**Response to the Mathematics Program Assessment Report 2011**

**Introduction**

The Mathematics Program Assessment Report summarizes a very useful assessment cycle. Program faculty are to be commended for aligning their program mission, goals, and objectives with those of the institution and of the college, for collecting a large data set from a wide variety of courses, and for analyzing it in order to improve student learning outcomes.

In future assessments, the program could benefit from considering the following suggestions:

* edit the mission statement to more consistently reflect its nature as a promise of what the program intends to deliver
* decrease the number of program goals
* articulate program goals more consistently
* unfold its composite learning objectives to simple learning objectives
* link student learning outcomes with the data collected in more meaningful ways

**Suggestions and Comments**

On Mission Statement

By its very nature, a program’s mission statement states what a program promises to do in order to help fulfill the institutional mission. As such, it must be a statement of promise, it must be linked to the University’s mission, and it must be linked to the college’s mission.

The Math Program’s statement does most of what it must do. It satisfactorily links the program’s mission to the college’s and university’s mission statements, and is, for the most part, a statement of promise on the part of the program.

Occasionally, however, it fails to meet that last condition; it describes what *students* will do rather than what the *program* will do. For example, to say that “mathematics courses develop the student’s analytical…” could be more usefully phrased “mathematics courses aim to teach students to develop their analytical and problem solving skills, while simultaneously encouraging students to see beauty and value in the study of mathematics.” Right after that, the mission states that “[S]tudents learn…” Again, the mission statement must articulate what a program will do, not what its students will do. Better wording might be “We promote the use of strong communication…” etc.

On Program Goals

The program has a number of goals, and several of them seem to overlap. The program may want to consider consolidating this list to reflect the core goals of the program.

One way to approach reducing the number of goals for its program could be to revisit the necessity of Goals I, II, and III, V, and VI, for the following reasons:

* Goal I, that of introducing students to mathematics as an important area of thought, is encompassed by Goal IV, which is to provide a foundation for critical thinking.
* Goal II, that of offering a broad selection of courses in support of the liberal arts, is also subsumed in Goal IV; to make that connection explicit, the program could simply reword Goal IV to read “…by developing students’ ability to use logic in solving problems. In so doing, the program supports skills that are central to a liberal arts education.”
* Goal III, that of encouraging students to appreciate the beauty of mathematics, could be a problematic goal; beauty is not very easily measured, which means that whether the program meets such a goal would be very difficult to assess. Goal III also suggests that the program will encourage students to appreciate the scope of Mathematics, but again, the discipline’s scope is subsumed in goals IV and VII-X; how can we fail to see the scope of math if every discipline requires some brush against it?
* Goals V and VI to not seem to be goals, but rather objectives. In fact, the first part of Goal V, that students investigate the complexity of the human experience, can be identified in several objectives for MATH 109, such as Objective 5 Goal 1, that students appreciate the connections among some of the big ideas in math. The second portion of Goal V, that students communicate in mathematics, is an objective for MATH 109, worded differently as Objective 2 Goal 2 and as Objective 1 Goal 4, for instance.

The program might consider adding a goal in the last section. Rather than wording goal X as providing students with the mathematical knowledge necessary to pursue a degree in the sciences and in mathematics, the program might separate those out into two separate goals. The fact is that the program delivers an enormous variety of courses for the sole purpose of serving its majors, so the goal is worth making explicit.

Finally, we would encourage the program to consider wording their goals more consistently.

Incorporating the above suggestions, the program Goals could be articulated as follows (this is solely an example). The Mathematics Program will

1. Provide a foundation for critical thinking by developing the problem solving skills central to a liberal education.
2. Provide students with the mathematical knowledge necessary to pursue a degree in education.
3. Provide students with the mathematical knowledge necessary to pursue a degree in business and the social sciences.
4. Provide students with the mathematical knowledge necessary to pursue a degree in nursing and the allied professions.
5. Provide students with the mathematical knowledge necessary to pursue a degree in the sciences.
6. Provide students with the mathematical knowledge necessary to pursue a degree in mathematics.

On Program Objectives

The suggestion that the Mathematics Program reconsider its goals makes the alignment of Student Learning Objectives less rather than more cumbersome.

For example, all objectives for MATH 109 would fall under the goal of providing a foundation for critical thinking. As it is, the artificial distinction between student learning objectives is glaring: how can we say that objective 1 under Goal 4, which is to view mathematics as a language to describe relationships and patterns is different than objective 2 Goal 2, which is to use mathematics to write and communicate in the discipline? Or that objective 4 Goal 1, which is to analyze the basic principles of mathematical modeling, is different than objective 1 Goal 3, which is to analyze data, reason with statistics, and understand math models?

A composite objective such as Objective 1 for Goal 3, to analyze data, reason with statistics, and understand math models, is actually THREE student learning objectives. The program could review each of its objectives and create simple student learning objectives to facilitate linking them to the data. As it is, it would be challenging for the program to deal with a student whose work suggests that she can analyze data but not be able to reason with statistics, or do two of the three tasks and fail at the third?

On Assessment Procedures, Data, and Analyses

The program collected an impressive amount of data in an impressive number of classes. The analysis of the data seems a bit spare; a fuller and more precise analysis could be useful.

For example, take the analysis of the data collected in MATH 109. From the summary of what we learned from the data collected from the first test in MATH 109: “A majority of students in all three sections showed above average competency in all six objectives.” The statement imprecise, in that a “majority” could mean 51% or 92%; is knowing this percentage more precisely important to our understanding of how well the students achieved the outcome? Further, as there are seventeen objectives for Math 109, we should have a list of the six objectives assessed in the first exam. The analysis of the data from the second test follows a similar pattern; identifying which objectives are tested would be useful, and we know only that in the case of two of them, students fall below par. It would also be helpful to have an explanation of the choice of 65% as the threshold for demonstrating competency – why this particular threshold?

In the case of MATH 110, we similarly would like to have more analysis. Summary statistics on the number of students that passed the first and second exams are provided, but not what student learning objectives are assessed. Nor are the data clear on which of the learning objectives students had the most trouble meeting. The report that “half the class (50%) earned a C or above on the second exam. 44% of students earned a passing grade below C. 6% failed the exam. Most students met all the objectives tested” seems incongruous. How can it be that most students met the standards over which they were tested but only 50% received a C or above?

The analyses for MATH 123, MATH 125, MATH 210, and MATH 431 are a good bit more complete. While we would appreciate clarity on exactly which of the objectives the assessment instruments measure in each of the cases, we are given a list of the objectives that students fail to meet, which is helpful information in understanding the learning outcome pattern.

Suggestions for Further Study

In several instances, the report suggests that the program is considering using additional online resources, such as MyMathLab and MyStatLab, as a possible way of addressing some of the more modest student learning outcomes results. We look forward to seeing the data suggesting that the addition of such packages does indeed improve outcomes in the classroom. If the program does not yet have such data, we hope it considers focusing on gathering it for its next assessment cycle.

In at least one instance, the report suggests that there may be a link between class size and more modest student learning outcomes. The answer to the question of whether such a link exists is very important and we recommend that the program explore it.

**Conclusion**

While suggesting that the Mathematics Assessment Report of 2011 might benefit from some revision, the fact is that we found it enormously informative.

The faculty in Mathematics must be commended for aligning their program mission, goals, and objectives to the institution’s and to the college’s, for gathering significant data from a large sample of courses, for culling those data for evidence of what their students know, and for making inferences about how to adjust their curriculum and their pedagogy to improve student learning outcomes. In doing so, they complied with the very spirit of student learning outcomes assessment, and they benefited from what makes such assessment fundamental to the program and to the institution.