To: Dr. Neal Bukeavich, Associate Vice President for Academic Affairs & Dean of Arts and Sciences
From: Dr. Weiwei Zhang, Chair of Mathematics and Computer Science Department
Subject: MATH Program Assessment 2018-2019
Date: June 2019

MATHEMATICS

Learning Outcome 3: Demonstrate a proficiency in the use of a computer algebra system

Assessment Measures / Methods	Target / Benchmark	Results	Action Taken
Assessment 1 (direct) Laboratory reports in Math 129 and Math 130.	80% of students will have a total score of at least 80 on the scale for evaluation of lab reports.	Target **met.** 87% scored 80 or better for Fall 18 and 83% scored 80 or better for Spring 19.	No Action taken.
Assessment 2 (indirect) Seniors' self-evaluation of Technological Competence.	80% of seniors report a score of at least 4.0 on the 5-point scale for technological competence on the annual program evaluation.	No data due to small sample**.**	

Discussion:

After studying the following report:

PROGRAM EVALUATION AND OUTCOMES STUDY OF MAY 2018 DEGREE RECIPIENTS - Technological Competence (computers & multimedia)

We found that there is no data available for 2018 as the number of graduates was small. However, 2017 data shows that the Math program is in Tier 1 with a score of 5.00. This indicates that the program has been effective regarding Learning Outcome 3 for the two-year circle.

MATHEMATICS
Learning Outcome 5: Make polished oral presentations of mathematical arguments

Assessment Measures / Methods	Target / Benchmark	Results	Action Taken
Assessment 1 (direct) Students make a public presentation of an original axiom system in Math 490 Junior Seminar.	All students earn scores of at least 2 on the rubric.	Target **met.** 100% scored at least 2.	No Action taken.
Assessment 2 (direct) Students present arguments to their peers in Math 425.	90% of students earn scores of at least 2 on the rubric.	Target **met.** 100% scored at least 2.	

Discussion:
Three students presented their axiom systems at the regional meeting of the Mathematical Association of America (EPADEL) on campus. It is worth mentioning that the EPADEL meeting was hosted this year by the MATH department. The math majors were well prepared, and answered the questions raised by the audience well.

MATHEMATICS

Learning Outcome 6: Successfully create and resolve mathematical conjectures

Assessment Measures / Methods	Target / Benchmark	Results	Action Taken
Assessment 1 (direct) Students create their own conjectures and resolve conjectures developed by their peers in Math 425, the capstone course.	80% of students earn scores of at least 2 on the rubric.	Target **met.** 100% scored at least 2.	The instructor will minimize the lecture component even more and spend more time on the discussion and presentation of problems and conjectures.
Assessment 2 (indirect) Critical Thinking on the program evaluation by seniors.	80% of seniors report a score of at least 4.0 on the 5-point scale for critical thinking on the annual program evaluation.	No data due to small sample**.**	

Discussion:

After studying the following report:

PROGRAM EVALUATION AND OUTCOMES STUDY OF MAY 2018 DEGREE RECIPIENTS - Critical Thinking Ability

We found that there is no data available for 2018 as the number of graduates was small. However, the 2017 data shows that the Math program is in Tier 1 with a score of 5.00. This indicates that the program has been effective regarding Learning Outcome 6 for the two-year cycle.

Appendix A / Outcome Three: Demonstrate a proficiency in the use of a computer algebra system.

Assessment #1: Laboratory reports in Math 129 and Math 130.

Individual labs are graded out of 25 points, and evaluated as follows:

SCORE	Characteristics of the Assignment
24-25	The student successfully performs all computations and manipulations using the software. The student provides sophisticated answers to all questions requiring conceptual understanding and interpretation of the results. Points are only deducted for minor errors in writing or presentation.
22-23	The student successfully performs nearly all computations and manipulations using the software. One minor error may be present. The student provides sophisticated answers to most of the questions requiring conceptual understanding and interpretation of the results. One such question may have an insufficient answer.
20-21	The student successfully performs nearly all computations and manipulations using the software. One or two minor errors may be present. The student provides sophisticated answers to some of the questions requiring conceptual understanding and interpretation of the results. The student may struggle to provide such answers to some of these questions.
17-19	The student successfully performs nearly all computations and manipulations using the software. One or two minor errors may be present. The student does not provide sufficient answers to the questions requiring conceptual understanding and interpretation of the results.
16 or less	The student has substantial errors in computations and manipulations completed with the software. The student does not provide sufficient answers to questions requiring conceptual understanding and interpretation of the results. Such a level of performance is often indicative of a failure to complete work.

Appendix B / Outcome Five: Make polished oral presentations of mathematical arguments.

Assessment #1: Students make a public presentation of an original axiom system in Math 490 Junior Seminar.

SCORE	Description
3	All arguments presented are correct. Quantifiers are used correctly. Terms from axiomatics, such as consistency and independence are used correctly. Alternative ways of looking at the same problem are presented. PowerPoint slides are professional in quality and the presenter does not read from them. The presenter is able to correctly answer questions about her or his presentation.
2	All arguments presented are correct. Quantifiers are used correctly, possibly with minor exceptions that do not make arguments incorrect. Terms from axiomatics, such as consistency and independence are used correctly, possibly with minor exceptions that do not make the arguments incorrect. PowerPoint slides are professional in quality. For the most part, the presenter does not read from them. The presenter is able to correctly answer questions about her or his presentation.
1	One of the following is true: There is a significant error in an argument. The presenter makes significant errors in using the language of quantifiers or terms from axiomatic. The presenter is not able to answer questions about her or his presentation.

Appendix C / Outcome Five: Make polished oral presentations of mathematical arguments.

Assessment #2: Students present arguments to their peers in Math 425.

SCORE	Description
4	Consistently solve and present problems that require mastery of basic definitions and theorems dealing with algebra and number theory. Routinely develop and present correct arguments and proofs dealing with various elements of algebra and number theory. Routinely create, present, or analyze examples that contribute to the understanding of algebra and number theory. Frequently create and present correct arguments and proofs that require ingenuity and creativity in thinking about algebra and number theory. The student should apply a variety of strategies and methods of proof in this work. Create insightful and meaningful mathematical conjectures. In particular, these conjectures should demonstrate an ability to generalize established results to build new results, and they should show an understanding of the connections between mathematical ideas. Resolve mathematical conjectures by presenting correct arguments and proofs or by creating counterexamples. Routinely use mathematical language correctly in communicating to the class. Communicate ideas coherently when presenting to the class. Identify flaws in mathematical thinking presented by others in the class.
3	Consistently solve and present problems that require mastery of basic definitions and theorems dealing with algebra and number theory. Routinely develop and present correct arguments and proofs dealing with various elements of algebra and number theory. Routinely create, present, or analyze examples that contribute to the understanding of algebra and number theory. Occasionally create and present correct arguments and proofs that require ingenuity and creativity in thinking about algebra and number theory. The student should apply a variety of strategies and methods of proof in this work.

	Create meaningful mathematical conjectures. In particular, these conjectures should demonstrate an ability to generalize established results to build new results, and they should show an understanding of the connections between mathematical ideas. The student may at times struggle to articulate her or his conjecture in a clear way. Resolve mathematical conjectures by presenting correcting arguments and proofs or by creating counterexamples. Routinely use mathematical language correctly in communicating to the class. Generally communicate ideas coherently when presenting to the class. The student may at times struggle to communicate her or his ideas to the class. Identify flaws in mathematical thinking presented by others in the class.
2	Often solve and present problems that require mastery of basic definitions and theorems dealing with algebra and number theory. Occasionally develop and present arguments and proofs dealing with various elements of algebra and number theory. These arguments should be fundamentally correct, but they may contain some errors. Occasionally create, present, or analyze examples that contribute to the understanding of algebra and number theory. Attempt to create mathematical conjectures. The student may not be able to fully formulate a meaningful conjecture, but will at least express ideas that show some ability to generalize established results to build new ones and an understanding of the connections between mathematical ideas. The student may at times struggle to articulate her or his conjecture in a clear way. Usually use mathematical language correctly in communicating to the class. The student may make some errors involving mathematical language, such as misinterpreting quantifiers. Generally communicate ideas coherently when presenting to the class. The student may at times struggle to communicate her or his ideas to the class.
1	Only occasionally solve and present problems that require mastery of basic definitions and theorems dealing with algebra and number theory. Very rarely develop and present arguments and proofs dealing with various elements of algebra and number theory. Arguments and proofs that are presented may contain significant errors.

	Very rarely create, present, or analyze examples that contribute to the understanding of algebra and number theory. Presentations of examples may contain significant errors. This level of performance is also indicated by the student's lack of ability to: Create mathematical conjectures. The student may not even attempt to formulate conjectures. If the student does attempt to formulate a conjecture, it will likely be unclear and difficult for the class to understand. Use mathematical language correctly in communicating to the class. The student may make some errors involving mathematical language, including misinterpreting quantifiers and logical connectors. Communicate ideas coherently when presenting to the class. The student will struggle, or not attempt at all, to communicate her or his ideas to the class.

Appendix D / Outcome Six: **Successfully create and resolve mathematical conjectures**

Assessment #1: Students create their own conjectures and resolve conjectures developed by their peers in Math 425, the capstone course.

SCORE	Description
4	Writes mathematical conjectures that are clear and correctly use mathematical language, including conditional statements and quantifiers. Mathematical conjectures are reasonable based on the examples and results presented in the course. Mathematical conjectures presented exhibit creativity. Resolves mathematical conjectures using proof or counterexample. Mathematical logic and language is applied correctly in proofs or counterexamples. Creative strategies are used in resolving conjectures. Resolutions to conjectures are fundamentally correct.
3	Writes mathematical conjectures that are clear and correctly use mathematical language, including conditional statements and quantifiers. Mathematical conjectures are reasonable based on the examples and results presented in the course. Resolves mathematical conjectures using proof or counterexample. Mathematical logic and language is applied correctly in proofs or counterexamples. Resolutions to conjectures are fundamentally correct.
2	Writes mathematical conjectures that are clear use mathematical language, including conditional statements and quantifiers. Minor errors may be present, but the conjecture is still meaningful. Mathematical conjectures are reasonable based on the examples and results presented in the course. Resolves mathematical conjectures using proof or counterexample. Resolutions to conjectures are fundamentally correct, though minor errors and a lack of clarity may be present.
1	Attempts to write mathematical conjectures, but the conjectures are not meaningful. Attempts to resolve mathematical conjectures, but proposed solutions contain significant flaws.