Assessment Grant End of Project Report

Sarah E. Eichhorn, UCI Mathematics Department

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During the grant period, significant progress was made on developing and implementing an assessment of the mathematical knowledge of the graduating UCI mathematics majors. Under the grant support, three major objectives were achieved and one objective is still in progress. Namely, the department created a list of **learning outcomes** for the major through collaborative discussion of a preliminary list developed by the PI from research of other institutions and articles on the subject of assessment available from the Mathematical Association of America's publications from SAUM- "Supporting Assessment in Undergraduate Assessment" (http://www.maa.org/saum/). A exit survey/exam was developed to **directly measure** four out of the five learning outcomes and gather data on student experience in the major (courses, outside course experience, etc.). The exit survey/exam was administered to a representative sample of graduating seniors in the Spring 2009 and those **results** were compared to national benchmark standards. Currently in progress, the department will be **using the assessment results** to reevaluate our course sequencing and content. Also, we will be adding additional measurement tools to the assessment plan, including collecting final exams at the time of course completion in addition to the exit exam.

Included below are the products and results from the year long project to develop a major assessment plan for the mathematics department. Also included is a discussion of some relevant implementation details.

Learning Outcomes for the Mathematics Major

1. Students will be able to solve mathematical problems using tools and concepts from calculus, linear algebra and differential equations.

2. Students will demonstrate proficiency in the comprehension and writing of mathematical proofs. They will be able to write well-organized, grammatically correct, and logically sound mathematical arguments.

3. Students will be able to communicate mathematical ideas through symbolic expressions and graphs and be able draw inferences from such presentations of data.

4. Students will have an appreciation of the beauty and/or power of mathematics.

Mathematics Major

5. Students will demonstrate mastery of the core concepts in algebra, analysis, and at least one other core area of mathematics.

Spcialization in Applied and Computational Mathematics

5. Students will demonstrate the ability to apply mathematics to real world situations, using deterministic or probabilistic models, and will be able to employ a variety of techniques to solve these systems, including numerical methods.

Specialization in Statistics

5. Students will be able to analyze and interpret data using statistical tools.

Concentration in Mathematics for Economics

5. Students will demonstrate the ability to apply mathematical tools to economics problems and appropriately interpret the results.

Specialization in Mathematics for Education

5. Students will have had the opportunity to act as a mathematics instructor to one or more students and will be able to discuss principles of good educational practices as it relates to this teaching experience.

Measurement Tool

An exit survey/exam was developed to directly measure student performance on outcomes 1-4. Included on this survey were questions about courses taken, activities outside of courses and post-graduation plans. The exam portion included 6 multiple choice questions, 1 free response question and 2 proof writing exercises. The intent of the exit survey design was to collect as much information as possible and require as little time and effort from the student and still have the data collected effectively represent students achievement of the learning outcomes.

In the future, the department is considering collecting final exams from key courses and looking at a representative sample of those exams. This will help measure student performance at the time rather than just their recall upon graduation time.

Assessment Results

Graduating senior math majors were invited to a Math Department Graduation Party at which we administered an exit survey and short exam. Students were told ahead of time they would be asked to take an exam in order to help the math department assess and improve the undergraduate major and would be getting pizza in return for their assistance. Unfortunately, the attendance rate was lower than hoped (possibly due to a Laker’s playoff game at the same time as the event), but a fairly representative sample was still obtained. All students taking the exam seemed to take it seriously and give it their best effort.

In general, we are pleased to see how well the students were doing in comparison to the nation on the GRE problems, because this sample of graduate school bound students should be higher than we would expect from our average mathematics major, yet our average student is competitive with this group. Finer analysis of the data is still being done by correlating their performance on particular questions to the list of courses which they took.

Using the Assessment Results

The department intends to keep iterating and refining the assessment process in the future. Currently, we intend to keep the Student Learning Outcomes unchanged, but to add additional measurement tools. Also, the department is actively seeking to alter and improve the major through course content and course sequencing.