

**Report of Student Learning and Achievement
Concordia University Irvine
School of Arts and Sciences – Mathematics Program**

For Academic Year:	2024-2025
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School of Arts and Sciences Mission
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Mathematics Program Purpose

The School of Arts and Sciences strives to educate its students within the multi-faceted context of the liberal arts. Firmly rooted in the Christian tradition of Concordia University Irvine, the School confidently and freely explores both the riches of the past and the knowledge of today. The School cultivates within all students a disciplined and coherent worldview to prepare them to be active and effective leaders in today's world.

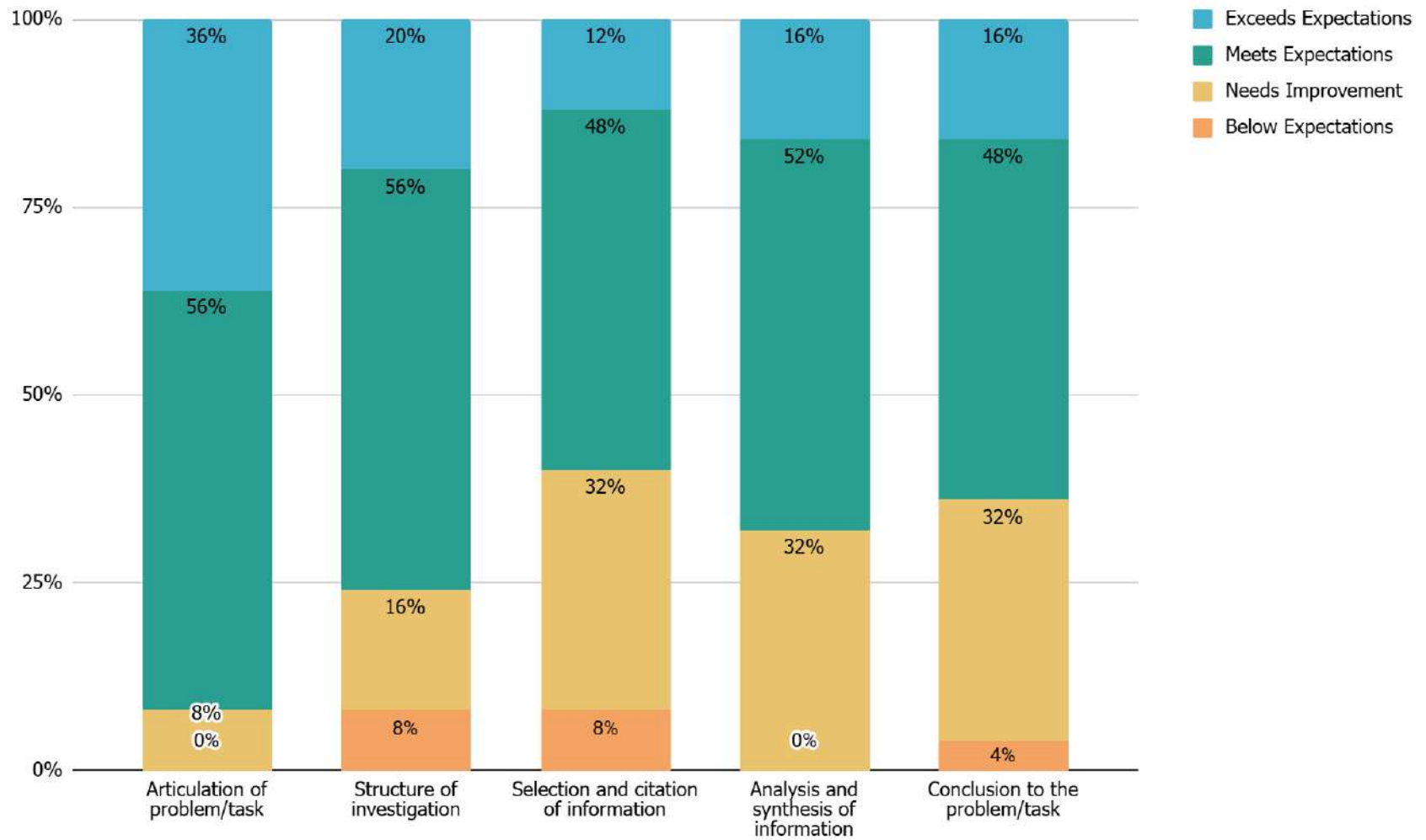
The Mathematics Bachelor of Arts develops student numerical and analytical abilities to investigate, formulate, analyze, and articulate solutions to problems within the discipline of mathematics, including the application of mathematical ideas to real-world problems and issues, and the theoretical foundations of mathematics.

Program Learning Outcomes (PLOs)

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| 1. Write, critique and interpret various forms of mathematical proofs. |
| 2. Calculate, apply and synthesize core content in mathematics. |
| 3. Utilize effective strategies in problem solving, including data analysis and multiple representations of mathematical ideas (visualization/ graphs, symbolic notations and numerical data). |
| 4. Clearly communicate mathematical concepts, vocabulary and notation. |
| 5. Apply the Christian teaching of vocation to learning, service, and leadership. |

Program Assessment Overview Aligns with ULO: Systematic Inquiry			
PLOs Assessed	Evidence and Assessment Instrument	Performance Objectives (Targets/Criteria) Measures:	Results for Measures of Student Learning:
PLO #3 Calculate, apply, and synthesize core content (e.g., algebra, calculus, statistics) in mathematics.	MTH 388 (Prob & Stats 2): Final Statistics Project using R-studio MTH 496 (Final Project): Final Research Paper	At least 75% achievement in all rubric areas used.	Percentage of students who met or exceed expectations: Articulation - 92% Structure - 76% Selection - 60% Analysis - 68% Conclusion - 64%

Program Assessment Results



Summary of Program Assessment Findings

Final Papers in MTH 388 and MTH 496 (7 student artifacts, each with 3-5 graders, so 25 scores)

- Systematic Inquiry Criteria: Articulation of problem/task
 - 23 scores (92%) met or exceeded expectations
 - 2 scores (8%) reflect "Needs Improvement"
- Systematic Inquiry Criteria: Structure of investigation
 - 19 scores (76%) met or exceeded expectations
 - 4 scores (16%) reflect "Needs Improvement"
 - 2 scores (8%) reflect "Below Expectations"
- Systematic Inquiry Criteria: Selection and citation of information
 - 15 scores (60%) met or exceeded expectations
 - 8 scores (32%) reflect "Needs Improvement"
 - 2 scores (8%) reflect "Below Expectations"
- Systematic Inquiry Criteria: Analysis and synthesis of information
 - 17 scores (68%) met or exceeded expectations
 - 8 scores (32%) reflect "Needs Improvement"
- Systematic Inquiry Criteria: Conclusion to the problem/task
 - 16 scores (64%) met or exceeded expectations
 - 8 scores (32%) reflect "Needs Improvement"
 - 1 score (4%) reflects "Below Expectations"

These numbers were lower than anticipated or expected in several categories, and showed that students had difficulty incorporating background information, synthesizing information, and making a conclusion to the problem or task. In three of the five categories considered, the expected standard of 75% achievement in each area was not met. Thus, we broke the information down further, by assignment.

Considering only the MTH 496 Final Papers, 2 student papers were assessed by 5 graders (10 scores)

- Systematic Inquiry Criteria: Articulation of problem/task
 - 8 scores (80%) met or exceeded expectations
 - 2 scores (20%) reflect "Needs Improvement"
- Systematic Inquiry Criteria: Structure of investigation
 - 6 scores (60%) met or exceeded expectations
 - 3 scores (30%) reflect "Needs Improvement"
 - 1 score (10%) reflects "Below Expectations"
- Systematic Inquiry Criteria: Selection and citation of information
 - 6 scores (60%) met or exceeded expectations

- 4 scores (40%) reflect “Needs Improvement”
- Systematic Inquiry Criteria: Analysis and synthesis of information
 - 5 scores (50%) met or exceeded expectations
 - 5 scores (50%) reflect “Needs Improvement”
- Systematic Inquiry Criteria: Conclusion to the problem/task
 - 5 scores (50%) met or exceeded expectations
 - 5 scores (50%) reflect “Needs Improvement”

These scores were extremely low, with “Articulation of the problem/task” being the only category in which 75% achievement was met.

Considering only the MTH 388 Final Statistical Research Papers using R-studio, 5 student papers were assessed by 3 graders (15 scores)

- Systematic Inquiry Criteria: Articulation of problem/task
 - 15 scores (100%) met or exceeded expectations
- Systematic Inquiry Criteria: Structure of investigation
 - 13 scores (87%) met or exceeded expectations
 - 1 score (7%) reflect “Needs Improvement”
 - 1 score (7%) reflects “Below Expectations”
- Systematic Inquiry Criteria: Selection and citation of information
 - 9 scores (60%) met or exceeded expectations
 - 4 scores (27%) reflect “Needs Improvement”
 - 2 scores (27%) reflect “Below Expectations”
- Systematic Inquiry Criteria: Analysis and synthesis of information
 - 12 scores (80%) met or exceeded expectations
 - 3 scores (20%) reflect “Needs Improvement”
- Systematic Inquiry Criteria: Conclusion to the problem/task
 - 11 scores (73%) met or exceeded expectations
 - 4 scores (27%) reflect “Needs Improvement”

These numbers were stronger, with at least 75% of students meeting or exceeding expectations in four of the five categories. (Note - in the Conclusion section, only 73% met or exceeded expectations, but because of the sample size, we will count that as successful.) The only category in which students did not meet expectations was in the “Selection and citation of information” category, with only 60% of the marks meeting or exceeding expectations.

The mathematics department has identified a few issues to address some of these weaknesses. First, a basic statistics course will be required for all mathematics majors starting in Fall 2025. We’ve found that some students lack basic knowledge on inferential statistics, so struggle with the theory

and application of those ideas in MTH 388. The Final Research papers in MTH 496 were also extremely low; the mathematics department will continue to work to develop written communication skills, including using and citing source information, clear analyses and synthesis of the material, and articulation of the conclusions.

We will continue to work with students on mathematical research papers, and helping them clearly communicate their results. For MTH 388, the description and assignment directions will be modified to more clearly require cited background information, synthesis of information and a clear conclusion from the results.

Summary of Achievement Outcomes Aligns with ULO: Systematic Inquiry		
2024-2025 PLO Assessed	Student Evidence: Final Project / Final Research Paper	Student Evidence: N/A
Criterion Measured	Performance Target Was...	Performance Target Was...
Articulation of Problem / Task	Met	
Structure of Investigation	Met	
Selection and Citation of Information	Not Met	
Analysis and Synthesis of Information	Not Met	
Conclusion to the Problem / Task	Not Met	

Program Proposed Course of Action for Improvement in Learning Outcomes
The department will further discuss the findings, and determine other future changes necessary to improve systematic inquiry and the articulation, analysis, and interpretation of mathematical problem/task. After the department considers the APLO results, potential changes (both to curriculum and also to particular course assignments/instructions) will be introduced and/or adopted throughout the major.