Program Assessment and Curriculum Development in the Applied Math Graduate Program

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Overview

- Graduate program in Applied Math currently has 21 PhD students and 1 MS student.
- Our program emphasizes the following areas:
  - Modeling complex, realistic systems
  - Scientific computing
  - Analysis of data

Annual Assessment 1

In AY 2014-15, we assessed PLO #3:

Give clear and organized written and verbal explanations of mathematical ideas to a variety of audiences, including teaching undergraduate students.

Annual Assessment 2

In AY 2015-16, we assessed PLO #4:

Model real-world problems mathematically and analyze those models using their mastery of the core concepts.

Questions

- We do not require any coursework in communication or mathematical modeling.
- Questions:
  1. How are students learning how to communicate / to build mathematical models?
  2. How well do our students currently do these things?

Procedure

- For both assessments, we used:
  - SATAL focus group
    - Targeted students in at least their second year.
    - Each year, we had 8 participants, roughly 50% of the target group.
  - Direct assessment of student work
    - Focused on peer-reviewed publications coauthored by students.
    - Three faculty members scored publications using rubrics.

Findings

- Overall, our program does improve students' abilities to communicate mathematics, and to build/analyze mathematical models. (yay!)
- The focus group summaries and direct assessments agree on this point.
- Of course, we also have areas in which to improve.

Communication

- Students wanted more opportunities to give talks and get feedback.
  - We purchased an LCD projector for use by grad students.
  - We restarted a seminar series run by grad students; strong encouragement for faculty to attend and give feedback.
  - We channeled USAP funds into travel fellowships to increase student talks at conferences.

Other Recommendations

- Faculty should give prompt, detailed feedback (say, shortly after the student gives a talk or sends a draft of a paper).
- Program needs to find ways to improve measurement of student talks.
- Faculty should collaboratively improve rubrics and then disseminate them to students, so that expectations are clear.

Mathematical Modeling

- Just finished assessment, hence improvements haven't been implemented yet. ☺
- Suggestions for areas to improve:
  1. Teach more math modeling in core grad courses.
  2. Require Math 292: Special Topics.
  3. Organize "hackathons" or similar activities.
  4. Distill best practices from research groups.
  5. Create grad electives in statistics & stochastic processes.

Future Directions (revised P&P)

- We're adding two required, second-year courses:
  - Math 233 (Scientific Computing)
  - Math 224 (Advanced Methods of Applied Math)
- This will enable us to
  - **move** technical material out of the first-year curriculum and into these courses.
  - **increase** coverage of mathematical modeling in first-year courses.

Future Directions (revised P&P)

- Clarified our requirement of two "Special Topics" courses.
- Students must now take **at least one** semester of Math 292: Special Topics.
- The other course can be another Math 292, or a grad-level course from another discipline.
- Need to encourage more mathematical modeling in Math 292, to complement technical material.