PROGRAM REVIEW COMMITTEE REPORT

Fall, 2012

Mathematics

Goals, Objectives, and Activities

The mission of the school of Mathematical and Natural Sciences is to educate professional scientists and mathematicians and provide opportunities to enhance the understanding of science and mathematics for all students. This mission is aimed at preparing undergraduate math majors for careers in industry and K-12 education as well as graduate work in applied and/or pure mathematics and science. In addition, the School of Mathematical and Natural Sciences offers courses that support the training for pre-professional studies in medicine, dentistry, optometry, pharmacy and allied health. Math and science courses also support ancillary programs including agriculture, forestry, nursing, education, pre-veterinary medicine, psychology, and wildlife management, and the general education requirements of UAM in biology, chemistry, earth sciences, mathematics, physics and physical sciences.

Southeast Arkansas public schools have a high need for qualified math teachers. The Arkansas Department of Education has designated the entire state of Arkansas as a mathematics (grades 7-12) critical shortage area and has implemented several programs, such as the Teacher Incentive Fund Program, to provide qualified mathematics teachers. UAM graduates that major in mathematics typically receive one or more teaching offers in the State of Arkansas provided the student meets the criteria for admission into the Master of Arts in Teaching (MAT) program. Many UAM graduates accept these positions because they are able to remain close to home.

Industries and businesses in Arkansas are also experiencing a shortage of qualified mathematics graduates. The Arkansas Science, Technology, Engineering and Mathematics

(STEM) Summit reported in 2012 that Arkansas businesses and industries must hire out of state graduates or move jobs to other regions due to the lack of mathematics graduate in Arkansas.

At UAM, the number of students *majoring* in mathematics has been fairly steady for the past ten years, typically numbering about 20. However, the number of program *graduates* has fallen slightly likely due to changes in the chemistry major requirements. The ten-year mean for graduates per year is 4.7, above the minimum number required by the Arkansas Department of Higher Education for a viable program.

Curriculum

The UAM mathematics curriculum has been modified to meet current requirements and trends in post-course evaluations of remedial courses, on-line homework, and off-campus education (concurrent enrollment programs). The State of Arkansas requirement for end-of-course testing for Intermediate Algebra has been met using the ASSET exam. As a result of the end-of-course testing, some material has been moved from College Algebra to Intermediate Algebra to better match material covered by the ASSET exam. Several courses have been augmented with on-line homework and assessment using the ALEKS or WebAssign systems. The UAM Mathematics faculty members work closely with area Advanced Placement instructors to assure proper course content and exams for courses taken outside of the campus environment. Finally, the Calculus sequence was changed from four credit courses to five credit courses to be consistent with other universities and better meet the needs of students from diverse majors.

The Bachelor of Science degree in Mathematics requires 120 hours that includes 35 hours of General Education requirements, 35 hours of major requirements and 8 hours of supportive requirements. A minor is also required for the Mathematics major.

The 35 hours of major requirements includes the following 26 hours:

MATH 2255 Calculus I
MATH 3403 Probability and Statistics
MATH 3453 Abstract Algebra
MATH 3463 Linear Algebra
MATH 3495 Calculus II
MATH 3533 Differential Equations
MATH 3543 Calculus III
MATH 4711 Mathematics Seminar

And 9 hours of the following mathematics electives:

MATH 3233 History of Mathematics
MATH 3413 Number Theory
MATH 3423 College Geometry
MATH 3513 Discrete Mathematics
MATH 399V Special Topics in Mathematics
MATH 465V Reading and Research

The minor in Mathematics requires 22 hours of mathematics coursework and includes 13

hours of the Calculus sequence and 9 hours of 3000 or higher-level mathematics courses.

The following courses are offered each semester:

MATH 1043College Algebra
MATH 1033Trigonometry
MATH 1003 Survey of Mathematics
MATH 2255 Calculus I
MATH 4711 Math Seminar

Summer course offerings include:

MATH 1043 College Algebra
MATH 1033 Trigonometry
MATH 1003 Survey of Mathematics
MAED 2243 Fundamentals of Geometric Concepts
MAED 3553 Number Systems

Fall semester course offerings include:

MATH 3495 Calculus II
 MAED 3553Number Systems

Spring semester course offerings include:

MATH 1073 Compact Calculus
MATH 3543 Calculus III
MAED 2243 Fundamentals of Geometric Concepts
MAED 3563 Geometric Investigations

Other offerings include:

MATH 3403 Probability and Statistics, offered fall semesters, odd-numbered years
MATH 3453 Abstract Algebra, offered fall semesters, odd-numbered years

MATH 3233 History of Mathematics, offered fall semesters, even-numbered years
MAED 3553 Number Theory, offered fall semesters, even-numbered years

MATH 3423 College Geometry, offered spring semesters, odd-numbered years
MATH 4453 Differential Equations, offered spring semesters, odd-numbered years

MATH 3463 Linear Algebra, offered spring semesters, even-numbered years
MATH 3513 Discrete Mathematics, offered spring semesters, even-numbered years

MAED 4663 Methods of Teaching Mathematics, taught on demand

If a new course, a change in an existing course, or a new section is deemed necessary, mathematics faculty members discuss any change(s) and submit a proposal to the Dean of Mathematics and Natural Sciences. The change must be outlined in the Curriculum and Standards (C&S) Approval Form and is submitted by the Dean to the Academic Council for review. The C&S Committee takes the approved proposal before the University's General Assembly for approval; the Chancellor ultimately authorizes the curricular changes.

No courses required for the mathematics major are currently offered by distance delivery. MATH 1003 Survey of Mathematics and MAED 3563 Geometric Concepts have been occasionally offered by CIV (Compressed Interactive Video) to other campuses that are part of the University of Arkansas System as part of the teacher education 2+2 transfer agreement. Courses offered by CIV are limited to approximately two courses per year and these courses are not required courses for mathematics majors. These courses are typically offered at the request

of the School of Education. The course is taught through CIV by a mathematics faculty member from the UAM campus. The faculty member is available to students via email, telephone, and designated office hours. Exams are scheduled closely with multi-section mathematics courses that are taught on the UAM campus. With the CIV format and the number of campuses involved, facilitators monitor students at the respective campuses for tests, quizzes, and the final exam.

Program Faculty (full-time/adjunct/part-time)

The mathematics program in the School of Mathematical and Natural Sciences includes the ten full-time faculty members indicated below.

Linda Chapman, Instructor
Victoria Lynn Fox, Instructor
Guy Nelson, Instructor
Victoria Ryburn, Instructor

Jared Gavin, Assistant Professor

Farrokh Abedi, Associate Professor
Charles Dolberry, Associate Professor
Carole Efird, Associate Professor
Lowell Lynde, Associate Professor
Hassan Sayyar, Associate Professor

The mathematics faculty also includes four concurrent faculty members: Rebecca Belvin, Regina Gorman, Teresa Martin, and Shelvia Ross. All concurrent faculties have been approved to teach concurrent courses in area high schools by the Mathematics Faculty Committee. All concurrent faculties hold master's degrees and have at least 18 graduate-level course hours in the subject of mathematics, as any adjunct faculty member would need to have.

All major courses are taught by tenured or tenure-track faculty. Faculty members that do not fall into this category are restricted to teaching foundation courses. All faculty members regularly undertake professional development and scholarly activities in order to maintain currency in their fields.

All new faculty members in mathematics undergo the official university orientation process during Professional Development Week. New faculty members also participate in follow-up workshops on topics such as academic advising or using the online learning management system. Faculty members undergo an annual self-evaluation and peer-evaluation process, and student course evaluations. Dean Bramlett, the dean of the School of Mathematics and Natural Sciences, reviews the faculty evaluations in an annual performance review that is discussed with the faculty member and forwarded to the Provost.

Faculty members in mathematics teach 9-15 hours per semester based on faculty rank. Credit hours per instructor vary by semester and year.

Program Resources

Faculty members in the School of Mathematics and Natural Sciences are supported with institutional training for developing new on-line or hybrid courses. UAM provides technical support for the use of instructional software such as Blackboard. The faculty members of the School of Mathematics and Natural Sciences are encouraged to attend meetings such as the National Council of Teachers of Mathematics (NCTM) and the Mathematics Association of America (MAA) to enhance teaching skills and research. The School of Mathematical and Natural Sciences may support faculty research and scholarly activity by granting off campus duty assignments. Faculty members are encouraged to write textbooks and try new software products, mathematical tutorial programs, and research new trends in mathematics education. Faculty research grants are available through UAM on a competitive basis for basic research.

The School of Mathematical and Natural Sciences provides $6,600 per year for faculty development and a portion of the funds are used to attend professional meetings. Faculty

members in mathematics (Lowell Lynde, Linda Chapman, Charles Dolberry, Hassan Sayyar, and Farrokh Abedi) used $4,539.10 to attend professional meetings over the last two academic years.

The Fred J. Taylor Library and Technology Center collections comprise over 500,000 items that include books, bound periodicals, microforms, government documents, and serial subscriptions. The total library budget for the entire School of Mathematical and Natural Sciences is $15,000. The library holds almost 679 online periodical titles, six printed periodicals, 40 eBooks, and 3,908 mathematics titles in print.

The faculty members of the School of Mathematical and Natural Sciences attempt to provide the latest technology for instruction. The Mathematics Department is housed in the Science Center, where all classrooms are equipped with a computer, document camera, and a digital projector. All mathematics faculty members utilize this technology in their classroom instruction. Eight of the 10 classrooms in the Science Center are connected to the internet. The Science Center Computer Lab and Tutor Center were upgraded in 2011. Information Technology (IT) provides Microsoft software packages, SAS Statistical Software, and other needed software on request. IT works with the mathematics faculty members to insure that students and tutors have access to the latest versions of educational software (ALEKS; WebAssign; MyMathLab) for courses.

Equipment purchased for the mathematics program during the past three years includes office computers and printers for the faculty and presentation equipment for classrooms including digital projectors, document cameras, and a smartpen system.

Majors/Declared Students

The number of declared mathematics majors has remained fairly constant over the last three years with 20 students in 2009 and 2010, and 22 students in 2011. An average of four

students per year has graduated with a Bachelor of Science in mathematics over the past three years. Four students graduated in 2010, no students in 2011, and eight students graduated in 2012. Several students from the 2011 class attended summer school in 2011 and were included on the 2012 graduation list.

The School of Mathematical and Natural Sciences has several strategies to recruit, retain and graduate students. Several faculty members in mathematics have developed relationships with high school mathematics teachers and also travel to local high schools to present mathematics topics. High school teachers, along with junior- and senior-level students, are invited to visit UAM mathematics classes while the class is in session. The School of Mathematical and Natural Sciences also recruits potential students during Scholar's Day, Weevil Welcome Days, and Parent/Family Appreciation Day. UAM yearly hosts three Advanced Placement (AP) test preparation sessions in mathematics. Approximately 200 area high school students that are enrolled in AP Calculus or AP Statistics visit UAM with AP trainers on these three Saturday events.

The faculty members in mathematics discuss job opportunities in mathematics and other STEM disciplines with undecided General Studies majors. Faculties also recruit students that are interested in mathematics through the members of Sigma Zeta Math and Science Honor Society and the Math and Physics Club. Free mathematics tutoring is available in the department for students that are struggling with mathematics courses. Many upper-level students who are majoring in mathematics earn work-study wages by working in the Tutoring Lab. In addition, faculty members in mathematics provide weekly help sessions or work one-on-one with students during office hours. Faculty members also help place students in local schools if the student decides to pursue the M.A.T. (Master of Arts in Teaching) graduate degree program.

<u>Program Assessment</u>

The School of Mathematics and Natural Sciences uses the following criteria for assessment and evaluation of learning: course examinations and research projects; standardized exams (Praxis II Math Exam; GRE); the capstone course, MATH 4711 Mathematics Seminar; and placement of graduates.

The assessment and improvement of remedial and General Education mathematics courses has also been a big priority. All entering freshmen students are placed into either MATH 143 Introduction to Algebra, MATH 183 Intermediate Algebra, MATH 1043 College Algebra or higher level courses such as MATH 1033 Trigonometry or MATH 2255 Calculus I. Placement into a beginning mathematics course is based on ACT scores or an equivalent placement exam. An ACT score of 19 is required to enter college-level mathematics courses.   In accordance with state law, a post-test, (ASSET exam) is given at the end of the MATH 183 Intermediate Algebra course. In Fall 2011, 65% of the Intermediate Algebra students who took the ASSET exam received a passing score. In Spring 2012, 68% of the Intermediate Algebra students passed the ASSET exam. The success rate for 2010-2011 Intermediate Algebra students taking the end-of-course ASSET exam was 83%. Overall, approximately two-thirds of the students taking the ASSET exam scored proficient. This pass rate compares favorably to the rate of students at other Arkansas universities.

The capstone course for mathematics majors is MATH 4711 Mathematics Seminar. The goals of this course are to provide an overview of mathematics from many courses in the curriculum, improve written and oral communication skills, and acquaint the student with basic library research techniques. The student conducts library research on a specific mathematics topic that is approved by the faculty member. The student is also required to write a research

paper and make a 30-50 minute presentation to his/her peers, other mathematics faculty, and other interested individuals.

Teaching effectiveness is primarily evaluated through the use of classroom observation by the Dean and/or peer faculty and student evaluations. Classroom observation focuses on class preparation, lecture organization, presentation of content and interpersonal skills. This peer review provides constructive criticism on teaching performance and suggests possible improvements. Student evaluations are an important means of feedback about teaching performance. In Spring 2012, the student evaluation process was moved to a secure online survey (CoursEval). Students are asked to evaluate their performance in the class such as effort level, attendance, projected grade and academic history. The instructor is also evaluated on presentation of course content, teaching performance and effectiveness. This student input is valuable in the faculty evaluation process, course feedback, and evaluation of the curriculum.

Only a few transfer students enter the mathematics program at UAM, and most of those students have had few courses above the general education core. The transcripts of transfer students are evaluated and proper placement is made within the program. Transfer students are typically interested in engineering majors and UAM mathematics courses transfer well into state and regional engineering programs.

The School of Mathematics and Natural Science does not conduct annual alumni and employer surveys. In a list of graduates from the last ten years (Appendix G), UAM mathematics graduates are represented in almost every school district in Southeast Arkansas. Anecdotal evidence indicates that UAM mathematics graduates have achieved a high level of job placement.

The entire State of Arkansas is in need of graduates in mathematics. In addition, several high technology industries require graduates from STEM (science, technology, engineering, mathematics) areas to fill professional positions. UAM graduates in mathematics typically enter the M.A.T. (Master of Arts in Teaching) program to teach in Arkansas schools so they can stay within the state. However, several students are accepted into STEM graduate programs. The mathematics degree at UAM provides a broad background of core courses and electives to accommodate a career in teaching or graduate school in STEM areas.

Program Effectiveness

The major strength of the mathematics program is the commitment of its faculty. The faculty members engage in a wide range of activities to support student learning including tutoring, help sessions, and practice exams. Faculty members have written three workbooks for the Algebra sequence. Faculty work closely with public school teachers and are involved in curriculum development at the state and national levels. The mathematics faculty members are integrated into the natural science programs and are responsive to the course needs of students in other majors.

Areas in need of improvement include scholarly activity by the faculty. No faculty members are presently involved in research although several are involved in mathematics education projects. One reason for this lack of research is that staffing in the program needs improvement. Faculty members are heavily involved in large remedial courses that probably should be taught by instructors rather than professors which would lead to smaller classes enabling faculty to conduct research. Classroom technology also needs to be improved: existing technology is not equal to facilities found in most public schools. Information on alumni/ job/graduate school placement should be regularly collected by the School of Mathematics and

Natural Science in some type of annual survey. The biggest need, however, is a new facility. The mathematics faculty does understand that a new facility would take a considerably large amount of money, but at the same time the Science Center building continues to deteriorate.

Even with these needs, the mathematics program has made significant improvements over the past two years. Workbooks have been prepared for developmental and general education classes. On-line technology has been used for homework and assessments in several courses. New assessment vehicles have been developed for some classes. An important curriculum change is the creation of a new minor in Teaching and Learning in the School of Education that is a direct result of the needs of mathematics majors who are planning careers in mathematics education. Classroom technology has also improved, with all classrooms now equipped with digital projectors, document cameras and computers. The final three classrooms will soon be connected to the Internet and a wireless system for the building is expected soon. New computers were purchased for the Science Center computer lab, and the mathematics Tutoring Center was moved back to the Science Center to be closer to the mathematics faculty.

There have also been other improvements including better publicizing the program via the Internet and the School of Math and Science Newsletter. This publicity is part of an increased recruitment effort with the goal of increasing the number of mathematics majors at UAM. The mathematics faculty also plans to increase assessment efforts which have been identified as a weakness for the program.

Institutional Program Review Committee:

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