



which provide opportunities for faculty to share information and participate in workshops/conferences. Faculty are also involved locally through the Ohio Council of Teachers of Mathematics and the Ohio Math Association for Two-Year Colleges.

The master syllabi will be reviewed Fall of 2000.

**II. Program Learning Outcomes:** A description of what you intend for students to know (cognitive), think/feel (affective), or do (psychomotor), when they have completed your degree program. A suggested manageable number of outcomes should be in the range of five to ten. Describe Program Learning Outcomes review activities.\*

a. Program Learning Outcomes

The Liberal Arts and Sciences (LAS) program learning outcomes are under review but no changes have been approved at this time. Please refer to the section on the LAS degrees for more information on the review process.

The program learning outcomes for Liberal Arts and Sciences that are applicable to the Mathematics sequences (MAT 101-102-108 and MAT 101-102-116) are:

- Communicate the significance of facts, concepts and ideas in spoken and written English which is clear, precise and logical.
- Demonstrate a problem-solving capability through analysis/synthesis.
- Recognize the ways in which a scientific approach can be used to formulate an understanding of the observable world.
- Demonstrate an academic proficiency comparable to students completing the second year of a baccalaureate degree program.

b. End-of-sequence learning outcomes for Math

The end-of-sequence learning outcomes for MAT 101-102-108 are:

- Apply mathematical models to real world problems.
- Discuss the use of contemporary mathematics in real world applications.
- Gain a basic familiarity with a broad range of mathematical fields.
- Manipulate Algebraic expressions and solve equations at the intermediate Algebra level.

The end-of-sequence learning outcomes for MAT 101-102-116 are:

- Manipulate Algebraic expressions and solve equations at the intermediate Algebra level.
- Use functions and graphs of various types (polynomial, rational, exponential, logarithmic) to analyze relationships between variables and solve applied problems from many disciplines.
- Find roots of polynomial equations.
- Use the geometric properties of the conic sections to derive equations and graphs for these curves; use these equations and the curves' reflective properties to solve applied problems.
- Solve systems of linear and nonlinear equations by methods of substitution, elimination, Gaussian elimination and the inverse matrix method.
- Perform the matrix operations of addition, subtraction, scalar multiplication, matrix multiplication, and finding the determinant and inverse of a square matrix.
- Express infinite sequences and series.

III. **Assessment Method(s):** A measurable indicator of success in attaining the stated learning outcome(s). The methodology should be both reliable and valid. Please describe in detail.

- a. **Formative Assessment Method(s) and Description:** a measurable indicator of student in-progress success in attaining the stated learning outcome(s).

All students enrolled in Math 101, 102 and 116 are given instructor-developed placement tests on the first class day. Students are advised to change courses if the results indicate that the student is not prepared for the course they enrolled in. The department is becoming more adamant that students are placed into the correct course based on their placement results. The faculty are making additional efforts to counsel students who need to change courses for proper placement. Some faculty use student transcript information to aid in counseling students in addition to placement test results.

All students enrolled in Math 101 are required to complete a final comprehensive examination. The results of the final examinations for all students enrolled in Math 101 have been collected on a quarterly basis since 1991. The exam for Math 101 was revised in Fall 1996 to coordinate the exam with curriculum changes brought about with adoption of a new text. Final examination averages are calculated for each class and shared with individual instructors. This provides faculty an opportunity to compare the results of their math class(es) with all other sections. Faculty can then evaluate the impact of changes they make in their learning facilitation strategies against measures of student performance. As well, the department can measure the impact of departmental efforts to improve student performance.

Since Winter of 1997 a final comprehensive exam and process similar to that used for Math 101 has been used for all sections of Math 102.

A comprehensive math test is administered at the conclusion of Math 108 and Math 116 as a means of end-of-sequence assessment. The test results must be calculated as part of the final course grade or used in some meaningful way by the instructor of the course. The test results are collected and a summary prepared by the Math faculty. These final tests were developed by the department and based on the overall objectives for each sequence. The summary data provides an overall picture of student performance levels. These final examinations have been administered for four years in Math 108 and five years in Math 116. The math department maintains a database to track performance in both Math 108 and 116.

- b. **Summative Assessment Method(s) and Description:** a measurable indicator of end-of-program success in attaining the stated program learning outcome(s).

Not applicable to end-of-sequence assessment.

Refer to the report at the beginning of Liberal Arts and Sciences for information on summative assessment of the program learning outcomes for Liberal Arts and Sciences.

**IV. Results:** A description of the actual results of overall student performance gathered from the assessment(s). (see III.a.)

The results from instructor-developed placement tests that are given on the first class meeting in Math 101, 102 and 116 are shared with the student on an individual basis. Students are given the option of transferring to another math course based on the placement test results.

The final comprehensive examination has been administered in Math 108 on a regular basis since 1994 creating enough historical data to allow trend analysis of the results. The overall results show student performance has been steady over time with slight increases and decreases from year to year. Data from fall of 1999 indicated a slight decrease in scores. The department noted that fall quarter now has 2 fewer days than in the past which might effect student performance in a three-hour course. Assessment tests have been traditionally administered in fall due to the extra days in the quarter schedule.

The final comprehensive examination has been administered in Math 116 on a regular basis since 1994 creating enough historical data to allow trend analysis of the results. The overall results show student performance has been increasing over time.

**V. Analysis/Actions:** From analysis of your summative assessment results, do you plan to or have you made any adjustments to your program learning outcomes, methodologies, curriculum, etc.? If yes, describe. If no, explain.

Additional data analysis from exams administered in Math 102 indicates that students are now entering Math 116 having been better prepared in Math 101-102. This would be one way to explain why students are generally performing better on the Math 116 exam.

Students enrolling in Math 116 have a choice between taking the course using graphing calculators or taking the course under traditional instructional methods. No conclusive evidence is available that student performance increases using graphing calculators, but some students and instructors prefer that methodology.

The department has opened a Math Help Room staffed with faculty and tutors to give students access to one-on-one help with math courses. All full-time faculty are available in the Help Room at some time each two-week period. The Help Room is open all day long and gives students the opportunity to receive help in 200-level courses that are not supported through Tutorial Services. Data collected shows there were 1396 visits to the Help Room in fall of 1999 and 1522 visits in winter of 2000. Records from fall of 1999 and winter of 2000 indicate that students using the Help Room most frequently are registered in these courses (in order of usage): MAT 116, 101, 102, 201, and 202. The department also supports a Math Lab where students have access to computers and lectures on video. The total student visits to both the Help Room and the Lab in fall of 1999 was 5625, an increase of 1150 visits over the previous all-time record for the Lab alone.

The Math Department has some data analysis of student records extracted from Colleague. There is interest in researching lack of course pre-requisites and how this effects student performance in math courses. Research has also been done to see how students perform in subsequent math courses after completing lower level course work at Sinclair (Math 116 and Math 101-102).

In seventeen of its courses, the Math Department has implemented a policy requiring a grade of "C" or better for completion of the pre-requisite course. This took effect in Fall of 1998. The students' grades are checked during the course registration process.

The department has been involved in a SEM (Strategic Enrollment Management) project since 1999 to utilize a math retention specialist to increase student success in math. The specialist contacts students who have been identified by math instructors as potential "D" or "F" students in lower level math courses. Over three hundred phone calls were made over the last three quarters. The retention specialist also conducts study skills workshops for students. Seventy-two students met with the specialist; twenty-one students met the specialist more than 3 times. The project positively identified twelve students that successfully completed their math course that would not have without the extra support.

The department has initiated some activities specifically designed to entice and motivate students toward high achievement in mathematics. One activity is the "Problem of the Week" Contest. A college-algebra level problem is posted to all classes and the student with the most correct answers at the end of the quarter receives a prize. Another opportunity for high achieving students is participation in a student math competition for community college students sponsored by AMATYC. The students take an exam that tests their pre-calculus math ability as well as requiring quick, creative, innovative thinking skills. This is a national test with about 150 college participants that awards local prizes to the first and second place winners. Sinclair usually has 15 to 20 students who enter. Sinclair previously placed 91<sup>st</sup> in the nation but recently achieved 25<sup>th</sup> place and second in the Midwest region. The department also sponsors a Math Club that meets once a week. This is a scholastic club of a few students who meet to prepare for math competitions and discuss math topics.

There have been a few changes made to the math curriculum based on formal and/or informal feedback. Math 110 is now a course similar to Math 108 that is offered to education majors. Math 151, Mathematical Modeling, was recently added to the curriculum. The statistics sequence, Math 122 & 220, now has a laboratory component to allow hands on demonstrations of statistical concepts throughout the course work. Special sections of the Technical Math sequence, Math 131 and Math 132, also include lab components as of fall 1999.

Informal feedback from students, especially in Engineering, indicates they do well after they transfer from SCC to four-year institutions.

No formal surveys are administered by the Department to students or other parties. The Transfer Study administered by IP&R generally does not include any specific information that can be used by the Math faculty. The Department would like to be

able to track the success of students who subsequently enroll in mathematics courses at four-year institutions.

**VI. General Education:** Are you using any tool(s) to assess any of the three primary general education outcomes \* (communication, thinking, values/citizenship)? If so, describe.

- a. Where within the major do you assess written communication? Describe the assessment method(s) used. Describe assessment results if available.

Writing activities are being incorporated into classes by more Math faculty. Students in MAT 122 and MAT 220 (Statistics sequence) are required to submit written lab reports.

- b. Where within the major do you assess oral communication? Describe the assessment method(s) used. Describe assessment results if available.

Oral presentations are being incorporated into classes by more Math faculty. Interactivity exercises used for teaching math also elicit more oral communication between students and faculty. MAT 110 (Math for Education Majors), MAT 122 and MAT 220 (Statistics sequence) and special sections of MAT 131 and MAT 132 (Technical Math sequence) all involve collaborative activities that elicit oral communication.

- c. Where within the major do you assess thinking? Thinking might include inventing new problems, seeing relationships and/or implications, respecting other approaches, demonstrating clarity and/or integrity, or recognizing assumptions. Describe the assessment method(s) used. Describe assessment results if available.

Thinking skills are the primary emphasis in the math program and courses. Problem solving and critical thinking skills are the major component of math. Math reinforces logic and reasoning based on its very nature. "Word problems" in math classes focus on problem solving skills. Thinking skills developed in math courses are also important to students for out-of-class problem solving that requires seeing implications and/or relationships.

- d. Where within the major do you assess values/citizenship/community? These activities might include behaviors, perspective, awareness, responsibility, teamwork, ethical/professional standards, service learning or community participation. Describe the assessment method(s) used. Describe assessment results if available.

Math 108, Math in the Modern World, touches upon issues related to values such as extended warranties, public opinion polls, etc. The faculty within the department emphasize values and citizenship through role modeling. The department sponsors a Colloquium once a quarter to host a speaker from the community.

- \* Note: The oral communication checklist and the written communication checklist developed by the General Education Committee were adopted for college-wide use during the 1997-98 academic year by Academic Council. Thinking Guidelines developed by the General Education Committee are being piloted by faculty during the 1998-99 academic year.
  
- \* Note: These three general education outcomes were identified during the 1994-95 academic year through a prioritization process with faculty/students/staff.