



College of Arts and Sciences

Institutional Program Review Report to Board of Regents

Mathematics Program

Date of Visit: November 8, 2005

**Reviewer: Dr. Tamara Worner
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Part 1: Strengths and Limitations Identified to the Reviewer

Analysis of Trends in the Discipline

Dr. Worner, the reviewer for Mathematics Institutional Program review, recommended two texts to follow for guidelines on curriculum and program development for Math. The first of these, *CUPM Curriculum Guide, 2004, A Report by the Committee on Undergraduate Program in Mathematics* is put forth by the Mathematical Association of America (MAA). The second text, *The Mathematical Education of Teachers* was compiled by the Conference Board of the Mathematical Sciences, as part of the MAA and the American Mathematical Society.

The report by the MAA (CUPM Curriculum Guide 2004) on undergraduate programs emphasizes understanding the strengths and weaknesses of incoming students as well as their goals and aspirations. “Mathematics departments need to serve all students well – not only those who major in the mathematical or physical sciences.” (Page 5, CUPM Curriculum Guide 2004)

Analysis of Academic Programs and Curriculum

The external reviewer commended DSU’s Math Department for the excellent instruction provided in the service courses. Dr. Worner praised the Math faculty for placing students into appropriate courses, and maintaining the expectation that students will learn material from one course before moving to another. In addition, she was impressed with MyMathLab and by the “excellent, caring instructors guiding the students.”

The reviewer suggested that the number of Mathematics courses offered in the major is adequate, but low in number when compared with similar programs. Other suggestions offered: (1) math students should be exposed to some depth of mathematical thinking by taking a sequence of courses above calculus; (2) a capstone course for secondary education majors is not available; and (3) the amount of geometry secondary education majors are receiving is not adequate.

Analysis of Program Enrollments and Student Placement

Dr. Worner noted, according to a report by the National Science Board on Science and Engineering Indicators 2004, enrollment in advanced undergraduate courses rose slightly from a 1995 low. She indicated that DSU is feeling this trend, with a growth in the Mathematics for Information Systems from 16 in 2000 to 37 in 2004 and an increase in Mathematics Education majors from 11 in 2000 to 18 in 2004.

Dr. Worner noted in her report that placement of DSU Math majors is phenomenal, with 100% attaining employment. In addition, students are securing employment with quality companies.

Analysis of Faculty Credentials

The external reviewer stated, “It is clear that the strength of the mathematics program is its highly qualified, dedicated and caring faculty. “ She further noted that the Math faculty are active in the

three areas of teaching, scholarship and service. In addition, she remarked that the faculty's strengths complement each other, thereby making for a well rounded program even with a minimal number of faculty members.

Analysis of Academic and Financial Support

Dr. Worner indicated that the Math faculty felt that academic and financial support is adequate. She agreed with this assessment.

Analysis of Facilities and Equipment

The external evaluator noted that facilities and equipment currently meet the needs of the faculty.

Analysis of Assessment and Strategic Plans

Dr. Worner commented the assessment activities used by the mathematics program are thorough and complete. She was pleased to see both qualitative and quantitative data used; although she did suggest that the relative small number of majors will require quantitative data to be collected for a number of years before appropriate assessments can occur.

Analysis of Strategic Planning

It was noted by Dr. Worner that the University, College of Arts and Sciences, and the Math department are in alignment with the mission of the university. In addition, it appeared that the Math department has addressed several of the strategic plans in their ongoing activities. She noted that the revised format for entry level Math courses will help in retention; the Math faculty are increasing the visibility of DSU in the K-12 system which is tied to recruitment; technology is used in increasingly meaningful ways which is tied to technology strategies; and the math faculty are writing a number of grants to increase funding for their programs and supporting the strategy for increased research on campus.

Overall Evaluation of Strengths and Limitations of the Academic Program

Dr. Worner listed the strengths of DSU's Mathematics programs as: (1) excellent faculty, (2) needs have been identified and strategies are in place, (3) graduates secure good employment opportunities, (4) excellent placement program for entry level courses, (4) quality assessment plans, (5) technology, and (6) double major agreement with computer science.

Dr. Worner listed our limitations as: (1) ability to offer a wide variety of upper level courses in a timely manner, (2) the need for more geometry, (3) lack of a sequence of upper level courses for majors, (4) lack of a capstone course for education majors, (5) low number of upper division courses results in students taking some courses not fully prepared, and (6) no existing departmental leadership.

Part 2: Reviewer's Recommendations for Change

In the Analysis of Programs, the external reviewer made the following five specific recommendations.

1. Strongly consider developing a rotation for upper-level mathematics courses.
2. Examine the mathematics that secondary students take, determine if it fits with recommendations from professional societies and the goals of the college and find a way to make the necessary changes.
3. Examine the mathematics that majors take, determine if it fits with recommendations from professional societies and the goals of the college and find a way to make the necessary changes.
4. Consider discussing with business and the sciences a way for students to double major in mathematics that is similar to the current structure with computer science.
5. If the structure of the college permits, consider appointing a chair of the mathematics department. The department is working well at this point, but the appointment of a recognized leader of the department would give the department an opportunity to focus its ideas, plan for the future, and continue to build upon what it has accomplished.

Part 3: Institutional Response

Curriculum: *Develop a rotation for upper-level mathematics courses*

There is a “fixed rotation” for the required courses in both the mathematics and math education programs. The remaining upper level courses, with consistent strong enrollment, are in the “fixed rotation” as well, with the remaining course offerings each year being made in response to student interests. For example, the Abstract Algebra course was offered in 2004 so students could take a Cryptology course. The course had strong enrollment and there is sufficient interest due to the technology focus on campus and thus will be offered again in the fall of 2006. Given sufficient interest again this fall the course will probably become an every other year course, placed in the “fixed rotation.” When limited student interest in a course exists we have offered special topics and independent study courses to accommodate the interest. The College is flexible, which is a strength of the program and the faculty in the program.

Curriculum: *Examine the mathematics that secondary students take, determine if it fits with recommendations from professional societies and the goals of the college.*

All secondary education majors participate in a capstone experience, it is called student teaching. Before student teaching, education majors have level 1, level 2 and level 3 field experiences. Thus the Dakota State University education students have ample reflection opportunities related to education and this is reflected in their electronic portfolios that are created to apply to the teacher education program and later in their application to student teaching. Moreover, students in the program (math and math education) complete a project in the science and technology course that includes a writing intensive component and a presentation in a college forum. This could easily be construed as a capstone experience. Thus we don't see the need for another capstone experience that involves a paper, portfolio or a presentation. We do, however, accept that the program is in need of a

course for students to reflect their training in mathematics. In the current curriculum cycle, we have requested the inclusion of two, one-credit seminars as a mathematics reflection component and as an avenue to discuss the underpinnings of non-Euclidean geometry.

It is noted that the geometry component in the math education program is weak; however it does meet the certification guidelines. With the addition of the one-credit seminars in the program, we will have all our secondary education majors take a one-credit seminar that focuses on the axiomatic system and non-Euclidean geometry which are the core topics in a traditional geometry course. The focus will be on students learning how to teach themselves and present newly acquired knowledge, very important skills for teachers.

Curriculum: *Examine the mathematics that majors take, determine if it fits with recommendations from professional societies and the goals of the college.*

A survey of the DSU math offerings will find they all have direct applications and these applications are a major component of the courses. Technology is a key component in nearly all of our courses as a result of our mission and our close ties with Computer Science. The Math for Information Systems major is successful on our campus as a result of the number of students that are Computer Science majors that choose to double major in Math for Information Systems. Although on first appearance the number of courses in the major is low compared to the number of support courses, it is important to note that we are not training pure mathematicians, we are training math for information systems specialists. Graduates will have strong critical thinking skills as well as the technological background for today's society and work environments.

The College has reviewed the literature, in particular both the MAA documents mentioned in the reviewers reports, and are aware of the recommendations and trends in the program. We realize that we offer all of the courses that satisfy the mathematics component of general education and the mathematics content courses in the elementary education programs. In particular, we understand DSU students and have developed remedial (including an R2R design), general education, service, support and upper level courses to fit their needs. We will continue to monitor trends in the discipline as well as campus needs and opportunities.

Curriculum: *Discuss with business and sciences a way for students to double major in mathematics that is similar to the current structure with computer science.*

Currently, all of the science majors in the College of Arts and Sciences can double major in Mathematics for Information Systems by taking the math component of the major. The business, network security and information systems majors have only one required mathematics course beyond College Algebra in their majors and thus to be a mathematics major, they need the supporting computational courses.

Administrative Organization: *Consider appointing a chair of the mathematics department.*

DSU's organizational structure does not include the chair level of administration. We have a coordinator of Math and Science and individual Math faculty assume some organizational activities as needed.