Project-Based Learning in Analysis

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Class

Complex Analysis

- Upper-level elective course at small liberal arts college
- 10 students: 6 seniors, 3 juniors, 1 sophomore, almost all math majors
- 3 credit course

Motivation

- To give students the opportunity to study a topic outside of class discussions
- To allow students the opportunity to work in small groups (1-3 students) on a project
- To improve students' mathematical communication skills, both in writing and orally

Project Components

1. Project proposals
2. First drafts
3. Peer reviews
4. Final papers
5. Presentations

Overall worth 25% of course grade

Project Proposals

- Must include a 1-2 page description of the problem, including a description of its applications to complex analysis
- 1-2 pages, typed
- Due 8 weeks into the semester

Rough drafts

- 5+ pages long, single-spaced
- Must include introduction, conclusion, and reference sections
- Graded only on professionalism and timely completion
- Due 11 weeks into the semester (3 weeks after proposals)

Peer reviews

- Each group was given two projects to review.
- Reviewers asked to evaluate all aspects of project, including general readability, stylistic decisions, and each paper's greatest strength and weakness
- Graded on thoroughness of reviews in answering each of the questions asked
- Due 13 weeks into the semester (2 weeks after rough drafts)
- Students also received feedback from the instructor

Final papers

- Graded by rubric on several aspects related to overall quality of paper

- Due on the last day of classes (2 weeks after peer reviews)

Presentations

- Held during final exam slot (1 week after final paper handed in)
- 15-20 minute presentations each followed by 5 minutes for questions
- Grades determined half by instructor, half by other students through anonymous comment sheets

Project topics

1. Prime Time Loving (3 students)
2. Algebraic Closure and the Complex Field (3 students)
3. Conformal Mappings: Theory and Applications (2 students)
4. Quantum Complexities, Words, and Equations: The Relationship between the Quantum and Imaginary Worlds (1 student)
5. Modeling the Components of Capital Using the Complex Plane (1 student)

Student Responses

- Overall very positive
- Several mentioned the process as stressful, but ultimately rewarding
- Multiple students said this served as a much better culmination of the semester than a final exam would have been
- Largest issue was in knowing what to expect from a "math paper". Students felt unprepared to write formally about mathematics

Personal Response

- Overall seemed to work very well
- Student evaluations of final presentations far too lenient.

Future Changes

- Weave project more effectively into first half of the semester
- During rough draft stage, give students sample papers to look at for better sense of how to write a mathematical paper
- Give students incentive to not just give perfect scores on final presentations