

# Assessment Report: Mathematics Teaching Learning Outcomes Spring 2014

## Spring 2014 Assessment Results

According to the below description of Mathematics Teaching Program Learning Outcomes and Assessment, 4 students were assessed for Outcome 1 in M 242. This represents a census of the mathematics teaching students in the course in this semester.

- 1) Outcome 1: Reason with and about mathematical statements and construct and validate mathematical arguments.

### Description of Signature Assignment

Exam questions on the comprehensive final exam. Topics included deduction in mathematical contexts, deduction in other contexts, negation of sentences, nested quantifiers, creating the contrapositive, creating counterexamples, and formal proofs of five kinds including induction.

### Assessment Results

Two students were assessed to perform at a proficient level; two students were at an acceptable level.

Students were proficient at making deductions from given facts. In one case, students incorrectly attempted to reason from the converse. In proofs there was some evidence of beginning with the conclusion.

Students were all proficient at creating counterexamples.

Although the induction problem was relatively simple, some students did poorly on it.

Some terms (such as “upper bound” or “one-to-one”) have definitions that are conditional sentences. Some students were unable to work logically with these statements.

### Recommendations

In most contexts where “there exists” should be expressed (for example, the definition of “ $x$  is a rational number”), students don’t express it as such. Also, when negating a generalization (e.g. If  $n > n^*$ , then  $a_n > m$ ) the “there exists” part is often omitted. In future offerings of this course and in subsequent courses in the program, instructors will pay attention to explicitly addressing existential and universal quantifiers.

In light of the difficulties students had with induction and definitions with conditionals, we will continue to emphasize these topics in future offerings of this course and in subsequent courses in the program.

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## Program Learning Outcomes

Students should demonstrate the ability to:

- 1) Reason with and about mathematical statements and construct and validate mathematical arguments.
- 2) Solve problems with and reason about functional relationships and algebraic structures.
- 3) Apply fundamental ideas of number theory and combinatorics in the exploration, solution, and formulation of problems.
- 4) Create, critique, and revise proofs in Euclidean and non-Euclidean geometries.
- 5) Model, analyze, and interpret situations using data analysis, statistics, and probability.
- 6) Develop, apply and validate mathematical models using current and emerging technologies.

## Curriculum Map and Assessment Schedule

	Outcomes						Assessment Schedule
	1	2	3	4	5	6	
M 242, Methods of Proof	X						Even spring semesters
M 328, Higher Mathematics for Secondary Teachers		X	X				Even fall semesters
M 329, Modern Geometry				X			Odd spring semesters
M 428, Mathematical Modeling for Teachers					X	X	Odd fall semesters

## Rubric

The selection of the assignment that will serve as the signature assignment is left up to the discretion of the course instructor for that semester.

	Unacceptable	Acceptable	Proficient
Student's signature assignment for the learning objective being assessed:	Displays limited range of appropriate reasoning, problem solving, or modeling strategies in the mathematical content focus that would enable success in the teaching profession.	Displays an adequate range of appropriate reasoning, problem solving, or modeling strategies in the mathematical content focus that would enable success in the teaching profession.	Displays a substantial range of appropriate reasoning, problem solving, or modeling strategies in the mathematical content focus that would enable success in the teaching profession.

## Threshold

For the students completing the program in mathematics teaching, our goal is that 100% of students will be at an acceptable level or better, and 50% will be at a proficient level, for each of the learning outcomes.