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.