

School of Mathematical and Natural Sciences

Mathematics Program Review

External Review Report

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Site Visit April 4 and 5

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## 0. Introduction

The School of Mathematical and Natural Sciences at the University of Arkansas at Monticello (UAM) was visited by the external reviewer on April 4-5, 2013 as part of the Mathematics Program Review. The reviewer met with most of the mathematics faculty, the physics faculty and two of the chemistry faculty. The reviewer also met with a handful of students, Sandra Campbell, Library Director, Dr. Morris Bramlett, the Dean of the School of Mathematical and Natural Sciences, and Dr. Jimmie Yieser, the Provost/Vice Chancellor for Academic Affairs.

The internal *Mathematics Program Review* document was provided to the reviewer eight weeks before the site visit. This document details the mathematics curriculum, goals and objectives of the department, and activities and accomplishments of the department and students/graduates. In addition, the internal *Mathematics Program Review Committee Report* was provided in a timely manner. Both of these documents are currently available on the School of Mathematical and Natural Sciences website:

([http://www.uamont.edu/Math\\_and\\_Sciences/mathprogramreview.htm](http://www.uamont.edu/Math_and_Sciences/mathprogramreview.htm)).

UAM is a comprehensive post-secondary institution in southeast Arkansas, serving the needs of students through teaching, research and service. The School of Mathematics and Natural Sciences offers programs/courses in astronomy, biology, chemistry, earth science, mathematics, and physics. The focus of this review is the mathematics program.

## 1. Program Goals, Objectives and Activities

In essence, the mission of UAM's School of Mathematical and Natural Sciences is to provide opportunities for every student to enhance their own understanding of science and mathematics and to provide an appropriate level of education for budding scientists and mathematicians through a comprehensive curriculum. Courses are offered to support the general education program, other majors, and their own majors and minors. The School's graduates, through a curriculum guided by specific goals, are prepared for careers in industry or teaching and for graduate studies in education, mathematics, sciences, and pre-professional programs.

All of this helps guide the Mathematics program, whose primary objectives are to offer a Bachelor of Science in mathematics, offer a minor in mathematics, provide service courses to other disciplines, provide service courses to the general education program, and to offer courses in the developmental (remedial) mathematics sequence.

The mathematics department is heavily invested in the developmental sequencing, with the goal of preparing students to meet the mathematics requirements for their chosen degree program. It is apparent that the faculty (mostly instructor level, and majority of their teaching load) involved with the developmental courses are genuinely invested in helping students achieve success. The department has chosen the ASSET exam as an end-of-course assessment for students completing Intermediate Algebra (developmental) and appear to have a success rate that compares very favorably (based on informal department chairs meeting) to other universities in the state system. The state has not yet released official results for the university system.

The department offers courses in the general education program (College Algebra and Survey of Mathematics) and also provides service courses for other majors (Chemistry and specific majors within the School of Forestry), which include Trigonometry, Compact Calculus, and the Calculus sequence. It also offers courses for the School of Education to ensure that their majors are taking appropriate mathematics content courses to meet their program requirements. The mathematics faculty teach three courses which are required for the elementary and middle school programs.

The entire state of Arkansas has been identified, by the Arkansas Department of Education as a mathematics critical shortage area for 7-12 public school teachers. In particular, within the seven county region around UAM every school district is on the critical needs list based on National Science Foundation (NSF) criteria. As such, nearly every mathematics graduate who desires to further their education in the Master of Arts in Teaching (MAT) program at UAM is able to garner multiple teaching offers in the region.

It is evident that the mathematics faculty have high expectations for their courses and for their students. They are willing to assist students as much as possible, whether in the general education courses or major courses. The faculty and students are also involved in activities outside the classroom. A selection includes:

UAM Math Tutoring group: primarily junior and senior mathematics majors with interest in helping (tutoring, one-on-one assistance, computer lab help, etc.). Primarily developmental and general education courses. A very successful initiative.

Undergraduate research opportunities: opportunities for students in mathematics related research; current students involved with programming, encryption, computational physics, and chaotic dynamics.

UAM Math and Physics Club: students with interest in mathematics and physics and associated faculty provided social and educational activities to promote mathematics and physics.

Sigma Zeta Science and Mathematics Honor Society: students participate in Southeast Arkansas Regional Science Fair (SEARSF) and Arkansas Council of Teachers of Mathematics (ACTM) Regional mathematics contest, biannual Science Center cleanup day. In concert with faculty, students are also involved with Advanced Placement test preparation events.

SEARSF: a regional science fair event hosted by UAM for over 50 years. Mathematics faculty and students assist with all aspects of holding such and event. Current director is on the mathematics faculty.

The department uses four primary means of student assessment and program assessment. First, students are assessed by their performance in courses through the standard means: exams, projects, presentations, homework, etc. Second, many graduates take some sort of standardized exam (Praxis II Math, GRE). Recent performance of students entering the MAT program indicate 100 percent pass rate on the Praxis II component (see Table 10, page 28 of *Mathematics*

*Program Review*). Third, the senior seminar (MATH 4177), which is the capstone course required of all mathematics majors, is used as a proxy for gauging how well a student has met not only the course, but also programmatic, learning outcomes. Fourth, the program is assessed by the placement of graduates. Most graduates are successful in finding teaching positions, entering graduate programs, or finding gainful employment. In addition, the department provides an annual assessment report to the Provost detailing student performance and evaluation, program efforts towards retention, and program assessment based on student learning outcomes and their relationship to UAM's mission. To this end, much effort has been placed on assessing and improving the developmental and General Education course offerings.

Also, graduates are invited to interview with the Dean of the School of Mathematical and Natural Sciences. Although, several do visit the Dean, many do not. Exit question responses provide anecdotal evidence that can be used to assist in the assessment process. The department has not done an employer satisfaction survey in several years, but does have a working relationship with the public school districts that hire UAM graduates. Many of the department graduates have done very well in this setting (see Appendix G of *Mathematics Program Review*).

## **2. Program Curriculum**

Essentially, the mathematics department provides support or service courses and provides courses for their majors and minors. The mathematics faculty continually review their curriculum with the goal of best meeting the needs of not only their majors/minors, but also their support of other majors/minors, the needs of the pre-service teacher programs, the developmental sequence, and the general education program. Even though a majority of mathematics majors enter public education, the curriculum is not focused on this career path, but does offer electives that better augment this career choice. The mathematics curriculum is broad-based and provides an excellent mathematics preparation for various post-graduate paths

Recently, the state of Arkansas mandated end-of-course testing for developmental courses and UAM has elected to use the ASSET exam (a testing and placement service offered by the ACT) as the assessment for Intermediate Algebra. This selection required a modification of the topics covered in the developmental sequence to align with ASSET. In addition, the department has used on-line homework and assessment in the developmental courses and in College Algebra and Survey of Mathematics, Trigonometry and Calculus. This on-line work has been somewhat successful in getting students engaged in their work (which allows immediate feedback) and providing instructors with information about student progress on mastering various topics.

In addition, department faculty have worked with the Southeast Arkansas Educational Cooperative to offer Compressed Interactive Video courses (College Algebra, Trigonometry, Survey of Mathematics, and Calculus I) throughout the state.

The department's calculus sequence has also been modified over the past several years. Since 2009, the current sequencing of five credit Calculus I and II, with a three credit Calculus III has been in place and seems to allow for a better transition to the upper level courses.

Over the last 10 years, the number of declared majors has been fairly consistent at nearly 22 (freshman, sophomores, juniors, and seniors) each year which would translate to about 5 graduates a year. This matches their 10 year average of 4.7. While perhaps not large, the department meets an important need and growing demand for qualified mathematics teachers within Southeast Arkansas. The department recruits through local high schools and through specific events such as Scholar's Day and Weevil Welcome Days. They also work with admissions who do an outstanding job of identifying qualified students, who are then sent personal invitations, from the mathematics faculty, to visit UAM. UAM also hosts numerous Advanced Placement (AP) test preparation days in mathematics which offer the opportunity to engage potential students. The department also works to interest General Studies' majors in the mathematics curriculum through informal interactions and through the Math & Physics club and the Sigma Zeta honor society. Advising for declared mathematics majors is a priority for the faculty, ensuring proper course sequencing and discussions regarding post-graduation options.

The department runs a successful tutoring program that allows stronger students to assist their peers. The faculty also spend enormous amounts of time and energy providing help sessions, one-on-one assistance, and mentoring graduates involved in the Master of Arts in Teaching (MAT) program.

### **3. Academic Support**

The mathematics department provides two levels of support: service and developmental support and support for their majors. They work to recruit competent tutors who work in the tutoring center that services the general education mathematics courses, remedial courses, and to a lesser degree the upper level courses. There is a commitment, which funnels from the faculty through the tutors, to helping all students achieve success in their courses.

Advising for their majors is comprehensive. The faculty share the advising load and are able to ensure that students take appropriate courses in a timely fashion. A sequencing guide is provided to all majors, which is especially important since many of the upper level required courses are on a two-year cycle.

### **4. Program Faculty**

The mathematics department has 10 faculty distributed as four instructors, one assistant professor, and five associate professors. Recent activity indicates there would be a need to replace an instructor position and a tenure-track position. The qualifications of all faculty are appropriate for their rank and role within the department. The teaching load for faculty holding the rank of instructor is typically 15 credit hours per semester and for faculty holding the rank of Assistant Professor or higher is typically 12 credit hours per semester. In addition, the department does include the semester student credit hour (SSCH) as another measure of workload. These numbers vary greatly among the faculty depending on types of courses and actual teaching load, but do provide another means to quantify workload.

The issue of appropriateness of their workload through the lens of best-practices is difficult to gauge. Their current workload is within the range of similar institutions, but one needs to also

consider types of courses (developmental, general education, major), class size (some of the developmental and general education class sizes do seem rather large), and university-wide expectations on service and scholarship. With that said, as a whole, the workload does seem appropriate.

New faculty participate in a university-wide orientation program (week-long prior to start of the fall semester) which provides a thorough introduction to UAM and policies and procedures on advising, technology, academic support, etc.

Faculty are evaluated annually and required to submit an annual self-evaluation. Peer visits to class and course evaluations by students are also required. A few faculty members did have concerns about the authenticity of the feedback from peer visits. Nevertheless, the evaluation process appears to be adequate and appropriate.

## **5. Program Resources**

The Dean has been supportive of most, if not all, recent mathematics department initiatives and the mathematics faculty were unanimous in their praise of the Dean's support. Faculty have been encouraged to pursue various pedagogical approaches to their courses. At the developmental level the department has initiated a lab component to one of the course sections. This opportunity should provide data to help bolster success rates at the developmental level and possibly envision a different way of structuring the developmental courses. Several faculty have written their own workbooks for courses, to offer both a more focused approach and a viable alternative to costly textbooks.

The department provides funds for professional development and most faculty have attended and some have made presentations at both regional and national mathematics conferences. In addition, the Fred J. Taylor Library and Technology Center has excellent holdings (journals, books, and electronic resources) in mathematics. They subscribe to all of the National Council of Teachers of Mathematics (NCTM) journals and some excellent modeling journals. In addition, there are rooms that are available for use within the library that supplement the Science Center space.

While the classrooms in the Science Center have been updated to include Internet connections and projection capabilities (both document camera and computer), the facility itself is showing its age. The classrooms, although upgraded technologically, are aged. The building itself is in need of repairs to correct roof leaks, ventilation, and some of the outdoor cement stairs.

## **6. Program Effectiveness**

The mathematics faculty share a common vision to do what they can to help students achieve an appropriate level of success and to create a community or environment that supports not only students but also the faculty. These efforts led one faculty member to confide "the department is like my family." A dedicated faculty is a major strength for the mathematics department. In addition, the level of achievement of their graduates (Appendix G in *Mathematics Program*

*Review*) is quite laudable and a “point of pride” for UAM. Furthermore, some students have been or are currently working with Physics faculty on research projects (chaotic dynamics, encryption, cellular automata) which have led to conference presentations.

The department has self-identified some need-for-improvement areas. A handful of faculty have made presentations at conferences, but there is a lack of scholarly activities outside of teaching and there are no current ongoing research projects or any publications within the last ten years. The faculty are well aware of how an improvement in this area will greatly strengthen the overall program. Another area is staffing. A large amount of teaching time is spent on either developmental (with success rates, while good in comparison to other universities in the state system, are mediocre at best) or service courses which does not allow for as much time for the major courses and/or other scholarly pursuits. Considerations about staffing and class size could begin to address these concerns. Technology concerns are also valid for the program. New teachers will most likely be using modern technology (Smartboards) in their classrooms with little to no prior experience. In addition, computer lab space in the Science Center is minimal and perhaps not adequate for some of the courses.

## **7. Instruction by Distance Technology**

Not really applicable. The department understands the need, but is committed to face-to-face interactions for the upper level required courses in the major. The Compressed Interactive Video (CIV) offerings are minimal and limited to two courses per year. The last scheduled course (Fall 2012) was cancelled.

## **8. Program Research and Service**

These areas have been addressed in sections 1. and 2. and 6.

## **9. Local Review Comments**

These areas have been addressed in sections 1. and 2 and 10. below.

## **10. Summary**

The mathematics program is strong, vibrant and in good position to address the needs of the changing landscape of higher education. The program’s primary strength is a caring and dedicated faculty which works to meet the needs of their students, through the general education courses, other service courses, and the mathematics major courses. The Dean has an excellent relationship with the faculty and they are appreciative of the support that he has for their academic endeavors.

The department has identified several areas that are in need of improvement and should move to address these as quickly as possible. There are several opportunities that could help in this area. The Common Core State Standards in Mathematics (CCSS-M) will be implemented (K-12) in the very near future, so there is an opportunity to expand on the existing relationship with area schools by providing leadership and guidance towards their implementation. The physics faculty have some exciting research opportunities for students involving computer programming and applied mathematics. Augmenting the existing mathematics curriculum with some programming course and mathematical physics should be considered both as a means of faculty collaboration with the possibility of initiating research opportunities and also strengthening their program's curriculum in this applied fashion. Dedicating time, during department meetings, once or twice a semester, to address pedagogical issues would provide an opportunity for faculty to share/discuss issues specific to courses as well as general best-practices regarding teaching. Updating the mathematics program's web presence would be beneficial with a commitment to keep it current. Creating a separate page, within the School's page, could allow for specificity about program goals, could help with recruitment, and could be a starting point for local K-12 teachers looking for CCSS-M information.

Some identifiable threats involve recent retirements and possible retirements in the future. There is a need to continue the collaboration with the public schools and take the lead with CCSS-M in the southeast Arkansas. Consideration of new faculty with expertise in the mathematics education field (with appropriate mathematics content expertise) would be prudent for the immediate future. The facilities are in need of improvement and should be a priority. The improvements should not end with the upgrades in classroom technology, but continue in a manner that is appropriate from an academic and economic viewpoint.

Curriculum review, creative pedagogical approaches, staffing and facility considerations should continue, with serious consideration to all areas, to help guide an already successful departmental program.

## **Bibliography**

*Mathematics Program Review*, University of Arkansas at Monticello, School of Mathematical and Natural Sciences, Fall 2012

*Mathematics Program Review Committee Report*, UAM Institutional Program Review Committee, Fall 2012

[http://www.uamont.edu/Math\\_and\\_Sciences/mathprogramreview.htm](http://www.uamont.edu/Math_and_Sciences/mathprogramreview.htm)