who has a very similar conference, and we were able to videotape those competencies. In terms of the overall WASC plan, assessing the five core competencies is staggered. We are just starting Information Literacy right now. Quantitative Reasoning is the first core competency where we have already done a lower division assessment and can now do an upper division assessment. The WASC 5 Core Competencies is outside of program assessment and is a new set of measures to be looked at closely.

QUANTITATIVE REASONING AND NATURAL RESOURCES MANAGEMENT & ENVIRONMENTAL SCIENCES

YI-WEN: I teach 3 courses including a capstone class about Environmental Management. Students need to take two other classes before they can take this upper division class. Students initially thought environmental management as about hugging trees; they are surprised as to how much quantitative reasoning and math is involved. There are so many arguments that they have to synthesize, such as switching from plastic to stainless steel straws. We deal with these arguments on a daily basis. They learn that a lot of what they through media isn't true and that they have to justify the argument with math to support the idea. Human reasoning is the first step to talk about all of the numbers and talk about what we see. Without numbers, then decisions would be made based on feelings. Students develop group projects with proper computational tools.

At the end of the quarter, they have to present. With 10 weeks, to learn all of this computation is already challenging. I have no time to actually prepare them to improve their communication skills. We don't have that capacity in the class to implement that skill, so I have a collaboration with the English department. Students have to co-enroll in these classes: to take my class to learn quantitative skills and to take the English class to learn about presentation and communication skills. This co-enrollment allows students to expand their learning process and learn side-by-side. If they had only taken a class related to communication and argumentation in their first year, they would forget how to use those skills by the time they reach my class or other upper division classes.

JACK: Practice is critical. Where is a skill introduced, how is it developed, and when do students show mastery? There are big gaps in curriculum planning into where they developed the skills.

GITA: It's especially true if it seems to be an introductory class on a subject they don't like. They might not like having to remember those skills or see how it connects to the work that they do later in their upper division coursework.

YI-WEN: The English instructor has the ability to continue to develop those skills. It's related to their field.

JACK: There was this big interdisciplinary push. I think it was hard to get out of the silo of the college/discipline. How did you create that relationship with the English instructor?

YI-WEN: I went to CTLT and worked with Jay Peters. He teaches scientific writing, but he works with different majors. The student always struggled with how to write about the material from quantitative reasoning. We need to use existing courses.

GITA: The courses that I teach change every year, so it would be hard to have that co-relationship.

YI-WEN: My class is pretty standardized and taught frequently; same with that English class. That's why we ask students to co-enroll. We also have to ask University Scheduling to make sure there are no time conflicts between the classes. It is a concurrent prerequisite.

JACK: Do students know about that the overlap?

YI-WEN: Yes. We are still in the testing phase of this relationship. It is a three-year process. In the future, our goal is to take the evidence on SLOs and take this kind of practice into consideration.

ASSESSMENT GOALS AND PLANNING

JACK: That leads to the next step. Could there be an interest as an ambassador with this UD requirement? We spoke with Dawn Janke and Brenda Helmbrecht. We have always been a little behind the curve on faculty doing their work and being able to collect artifacts to assess. For instance, we teamed with Psychology, but they didn't have two of the criteria needed for us to assess. They said that they could have included it if they had enough notice. As ambassadors of the work of your own students, can we look to see if there is a culminating exercise that might fit?

GITA: There's a group project at the end of Winter Quarter.

JACK: If it's senior-level work, you could be working winter or spring with these assignments?

GITA: It's open to anyone above sophomore level. It's a smaller number. Typically, it's mostly seniors.

PAUL: The Math department has a couple of capstone senior seminar courses. We've revamped them over the last 4 years. We decided to make the senior project report optional, which was a very controversial decision within our department. There is a different set of projects: one for Math and one for Applied Math. They are designed to have students pull everything from their degree with modeling and then presenting the results. These courses would be great from Math to fit this description.

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Throughout the curriculum, there's a lot of need for more communication of these ideas. We acknowledge that's a huge skill that's needed with our students.

JACK: This area has been identified as the biggest skill. We usually don't have time to develop this idea before we need to assess it, too.

GITA: That's not the issue with BIO, especially in Area B where students have to do oral communication.

JACK: Do you notice their strength, ability, and creativity?

GITA: Very much. It's common to have presentations. We have a capstone class that can meet the senior project. They propose a grant proposal, but that is still in the hypothetical stage and might not demonstrate that much quantitative reasoning. In theory, they should be able to write the inferences by evaluating the other data. It's offered every quarter.

JIANBIAO: I have a few ideas with IME. I'm teaching IME 430, and I think all of these criteria have been embedded in our courses anyway. They have a group project, give a presentation, and write a report. We could make a recording of their work this quarter, and we could also videotape it next quarter. I'll be teaching the first part of senior project now. The senior project is now two quarters long, but we will be changing it to a 3-quarter requirement starting in 2019. I can talk to our department to videotape their final senior project.

JACK: We didn't have any video documentation of the oral communication in LD. It was typically written communication – walking through the problem, synthesizing, etc.

JIANBIAO: If we want to collect the data now, we could.

JACK: Unfortunately, we have to wait until Winter Quarter because WASC doesn't see a senior in Fall has having enough skills. However, there could be students graduating this winter, and it would be OK for us to collect their work.

JIANBIAO: Spring will be all IME. This quarter is a mix of BMED and IME. You can randomly sample a course and have that information.

GITA: The class I teach – BIO 442 – is really small. There's six hours on one day of oral communication. BIO 442 is just an upper division class; it's not a capstone class. Typically, we have a presentation, but it's just of ideas just not analysis. In BIO 442 it's a very specialized course with maybe 48 students.

JACK: To let you know sample size for the sustainability of what we can accomplish, anything over 60 students would be great.

YI-WEN: Lifecycle analysis – 314. The class happens Winter and Spring Quarters. It's a major required course, so I have about 50 students per quarter since we need a computer lab. We have another senior project – NR 465 – that is also a major requirement. There are 80-90 students in that class. It's the same situation; it applies all of the skills they learned. There is a group project with NR management plan,

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some quantitative numbers/analysis, but very minimal computation. They can collect census data. It fits with the other 3 areas but might be a little thin on the analysis.

JACK: This is very exciting. I'll reach out with a little bit of a prompt on the next step but plan on bringing a course or assignment to the next meeting. Then, we can all join into the conversation on each of your projects and coming up with a long-term goal. If there's anything within the rubric we need to fix, we can. Part of our goal, too, is to design a rubric for each of the five core competencies and have it be a standard set of rubrics that would work across the university. That is part of our goal.

Meeting ended at 1:06 p.m.