PLAN FOR ASSESSING STUDENT LEARNING OUTCOMES
2009-2010

Discipline/Program: Mathematics

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1. Summarize in three or four sentences the result of your outcomes assessment for 2008-2009.

The math department's 2008-2009 assessment plan focused on equation solving in Math 090 and Math 095. Math faculty developed a rubric and wrote free-response portions for the Math 090/095 final exams that were used assess students' equation-solving skills[1]. Using levels A-D of the rubric, math faculty decided that a reasonably proficient equation solver should attain an average sub-level of 2.5. With this in mind, we expected at least 75% of all passing students to obtain an average rubric sub-level score of at least 2.5 on the free-response portions of the exams. The exams of thirty passing students in both Math 090 and Math 095 were randomly selected and scored. Only 44% of those students had an average score of 2.5 or greater. The majority of passing students had average scores between 1.5 and 2.4.

2. Given these results, what changes are you implementing in 2009-2010? How will you assess the effectiveness of these changes?

The free-response portions of the final exams focused only on essential equation-solving skills. They assessed only those skills we feel are particularly important. It is troubling that so few passing students met faculty expectations. The fact that so many students passed, yet failed to perform well on the exams, may be indicative of grade inflation. However, there is another possible explanation.

For quite some time math faculty have been convinced that developmental students do not take their final exams as seriously as they should. Because the free-response portion of the final exam is much smaller than the multiple-choice portion, it is probably natural for students to believe that the multiple-choice problems are more important. It is possible that students simply did not try hard enough on the free-response portions.

The math department's 2009-2010 assessment plan will be a continuation of the previous year's plan. However, there will be two significant additions:

1. If we expect the assessment rubric to be useful and effective, all faculty must design and routinely use assessment instruments that give students the opportunities to reach all levels on the rubric. During the 2009-2010 academic year, faculty will develop and share such assessment instruments.
2. Faculty will be encouraged to use the assessment rubric and assessment instruments on a regular basis and students' grades should reflect their attainment of the rubric levels.

We should be able to judge the effectiveness of these strategies by comparing the results of this

[1] The rubric is attached. See the math department's 2008-209 assessment report for samples of the free-response portions of the final exams.

year's final exams to those of last year.

3. If you are launching a <u>new</u> assessment project in 2009-2010, describe the student learning outcome(s) you plan to assess. Identify the course(s) in which the outcome(s) will be assessed.

The math department's 2009-2010 assessment plan will be a continuation of the previous year's plan. The plan will continue to focus on:

- Math 090 – General Objective #2 – Apply various techniques to solve linear, polynomial, and rational equations.
- Math 095 – General Objective #1 – Apply various techniques to solve linear, quadratic, absolute value, rational, and radical equations and inequalities.

Much of what is taught in Math 090/095 pertains to these objectives, and the corresponding skills are assessed by individual instructors throughout the semester. As we did last year, we will assess these objectives departmentally by using free-response portions on the final exams and scoring them according to our equation-solving rubric. Our goal is: At least 75% of students who receive a C or better in Math 090 or Math 095 will reach or surpass an average rubric sub-level of 2.5.

The following is a tentative schedule for the activities associated with this assessment plan:

<u>Fall 2009</u>

- Faculty discuss and revise the equation-solving rubric
- Faculty develop the free-response portions for Math 090/095 final exams
- Faculty develop sample free-response problems to be shared with students
- Administer final exams
- Faculty develop sample assessment tools that will be used throughout the spring semester by all faculty

<u>Spring 2010</u>

- Faculty analyze final exams
- Department chair reports to all Math 090/095 instructors
- Faculty meet to discuss the final exam results
- Department chair shares sample assessment tools with all faculty and encourages faculty to use the assessment tools and equation-solving rubric on a regular basis
- Faculty develop the free-response portions for Math 090/095 final exams
- Administer final exams

<u>Fall 2010</u>

- Faculty analyze final exams
- Department chair reports to faculty and administration
- Faculty develop 2010-2011 assessment plan

4. How is this assessment related to your findings for 2008-2009?

The math department's 2009-2010 assessment plan is a continuation of the 2008-2009 plan.

5. How many sections of the course(s) will be assessed? How many students?

All sections of Math 090 and Math 095 will be assessed by using cumulative, departmental final exams. For each course, a free-response portion of the final exam will be designed to specifically address our assessment plan. Other multiple-choice problems throughout the final exams will also assess the objectives. In all, approximately 600 students will be involved in the plan. A random sample of the free-response work will be analyzed by full-time math faculty.

6. What data will you collect?

The most important data that will be collected are the results of the free-response portions of the Math 090/095 final exams. Full-time faculty will analyze this data with the goal of determining what level of proficiency our students obtained. An items analysis of the multiple choice portions of the final exams will also be carried out.

7. How will your adjunct faculty be involved in this assessment?

Adjunct faculty will be involved in a number of ways:

a. Adjunct faculty with experience in teaching Math 090/095 will be invited to participate in all meetings associated with the plan.
b. Experienced adjunct faculty will be invited to help full-time faculty write sample assessment instruments.
c. All Math 090/095 faculty will be asked to use the equation-solving rubric and to give their students plenty of opportunities to reach all levels on the rubric.
d. All Math 090/095 faculty will give common, departmental final exams.
e. Throughout the project, the department chair will report to all Math 090/095 faculty.

8. Do you have a need for any specialized data that is not provided as part of the annual program review process? If so, identify your needs.

This assessment plan requires no specialized data.

9. How will this data be analyzed? Do you have any specialized tools for analysis (e.g. rubrics, standards)?

The free-response portions of the final exams will be analyzed by full-time math faculty using our equation-solving rubric. The multiple-choice portions of the finals exams will be scored by the data center. The data center will also complete an items analysis of the multiple-choice portions.

10. Do you need any support or assistance to complete this project?

The multiple-choice portions of the finals exams will be scored by the data center. The data center will also complete an items analysis of the multiple-choice portions.

Provide your dean with both an electronic copy and a hard copy of this completed form by <u>November 15, 2009</u>.

Equation Solving Rubric v2.0

At each lettered level, a student may attain a numbered sub-level only if he or she attains each preceding sub-level.

A. Understand the Problem

- **0-** Student makes no attempt or shows no understanding of the mathematics involved in solving equations
- **1-** Student correctly uses properties of real numbers to remove parentheses, combine like terms, etc.
- **2-** Student correctly uses properties of equality to modify both sides of an equation.
- **3-** Student provides evidence that he or she understands the type of equation being solved.
- **4-** Student articulates the type of equation or a general solution method.

B. Devise a Plan

- **0-** Student provides no evidence of having a plan.
- **1-** Student work provides evidence of a weak plan.
- **2-** Student work provides evidence of a strong plan.
- **3-** Student articulates a vague general plan or describes some specific details of a plan.
- **4-** Student articulates a comprehensive general plan and provides evidence of understanding its specific details.

C. Carry Out the Plan

- **0-** Student makes no effort to solve the equation.
- **1-** Student takes some steps toward solving the equation, but none are correct.
- **2-** Student takes several correct steps toward solving the equation.
- **3-** With the exception of one or two minor mistakes, the student correctly solves the equation.
- **4-** Student correctly solves the equation.

D. Look Back

- **0-** Student neither provides a solution nor shows evidence of looking back.
- **1-** Student provides a solution consistent with the problem or provides some indication that he or she has looked back at the work.
- **2-** Student provides a solution consistent with the problem and provides some indication that he or she knows how to check the solution.
- **3-** Student successfully checks the solution.
- **4-** Student provides evidence that he or she can generalize and apply the work to new situations.

X. Content

- **0-** Student does not successfully solve any type of equation.
- **1-** Student has only limited success at solving simple linear equations.
- **2-** Student is generally successful at solving one type of equation.
- **3-** Student is generally successful at solving two types of equations.
- **4-** Student is generally successful at solving three or more types of equations.