SAINT LOUIS UNIVERSITY.

Program-Level Assessment: Annual Report

Program Name (no acronyms): Mathematics	Department: Mathematics and Statistics
Degree or Certificate Level: MA / PhD	College/School: College of Arts and Sciences
Date (Month/Year): September 2023	Assessment Contact: Benjamin Hutz

In what year was the data upon which this report is based collected? AY 2022-2023

In what year was the program's assessment plan most recently reviewed/updated? AY 2021-2022

Is this program accredited by an external program/disciplinary/specialized accrediting organization? NO

1. Student Learning Outcomes

Which of the program's student learning outcomes were assessed in this annual assessment cycle? (Please list the full, complete learning outcome statements and not just numbers, e.g., Outcomes 1 and 2.)

- MA Program
    - **PLO #1:** Graduates will be able to demonstrate the ability to learn high-level mathematical concepts and techniques.
    - **PLO #2:** Graduates will be able to demonstrate ability to apply methods of direct and indirect proof to solve problems at the master's level.
    - **PLO #3:** Graduates will be able to demonstrate ability to effectively communicate mathematics in both a written and oral setting.
    - **PLO #4:** Graduates will be able to demonstrate master's-level depth of understanding of mathematics at the foundation of contemporary applications.
- PhD Program
    - **PLO #1:** Graduates will be able to demonstrate fundamental knowledge in the areas of algebra, analysis, topology, and differential geometry.
    - **PLO #2:** Graduates will be able to demonstrate mastery in three of the four areas in PLO #1.
    - **PLO #3:** Graduates will be able to demonstrate ability to identify and solve new research problems in pure or applied mathematics.
    - **PLO #4:** Graduates will be able to demonstrate ability to effectively communicate new research in both a written and oral setting.
    - **PLO #5:** Graduates will be able to demonstrate ability to manage a large research project and prepare a manuscript.

2. Assessment Methods: Artifacts of Student Learning

Which artifacts of student learning were used to determine if students achieved the outcome(s)? Please describe the artifacts in detail and identify the course(s) in which they were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

Students were assessed based on their final degree oral examinations. These could take three forms:
1. Ph.D dissertation defenses (3 students)
2. Ph.D. Preliminary Exams (3 students)
3. MA thesis defenses (7 students)
4. Other presentations (1 student)

These were completed in-person on Saint Louis Universities main campus and consisted of the student and three faculty evaluators. The presentations were open to the public, but only the examiners were permitted to interact with

the student. Faculty members from both the evaluating and committee were able to submit evaluation reports on the students for the purposes of program evaluation and included in this document.

3. Assessment Methods: Evaluation Process

What process was used to evaluate the artifacts of student learning, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and **include them in/with this report document** (please do not just refer to the assessment plan).

Every faculty evaluator (committee member) was asked to complete a Google form that contained a series of questions rating the students in the following three broad categories:

- Mathematical Content
- Presentation Style
- Clarity and Organization

using the following rubric marks:

- 3 – Criteria fully met
- 2 – Criteria mostly met
- 1 – Criteria minimally met
- 0 – Criteria not met

Brief comments may be added for each category noting particular strengths or weaknesses of the presentation/presenter in that category.

Details on Categories and Criteria:

I. Mathematical Content
- Content presented is mathematically accurate
- Demonstrates adequate understanding of content and is able to answer questions related to the content
- Content is appropriate to the assignment/class/project (not off topic)
- Level of sophistication of the mathematics is appropriate to the class/project
- Appropriate amount of content is presented

II. Presentation Style
- Voice is of appropriate volume and is clear
- Pace is not too fast or slow
- Appropriate use of technology
- Sufficient preparation and practice evident in presentation
- Presenter engages appropriately with audience

III. Clarity and Organization
- There is a clear overall organization to the presentation
- Sufficient and clear examples are given when appropriate
- Sufficient motivation for the mathematics is given when appropriate
- Clear explanations of terminology, theorems, and proofs when appropriate

Sample Rubric Sheet for Oral Presentations in Mathematics

Mathematical Content   3   2   1   0
      Comments:
Presentation Style   3   2   1   0
      Comments:

| Clarity and Organization	3	2	1	0
Comments:				

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4. Data/Results

What were the results of the assessment of the learning outcome(s)? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

There were 26 faculty responses evaluating 14 different students. 77% of responses were from committee members and 23% from audience members. The data is the following:

Mathematical Content

Mathematical Content * Content presented is mathematically accurate * Demonstrates adequate understanding of content and is able to answer que...nce * Appropriate amount of content is presented

26 responses
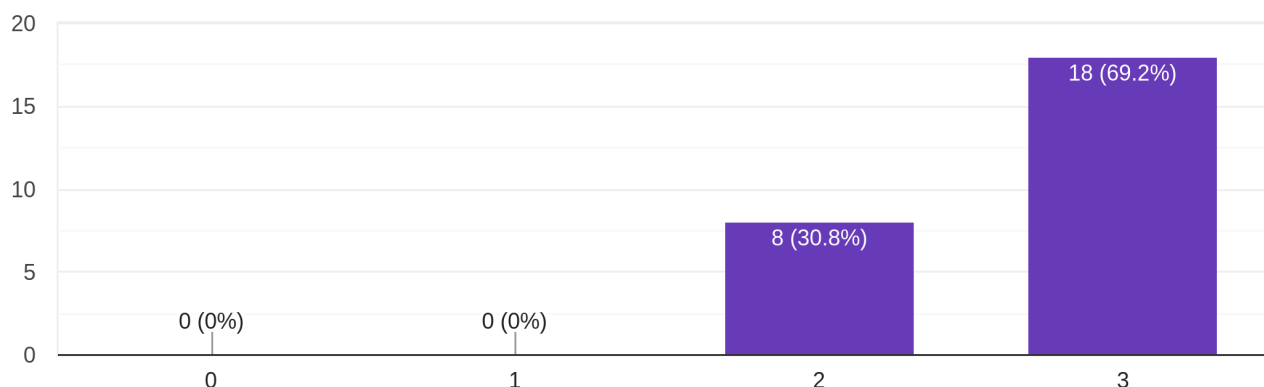
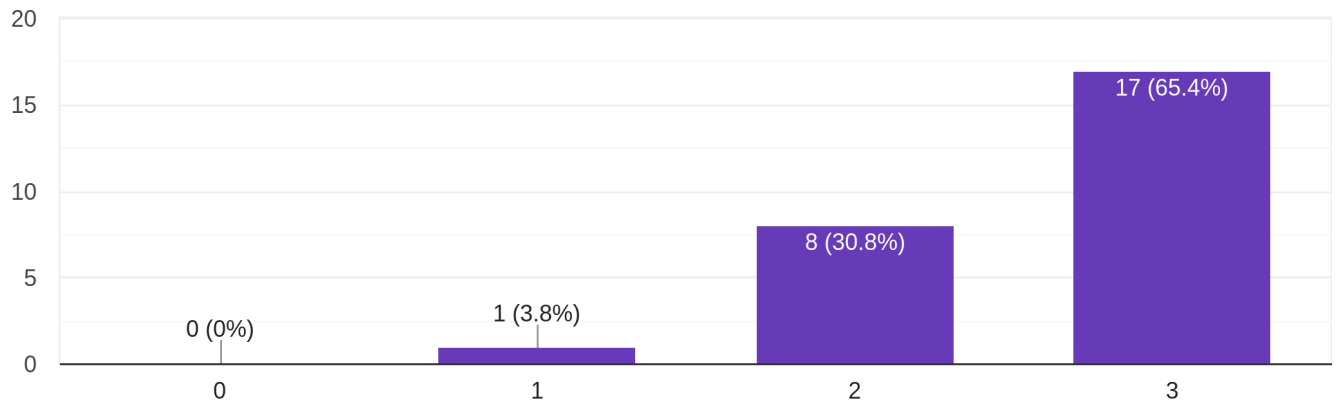**Open comments for PhD students:**
- [student] did a great job in the presentation and did a good job answering questions
- The content was at an appropriate level
- At an appropriate level
- There were some minor errors, but the content was mathematically correct on the whole.
- [student] did reasonably well. There were some instances where he presented things in a way that seemed unnatural to the committee. The content of the talk was mathematically correct.
- The mathematical content was very good.
- The mathematical content was very good for a PhD dissertation.

Open comments for PhD students:
- The math content was good.
- Very high level for an MA exam. However, a lack of understanding of some key points.
- Too much content presented. Level was OK, but could have been better.
- Overall good, but had some difficulty with more technical questions
- They didn't demonstrate an adequate understanding of all the content. Specifically, they weren't able to answer a question about the formula for the total Chern class of the quintic submanifold in 4 dimensional complex projective space.

Presentation Style

Presentation Style * Voice is of appropriate volume and is clear * Pace is not too fast or slow * Appropriate use of technology * Sufficient preparat...n * Presenter engages appropriately with audience

26 responses

Open comments for PhD students:
- Well paced and she clearly was well prepared. Did great interacting with audience when questions were asked
- A few too many slides, so covered quickly at times.
- Material was covered quickly, with many slides. Sometimes not enough time to absorb the contents of a slide.
- The talk was given fairly smoothly.
- Presentation style was very good.
- As I recall, some slides still contained typos at the time of the presentation, but they were minor.
- His slides were well prepared, and in number, sufficient for the time allowed.

Open comments for MA students:
- The student seemed well prepared and answered questions well throughout the presentation.
- This was not well prepared. The mechanics of the presentation were acceptable.
- Related to previous, pace was too fast.
- clearly well prepared
- They started rather slowly by going almost line for line through the their thesis, but the presentation picked up later in the talk.

Clarity and Organization:

Clarity and Organization * There is a clear overall organization to the presentation * Sufficient and clear examples are given when appropriate * Suffic...rminology, theorems, and proofs when appropriate

26 responses
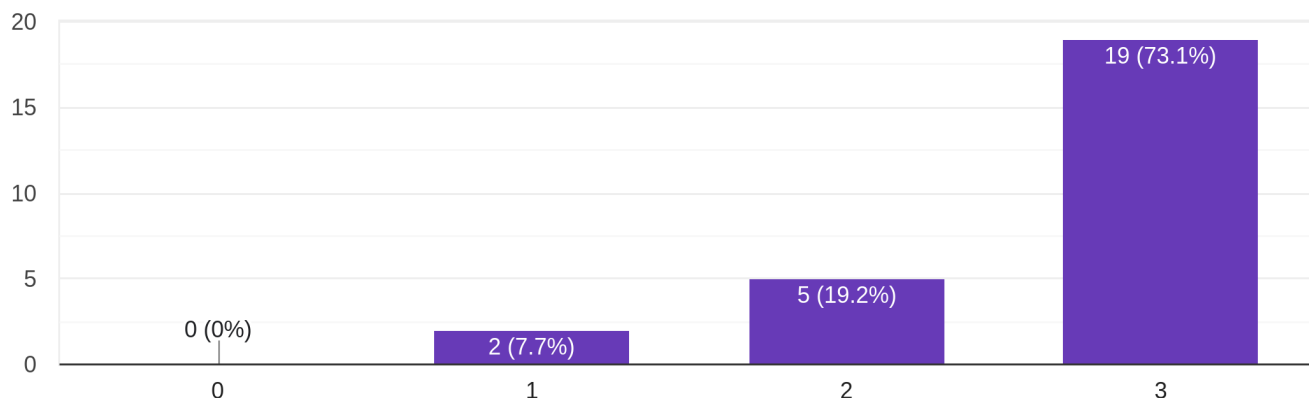
Open comments for PhD students:
- Good use of examples. The topic is very notationally dense and she did a good job with that
- Good examples
- The organization of the information was good.
- Information in the talk was clearly organized.
- The talk was well organized and delivered smoothly.

Open comments for MA students:
- The organization of the ideas in the presentation was good.
- Lack of examples, motivation.
- I felt that more details could have been given.

5. **Findings: Interpretations & Conclusions**
   What have you learned from these results? What does the data tell you?

SIn AY 2022-2023 our graduate students were very successful across all three measured areas, especially the area of mathematical content. There were some concerns for 1-2 students in their overall presentation skills and clarity. These concerns were for MA students with no concerns for the PhD students evaluated.

Interpretation and Conclusions:
The course work and mathematical content learning are excellent for the majority of students and good for all students. This tells us that the sequence of degree requirements through course work, thesis, and examinations are ensuring the mathematical content is being learned appropriately. For the presentation and clarity, nearly all students are giving clear well prepared presentations with a few students needing additions work in this area. The students needing work were primarily MA students. We need to examine specifically where we expect the students to be learning these skills and evaluate those activities in the shorter duration MA program. There are five areas where we would expect these students to learning these aspects of communication:
1. Course Work
2. Department Seminars
3. Teaching (both training and classroom teaching)
4. Informal and Formal discussions with faculty
5. Conference and seminar preparation and presentations

Examining each of these in turn:

1. We did not conduct an evaluation of coursework this assessment period. This was the main path of assessment for AY2021-2022
2. These have been slowing increasing in frequency since the end of the main restrictions in place from COVID-19. The department colloquium and graduate seminar restarted in AY2021-2022 and the additional research seminars restarted in AY2023-2024. Attending these seminars would help significantly for the graduate students. There is a weekly email to all students and faculty about the seminars. We do not track attendance at the seminars.
3. Students supported via a teaching assistantship undergo some basic training and mentoring in teaching and have an ongoing interaction with students over a number of years. For AY2023-2024 we've also increased the formality and scope of this training. Students not supported by a teaching assistantship (1-2 per year) do not have this additional training. The department is currently discussing whether to require the additional training for these students.
4. We have no way to track or monitor these discussions, but they often form a major component of where students learn to communicate mathematics at a very advanced level.
5. We have very few students who give conference presentations. We restarted the graduate student seminar in AY2021-2022 in part to encourage development of presentation skills.

6. **Closing the Loop: Dissemination and Use of <u>Current</u> Assessment Findings**
   A. When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

   > The assessment report was disseminated to all faculty in September 2023 and discussed via email.

   B. How specifically have you decided to use these findings to improve teaching and learning in your program? For example, perhaps you've initiated one or more of the following:

Changes to the Curriculum or Pedagogies	• Course content • Teaching techniques • Improvements in technology • Prerequisites	• Course sequence • New courses • Deletion of courses • Changes in frequency or scheduling of course offerings
Changes to the Assessment Plan	• Student learning outcomes • Artifacts of student learning • Evaluation process	• Evaluation tools (e.g., rubrics) • Data collection methods • Frequency of data collection

   Please describe the actions you are taking as a result of these findings.

   > • Increase in scope and formality of the training of teaching assistants.
   > • The restart of seminars was not in direct response to these results. However specific encouragement of graduate students to attend the seminars appropriate to their research area was increased in view of these results.

   If no changes are being made, please explain why.

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7. **Closing the Loop: Review of <u>Previous</u> Assessment Findings and Changes**
   A. What is at least one change your program has implemented in recent years as a result of assessment data?

   > Expansion of the scope of assessment data was made in response to the AY 2021-2022 report. See that report for details.

B. How has this change/have these changes been assessed?

We did not collect data on coursework and proof writing in this year's assessment.

C. What were the findings of the assessment?

N/A

D. How do you plan to (continue to) use this information moving forward?

This data will be compared to future year's assessment where similar elements are evaluated to track overall program success and progress.

IMPORTANT: Please submit any assessment tools (e.g., artifact prompts, rubrics) with this report as separate attachments or copied and pasted into this Word document. Please do not just refer to the assessment plan; the report should serve as a stand-alone document.