

INSTITUTIONAL EFFECTIVENESS ANNUAL REPORT FISCAL YEAR 2016

PROGRAM/UNIT: Mathematics

NAME of ASSESSMENT LEADER: Janice Doe

INSTITUTIONAL GOALS SUPPORTED:

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| <ul style="list-style-type: none"> <input checked="" type="checkbox"/> GOAL 1 – Strengthen the Academic Program <input checked="" type="checkbox"/> GOAL 2 – Support Pedagogical Exploration and Innovation <input type="checkbox"/> GOAL 3 – Strengthen Academic Advising and Mentoring <input type="checkbox"/> GOAL 4 – Enhance the Living-Learning Environment <input type="checkbox"/> GOAL 5 – Attract, Recruit, and Admit and Diverse New Generation of Students | <ul style="list-style-type: none"> <input type="checkbox"/> GOAL 6 – Attract, Recruit, and Retain a 21st Century Workforce <input type="checkbox"/> GOAL 7 – Improve Organizational Culture <input type="checkbox"/> GOAL 8 – Develop World-Class Infrastructure <input type="checkbox"/> GOAL 9 – Expand and Better Steward Resources <input type="checkbox"/> GOAL 10 – Explore More Cost-Effective Education Models |
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PROGRAM/UNIT PURPOSE STATEMENT:

The Department of Mathematics has a mission to provide all mathematics students with an understanding of the logical structure and style of mathematics appropriate to their discipline and level. We will provide mathematics majors and minors with the background necessary to successfully pursue graduate work or careers in private industry or government. The program will help students develop quantitative and abstract reasoning and the ability to use mathematics as a computational and analytical tool. We will provide students in General Education mathematics courses with substantive skills in quantitative and abstract reasoning and in the use of mathematics as a computational and analytical tool.

CURRENT CYCLE ASSESSMENT PLAN AND REPORT:

Learning Outcomes/ Unit Objectives	Method(s) of Assessment	Criteria for Success	Assessment Results	Use of Results to Improve Outcomes (Action Plan)
<p>1. Mathematics graduates gather, evaluate, and use relevant mathematical definitions and results to create logical gramatically-correct proofs. (Inquiry Outcome)</p>	<p>1a. HMTH 257, Introduction to Proof and Number Theory: Students were graded using detailed rubrics for proofs on 2 in-class exams and a final.</p> <p>1b. HMTH 420, Abstract Algebra: students were graded by detailed rubrics for proofs and revisions to proofs on homework, exams, and a final.</p> <p>1c. HMTH 427, Geometric proofs related to the properties of triangles and quadrilaterals (submitted in written form).</p>	<p>1a. 80% of students perform at the good or excellent level in ability to write mathematical proofs (according to attached rubric)</p> <p>1b. 80% of students perform at the good or excellent level (according to attached rubric)</p> <p>1c. 80% perform at an average of 3 or better as defined by rubric for creating and presenting logical, gramatically-correct proofs.</p>	<p>1a. 6 students in Fall15 class, 6 students in Spr16 class.</p> <p>Fall15: In-class exams - 84 proofs were graded; 52 scored at excellent or good, or 62%. Final exam - 36 proofs collected (6 per student); 22 scored at the excelent level, 7 scored a the good level for a total of 29/36 = 80%.</p> <p>Spr16: Final - 27 out of 36 proofs collected were excellent or good, or 75%.</p>	<p>HMTH 420: We will discuss as a department ways we can have the students self-assess their proofs in all our proof writing classes so they can begin to achieve more excellent or good ratings on their first attempt.</p> <p>HMTH 425: We are clearly not meeting the performance target in this course. We will rearrange the mathematics rotation and redefine the linear algebra curriculum so that students take</p>

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	<p>Each student will also present at least one proof to the class.</p> <p>1d. HMTH 425 Real Analysis. Detailed rubric for grading proofs.</p>	<p>1d. 80% of graded proofs at good or excellent level.</p>	<p>1b. (5 students in Fall15) Homework - 33 proofs were graded for each student, and revisions to 30 of those proofs were also graded. A total of 315 proofs were graded for homework. 86 out of 165 proofs (52%) were excellent or good on first attempt, 126 of 150 proofs (84%) were excellent or good on second attempt.</p> <p>Exams - 4 proofs were graded on each in-class exam, and revisions to all of those proofs were also graded. A total of 80 proofs were graded. 25 out of 40 proofs (62.5%) were excellent or good on first attempt, 38 out of 40 (95%) were excellent or good on second attempt...</p> <p>1c. 4 students in the Fall15 class. All completed assigned proofs and gave in-class presentation. All earned average score of greater than 3.</p> <p>1d. The analysis of the proofs is attached, showing the shares of successful work as the semester progressed. Overall, students performed at good or excellent on 62% of assignments, with no clear trend of changes in performance throughout the semester.</p>	<p>proof-centered courses every semester from fall of sophomore year through fall senior year. Also next time this course is offered, we will try an approach in which students are given daily activities with key ideas - definitions, theorem statements, and examples - already typed and with space to fill in the "hard stuff." Perhaps this will make the quick pace of the course less overwhelming.</p>

Learning Outcomes/ Unit Objectives	Method(s) of Assessment	Criteria for Success	Assessment Results	Use of Results to Improve Outcomes (Action Plan)
<p>2. Mathematics graduates connect mathematical ideas to real world applications; in other words, they can create and interpret mathematical models.</p>	<p>2a. HMTH 218 Term project - students had to come up with testable hypotheses on their own, design an experiment, gather data, and analyze and interpret their results. They had to submit a written report and present their results orally in class. The project description and rubrics are attached.</p> <p>2b. HMTH 418 Oral Presentation - Students researched and presented real-world applications of stochastic modeling; presentations were assessed using attached rubric.</p>	<p>2a. 80% of students perform at the good or excellent level in their ability to communicate mathematical ideas in their papers and orally.</p> <p>2b. 80% of students perform at the good or excellent level in their ability to communicate mathematical ideas in oral presentations.</p>	<p>2a. 10 students in Spr14: All students received excellent or good on project presentation; 9 out of 10 (or 90%) received good or excellent for mathematical content; 9 out of 10 students received good or excellent for interpretation of results and conclusions.</p> <p>5 students in Spr15: All students received good or excellent on project presentation; 4 of 5 (80%) good or excellent on mathematical content; 4 of 5 good or excellent on interpretation of results and conclusions.</p> <p>2b. 4 Students in Fall15: 3 of 4 students (75%) received good or excellent on project presentation; 3 of 4 good or excellent on mathematical content; all 4 good or excellent on interpretation of results and conclusions.</p>	<p>It seems that we are meeting our goal in this area. We to expand the our success by using MTH 218 as a draw for biology majors, particularly those interested in medicine. The class will be redesigned to incorporate biological applications to attract these students.</p>
<p>3. Mathematics graduates will be able to pose, research, and address new mathematical questions.</p>	<p>HMTH 427 - Triangle Centers Project: Students had to create four classic triangle centers using dynamic geometry software. They then researched and investigated on of several additional geometric theorems. Project rubrics are attached.</p>	<p>75% of students perform at the 80% level as defined by rubric in the ability to use dynamic geometry software to pose, research, and address mathematical questions</p>	<p>4 students in the Fall15 class. All students were able to complete the project as well as the independent investigation at the 90% or above level.</p>	<p>Our sample size is limited, so we will continue to assess the goal in future semesters.</p> <p>In order to help us reach a larger student population with this learning outcome, we plan to incorporate a small research project in HMTH 420, Abstract Algebra.</p>
<p>4.</p>				
<p>5.</p>				

INITIATIVES FOR NEXT CYCLE WITH BUDGETARY IMPLICATIONS:

None.

FOLLOW-UP REPORT ON PREVIOUS CYCLE ACTION PLAN:

Prior Year Learning Outcomes/Unit Objectives	Select Actions Taken Based on Prior Year Results (Select All that Apply)	Describe Actions Taken Based on Prior Year Results	Comments (Optional)	
1. Mathematics graduates gather, evaluate, and use relevant mathematical definitions and results to create logical grammatically-correct proofs. (Inquiry Outcome)	<input type="checkbox"/> Curricular Change <input checked="" type="checkbox"/> Course Revisions <input type="checkbox"/> Pedagogical Change <input type="checkbox"/> Stakeholder Feedback <input type="checkbox"/> Co-curricular Opportunities <input type="checkbox"/> Academic Support/Advising	<input type="checkbox"/> Financial Resources <input type="checkbox"/> Human Resources <input type="checkbox"/> General Resources <input type="checkbox"/> Service(s) Change <input checked="" type="checkbox"/> Assessment Methodology <input type="checkbox"/> Other	Both abstract algebra (HMTH 420) and real analysis (HMTH 425) were re-worked into writing-intensive (WI) courses, focusing to a great degree on the rewriting of proofs in order to improve their quality. HMTH 420 was taught as WI course during Fall15, HMTH 425 was taught as WI course in Spr16	None.
2. Mathematics graduates connect mathematical ideas to real world applications; in other words, they can create and interpret mathematical models.	<input type="checkbox"/> Curricular Change <input checked="" type="checkbox"/> Course Revisions <input checked="" type="checkbox"/> Pedagogical Change <input type="checkbox"/> Stakeholder Feedback <input type="checkbox"/> Co-curricular Opportunities <input type="checkbox"/> Academic Support/Advising	<input type="checkbox"/> Financial Resources <input type="checkbox"/> Human Resources <input type="checkbox"/> General Resources <input type="checkbox"/> Service(s) Change <input checked="" type="checkbox"/> Assessment Methodology <input type="checkbox"/> Other	We decided to have HMTH 418 meet in a computer lab so that students not only see the implementation during lecture but also do it themselves. Instead of R, we adopted a new statistical software. And we incorporated more in-class projects using the attached rubrics.	None.
3. Mathematics graduates will be able to pose, research, and address new mathematical questions	<input type="checkbox"/> Curricular Change <input type="checkbox"/> Course Revisions <input type="checkbox"/> Pedagogical Change <input type="checkbox"/> Stakeholder Feedback <input type="checkbox"/> Co-curricular Opportunities <input type="checkbox"/> Academic Support/Advising	<input type="checkbox"/> Financial Resources <input type="checkbox"/> Human Resources <input type="checkbox"/> General Resources <input type="checkbox"/> Service(s) Change <input checked="" type="checkbox"/> Assessment Methodology <input type="checkbox"/> Other	We modified the outcome from the last assessment cycle. We plan to assess this outcome in HMTH 427, Euclidean and non-Euclidean geometry.	None.
4.	<input type="checkbox"/> Curricular Change <input type="checkbox"/> Course Revisions <input type="checkbox"/> Pedagogical Change <input type="checkbox"/> Stakeholder Feedback <input type="checkbox"/> Co-curricular Opportunities <input type="checkbox"/> Academic Support/Advising	<input type="checkbox"/> Financial Resources <input type="checkbox"/> Human Resources <input type="checkbox"/> General Resources <input type="checkbox"/> Service(s) Change <input type="checkbox"/> Assessment Methodology <input type="checkbox"/> Other		
5.	<input type="checkbox"/> Curricular Change <input type="checkbox"/> Course Revisions <input type="checkbox"/> Pedagogical Change <input type="checkbox"/> Stakeholder Feedback <input type="checkbox"/> Co-curricular Opportunities <input type="checkbox"/> Academic Support/Advising	<input type="checkbox"/> Financial Resources <input type="checkbox"/> Human Resources <input type="checkbox"/> General Resources <input type="checkbox"/> Service(s) Change <input type="checkbox"/> Assessment Methodology <input type="checkbox"/> Other		

REPORT SUMMARY CONCLUSIONS:

None.

SUPPORTING DOCUMENTS:

Supporting documents are enclosed including:

1. HMTH 257 proofs rubric
2. HMTH 420 proofs rubric
3. HMTH 427 presentation rubric
4. HMTH 425 proofs rubric
5. Assessment results Excel workbook
6. Before-after syllabi for HMTH 420 and 425 showing change to writing intensive courses.
7. HMTH 418 rubric for in-class projects using new statistical software.