Woodbury University Mathematics

SLO Assessment Spring/Fall ‘09

Students completing Woodbury University’s mathematics courses are non-majors taking mathematics as prerequisites to science courses and courses within their major that require a level of math proficiency. The latter would include such courses as Architectural Structures and Economics. With that in mind, it should also be noted that as a University, Woodbury’s math program is not viewed purely as a service to other departments and is designed to educate beyond vocational needs. It was with this concept in mind that Woodbury’s Math and Science Department formed its list of student learning outcomes. The department’s assessment of student performance within these department learning outcomes and changes made for improvement is the focus of this paper.

I. Assessment Process and Rubrics

Assessment

Assessment of learning outcomes in Woodbury’s mathematics department is currently done with traditional testing. The testing is used to measure student mastery in several areas. Common finals are implemented to monitor levels of achievement of the various department learning goals.

Problems given in the common finals are derived from classroom discussions, book exercises and learned procedures. Correct answers rely on the student’s use of basic skills, abstract and critical thinking, and synthesis of mathematical concepts in real life applications.

Instructional Process

Course instruction was given via lecture, classroom discussion, group-work, and outside class assignments.

Rubrics and Evaluation

Learning outcomes were assessed via analysis of common final exams. The finals were first assessed via blind-grading. Instructors graded papers not belonging to their own students and shared in the process by contributing problems, looking over the finals and grade data and participating in discussions for improvement. Scoring is done on a percentage scale. Points for each problem are assigned based on the number of steps needed to solve the problem, difficulty and accuracy of the solution given.

II. Department Learning Outcomes Assessed:

Woodbury’s department of Mathematics and Natural Sciences has compiled a list of 10 learning outcomes to be achieved by students completing the various major course sequences (appendix a). Each
year, at least two learning outcomes are assessed. For the spring ’09/ fall ‘09 semesters the learning outcomes assessed are:

- 1. Explain correctly mathematical and/or scientific concepts and principles and their symbolic representations.

- 3. Apply mathematical and/or scientific concepts and principles to simple real life problems.

III. Results

Assessment of the department common finals revealed various strengths and weaknesses in student learning. With respect to Learning Outcome 1, at the introductory level, students made symbolic connections with varying degrees of success.

Good to excellent results were achieved in areas of:
- Slope and y-intercepts
- Graphing vertical and horizontal lines

Areas with satisfactory results included
- Graphing compound inequalities
- Graphing lines given in slope / intercept form
- Applications involving ratios
- Graphing linear inequalities

Areas with poor results include
- Solving linear equations involving fractions
- Solving compound inequalities involving fractions
- Solving systems of equations
- Finding the equation of the line through two points

Very poor results were found in the following areas:
- Order of operations
- Equation of the line perpendicular or parallel to another line
- Absolute value inequalities
- Solving equations involving rational expressions
- Simplifying expressions involving negative exponents
- Applications
- Factoring and solving quadratic equations with leading coefficient greater than 1.

Further details are in the attached appendices 2, 3, ad 4.
Assessment of learning outcome #3 was as mixed. 67% of students correctly interpreted and solved a real life application requiring the use of ratios but only 43% were able to apply a system of equations in the solution of a coin problem.

Further analysis of the common finals shows that students have trouble with basic skills and the language of mathematics. For example, it was not uncommon to see answers to a problem asking for the inverse of a function given incorrectly as the reciprocal of the function. Simple errors were found in other areas such as factoring and root-finding techniques. These issues indicate a necessity to put more emphasis on the review of basic skills and definitions.

IV. Next Steps

The department has responded to weaknesses indicated in the fall '09 semester common finals by promoting the use of writing assignments designed to increase student understanding of mathematical language and concepts. If students are taught not to cancel terms in a rational expression, they need to fully understand the mathematical definition of “terms”. Written response to interpretive exercises that focus on process will also aid the learning process.

Emphasis on student engagement in the math classroom is another challenge being addressed by Woodbury’s math instructors. Better learning is experienced in classes employing a discussion environment and the art of questioning as opposed to a pure lecture environment.

It is believed that with this focus on basic skills, writing, student engagement and at-risk student follow-up, assessment of the fall '09 common finals will show significant improvement.