

**Reviewer's Report for the Program of
Mathematics for Information Systems
College of Arts and Sciences
Dakota State University**

Date of on-site visit: February 28, 2014

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Part 1: Executive Summary of Findings

The program of Mathematics for Information Systems (MIS) at Dakota State University (DSU) should be applauded for its success in the effective and efficient use of technology in the curriculum, and excellent job placement record of its graduates. Even though this is a small program, it occupies a central place at DSU, offering a variety of courses to its majors as well as to students in other programs such as the Computer Science program, Computer Game Design program, and Computer Network Security program.

The MIS program is run by a very competent and highly motivated group of faculty who is passionate about teaching mathematics with computer technology, and has redesigned the curriculum in the spirit of the mission of DSU being South Dakota's technology university. They are also active in scientific research and bring their research experience to the students especially in the independent study courses and capstone projects.

The integration of computer technology into the MIS curriculum at DSU is quite impressive. In contrast to traditional ways of teaching undergraduate mathematics, use of tablet PCs in the classroom, use of current mathematical software into pedagogy, and online course offerings have added a new dimension to teaching mathematics at DSU for several years.

The MIS faculty indicated that there is an immediate need to hire a tenure track faculty to teach some of the introductory level support courses for students in the other programs at DSU. Hiring a new faculty in the MIS program seems fully justified in view of recent increase in enrollment in these introductory level mathematics courses by students from other programs.

The MIS-Computer Science double major option that is currently being offered at DSU is very attractive. This leads to an increase in student enrollment in the mathematics classes and also improves job placement for the graduates.

Student progress and program quality are assessed periodically using several well-established measures. In addition, accreditation of the MIS program is performed as part of the accreditation of DSU as a whole by the Higher Learning Commission's Academic Quality Improvement program. These measures provide valuable information that can be used for quality maintenance and continued growth of the MIS program.

The low student-to-faculty ratio of the MIS program is very appealing to the students allowing for close interaction between the students and faculty both in and out of the classroom.

Since the last program review in 2005, the number of students enrolled in the MIS program has continually decreased until 2010, followed by a steady increase through 2013. The overall student enrollment is still rather low, and some effort should be made in finding ways to increase the number of majors.

Part 2: Schedule of On-Site Visit

- 8:00 - 8:45 Dr. Judy Dittman, Interim Academic Vice President, Heston 314
- 8:45 – 9:30 Dr. Ben Jones, Dean of College of Arts and Sciences
Dr. Dale Droge, Math and Science Coordinator, Beadle Hall 114
- 9:30-10:30 Dr. Tom Halverson, Dean of the College of Business and Info Systems
and CS faculty, EH 101
- 10:30 – 11:15 Carrie Ahern – Assessment Specialist, Heston Hall #309
- 11:15 - 12:00 David Overby, CIO Network Manager, Lowry Conf Room (LH 107)
- 12:00 – 1:00 Lunch with Math Faculty
- 1:00 – 1:45 Dr. Glenn Berman, Associate Professor of Mathematics, SC 146A
- 1:45 – 2:30 Dr. Rich Avery, Professor of Mathematics, SC 146F
- 2:30 – 3:15 Student Interview
- 3:15-4:00 Dr. Jeffrey Palmer, Professor of Mathematics, SC 146I
- 4:00 – 5:00 Exit Interview, Beadle Hall College Office
Dr. Judy Dittman, Interim VPAA,
Dr. Ben Jones, Dean College of Arts and Sciences,
Dr. Dale Droge, Math and Science Coordinator

Part 3: Program Evaluation, organized by focus areas for review

Program Goals and Strategic Planning

Dakota State University (DSU) is designated as South Dakota's technology university. For many years, DSU's mission has been to develop and sustain technology-based programs across all disciplines campus-wide. In keeping with this mission, many of the academic programs including the MIS program show strong presence of technology throughout the curriculum. In particular, the MIS program has incorporated technology into its pedagogy by integrating computer technology through the use of tablet PCs, mathematical software, and online teaching.

The specific goals of the MIS program as listed in the Self-Study document may be summarized as follows. Students will understand mathematical concepts and methods and be able to apply them to solve new and unfamiliar problems. They will be proficient in the use of computer technology to find information, acquire and analyze data, and communicate the results to others within and outside the area of mathematics. Graduates of the program will be prepared to enter graduate school to further their career goals in mathematics and related areas, and/or gain employment in business and industry where they can successfully apply their knowledge of mathematics and information systems to solve real-world problems. From discussions with the MIS faculty and the undergraduate students, and the excellent job placement record of the graduates in the past few years, it is clear that the above goals are being successfully met. The MIS faculty should be congratulated for their success in achieving these goals.

Furthermore, many of the courses developed within the MIS program also serve students in other programs at DSU such as the Computer Science program, Computer Game Design program, and Computer Network Security program. Thus, the MIS curriculum positively contributes to the institutional mission of DSU by providing instructional support to other academic disciplines at DSU in a technology-integrated environment.

Currently, there is an increasing nationwide trend in teaching mathematics with computer technology. More and more colleges and universities are taking this approach to teaching mathematics at the undergraduate level. With a technology-integrated curriculum already in place in the MIS program at DSU for several years, this program is a frontrunner in the path of achieving student success in mathematics with the use of computer technology.

Program Resources

Each of the faculty in the MIS program holds a PhD degree in Mathematics, and thus well-qualified to run the program. Furthermore, this being a non-traditional mathematics program with emphasis on computer technology, additional training is necessary for the faculty to teach many of the courses effectively. From the discussion with the faculty, it was clear that each of them has invested a great deal of time and effort to train themselves in the technological aspects in order to deliver these courses as technology-integrated courses in the classroom and online. The faculty members also appear to be up-to-date with the latest development of the various mathematical software that are

used by the mathematics community at large. In addition, the MIS faculty is active in mathematical research, and this in turn helps support the independent study courses and the undergraduate capstone research projects.

The low student-to-faculty ratio makes the faculty easily accessible to the students, and the students have unanimously indicated that this is one of the very important features that attracted them to come to DSU. This also allows for closer interaction between students and faculty at both professional and personal levels.

Both the classroom facilities and computer facilities for students are found to be excellent. The students have indicated that they have easy access to the computer network for their coursework. The computer resources that are currently available on the DSU campus are also more than adequate for independent study courses and capstone research projects offered by the MIS program.

The MIS faculty expressed the need to hire a tenure track faculty immediately to teach some of the support courses at an introductory level, such as trigonometry, calculus I, introduction to discrete mathematics, and introduction to statistics. This seems fully justified due to the growth of some of the other programs at DSU as well as an increase in the number of online mathematics courses offered by the MIS program.

The financial support for the MIS program appears to be adequate, and as the MIS faculty has indicated, there are currently no financial concerns.

Program Curriculum

The MIS program curriculum is a nice blend of courses on calculus, discrete mathematics, linear algebra, mathematics of games, statistics, and mathematical modeling, including independent study courses, and capstone research projects. As mentioned earlier, many of the MIS courses are also taken by the students in other programs at DSU, such as Computer Science, Computer Game Design, and Computer Network Security programs. In addition, some of the mathematics courses offered by this program serve to satisfy the system-wide general education requirements at DSU. The service provided by the MIS program to other programs at DSU should not be underestimated.

A very attractive feature of the MIS program is that it offers a double-major option with the Computer Science program. Students can major in both these areas by taking several overlapping courses and a few additional courses. This Mathematics-Computer Science double-major option is available in many universities in the U.S., and has proven to be very effective not only to increase student enrollment in mathematics classes, but also from the standpoint of job placement.

Technology Integration

Integration of computer technology into the curriculum is the highlight of many of the academic programs at DSU, particularly the MIS program. Use of tablet PCs in the classroom in certain courses together with the use of various mathematical software

such as the Geometer's Scratchpad, Maple, and Stella create a rich environment for student learning. At the same time, use of such technology enables the students to analyze real-world problems far beyond the domain of standard textbooks. As stated in the Self-Study document and was also clear from discussion with the MIS faculty, each of the professors has participated in curriculum redesign projects utilizing technology, and in the development and offering of online courses within the MIS degree program. Technology integration to the extent implemented by the MIS program at DSU is a unique feature of the program. Only recently, some of the mathematics programs in the U.S. started incorporating computer technology into their teaching methodology including use of tablet PCs in the classroom and other tools. The MIS program at DSU has been a frontrunner in this path of technology-integrated teaching of mathematics for several years.

The computer infrastructure at DSU seems to fully support the technology requirements of the various mathematics courses within the MIS program. In addition, the online component of some of these courses is also appealing to distance learning students, complementary to classroom instruction.

Program Assessment

The various measures that are currently being used for assessing the different aspects of the MIS program appear to be sound. For example, the web-based interface, WebAdvisor, which is accessible to both students and faculty, is a nice tool for systematically monitoring student progress during the four years. The Major Field Assessment Test (MFAT) which is taken by the graduating seniors is a nationally recognized standardized test. MFAT is administered by the Educational Testing Service (ETS) and is used for assessment of student performance by many colleges and universities in the U.S. As indicated in the Self-Study document, the DSU students in the MIS program score at or above the 50th percentile when compared to the user norms. It would be appropriate to direct some efforts to improve this percentile rank. The various surveys that are periodically conducted at DSU also provide valuable indices for program assessment and improvement. In addition, surveying graduates at one and three years following graduation is an excellent way to evaluate the success of the program. Feedback from the employers can also be used effectively to find areas for improvement in the existing program. All these measures provide valuable feedback on the overall performance of the MIS program and should therefore be continued to be used in the future.

Accreditation of the MIS program is done as part of the accreditation of DSU as a whole by the Higher Learning Commission (HLC) using their Academic Quality Improvement Program (AQIP). The HLC is a Commission of the North Central Association of Colleges and Universities which accredits degree-granting post-secondary institutions in the North Central region of the United States, and is one of six regional accreditors in the U.S. The AQIP pathway uses the principles of Continuous Quality Improvement and reaffirms the institution's accredited status with the commission every seven years. Such an accreditation process is a valuable assessment tool and is important for monitoring the continued improvement of program quality. It also promotes visibility of the program both within the DSU system and outside. DSU was accredited by HLC in 2011, and

reaffirmation of the accreditation status is scheduled for 2018-19.

Student Support / Student Enrollment

Among many of the undergraduate mathematics programs in the U.S., the MIS program at DSU stands out in its excellent job placement record for the graduates. However, since the last program review in 2005, the number of students enrolled in the MIS program has continually decreased until 2010, followed by a steady increase through 2013. Overall, the student enrollment in this program is still rather low, and every effort should be made to increase the number of MIS majors. By virtue of the program's emphasis on computer technology and excellent job placement record, and its uniqueness among the South Dakota colleges and universities, it should be possible to attract more students into this program. Perhaps, one way to start this recruitment process is to contact the mathematics faculty in high schools, and other colleges and universities in South Dakota and neighboring states and send them a flyer illustrating the strengths of this program. The MIS faculty may also consider visiting some of the high schools and colleges, and interacting with their students and faculty and giving oral presentations. It should be pointed out that recruiting students into an undergraduate mathematics program is a challenge in many colleges and universities in the United States.

Both the classroom facilities and computer facilities for students are found excellent. The students have indicated that they have easy access to the computer network for their coursework. The students also find the computer personnel easily accessible and very helpful. In addition, the students find the double major option in MIS and Computer Science very attractive and valuable.

Students interviewed by the program reviewer were happy with the academic advising they received from the MIS faculty, but were dissatisfied by the fact that some of the upper level MIS courses are not offered regularly due to insufficient enrollment. This prevents them from taking the required courses in sequence in a timely fashion, which in some cases delays their graduation. This is an important issue, and some effort should be made to alleviate this situation.

Program Strength and Area for Improvement

The major strength of this program is its integration of computer technology into the curriculum, and preparing the students for a career in business and industry affiliated with the growing field of Information Technology. As mentioned above, the MIS curriculum is designed with a special emphasis on computer technology through the use of tablet PCs in the classroom, use of instructional mathematical software, and online courses. The MIS curriculum serves effectively both the MIS majors and students from other programs at DSU. Because of its uniqueness in the sense of technology integration, the program can be appealing to a wide range of students. In view of this, it would be appropriate to explore the possibility of attracting more students from the state of South Dakota and adjoining states.

Some effort should be made to offer the upper level courses regularly on a timely basis. Low enrollment in the upper level courses is clearly related to the small size of the program. Some effort for recruiting more students into the MIS program is necessary, and should be considered a priority in the next few years.

Specific issues identified by the university: program curriculum, program assessment, and program enrollments

Many of the MIS students will work after graduation in the Information Technology sector. Since computer network security issues are becoming more and more important in such an environment, it may be prudent for an MIS student to have some formal exposure to computer network security systems. This can be achieved by taking an introductory survey course on computer network security offered by the Computer Network Security (CNS) program at DSU.

The MIS faculty should also reach out to the CNS faculty to see if the CNS students would enroll in the first calculus course. The first basic calculus course is not just about calculus; it teaches analytical ways of thinking about things using functions and related concepts, and is fundamental to college education in Science and Technology. This would increase the enrollment in calculus courses and will also establish close interactions among the faculty between the two colleges. The issue of low enrollment in the upper level mathematics courses was brought up by the MIS faculty as well as the students. Some work needs to be done to address this and increase the enrollment in these classes.

As indicated above, there is an immediate need to hire a tenure track faculty to teach some of the support courses at an introductory level. With continuing growth of the MIS program, additional tenure track faculty may be needed to teach upper level mathematics courses.

Part 4: Recommendations for Change

Based on discussions with the MIS faculty, students, deans, academic vice president, and other personnel at DSU, the following changes are recommended.

First, the issue of low enrollment in the upper level MIS classes needs immediate attention. Every effort should be made to offer these courses regularly and in timely fashion so that a student entering the program as a freshman can take all the required courses in the proper sequence and graduate in four years.

Second, some effort is necessary to recruit more students into the MIS program. This will help grow the program, and at the same time increase the enrollment in the upper level courses, and allow these courses to be offered on a regular basis.

Third, the MIS faculty should explore the possibility of offering a double major option to students in other programs at DSU, especially those rooted in computer applications and information technology.

Fourth, it would be appropriate to expand the online teaching schedule by offering more online courses. This is especially important because of rather remote location of DSU, and sparse demography of the state of South Dakota. A fully operational online program will enable distance learning students to enroll and pursue the MIS program more effectively.