

Natural Sciences Program Review

External Review Report

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1. Program Goals, Objectives and Activities

The mission of UAM's School of Mathematical and Natural Sciences is to give students the opportunities they need to increase and broaden their understanding of science and math. The university offers a comprehensive curriculum guided by specific goals that provides students an appropriate level of education to prepare them for careers in the math and science fields. Upon graduation, students are prepared for careers in industry and teaching, graduate studies in science and math, and pre-professional programs. Courses are offered to support the general education program that provides the background for a baccalaureate or associate degree.

These aforementioned goals help guide the Natural Science program, whose main objective is to offer Bachelor of Science degrees with a major or minor in Natural Sciences. The Natural Science major is a totally embedded course of study that was initially designed to prepare graduate students for the appropriate Praxis exam so that upon completion of the MAT degree would have the tools needed to be an effective secondary science teacher. Core courses in the degree lead students to two options: a Life Science option or a Physical Science option. Students have maximum flexibility in seeking a secondary area of expertise because a minor is not required.

All UAM majors must pass eight hours of laboratory-associated science at the 1000 level or higher. The School of Math and Science offers courses that allow students to meet these requirements. Several courses in the Natural Science major are accepted as general education science courses.

It is evident that the Natural Science faculty has high expectations for their courses and for their students. They are willing to assist students as much as possible both in and out of the classroom. Some specific activities include:

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 this event. Current director is on the mathematics faculty.

ASGC: member of Arkansas Space Grant Consortium, funding by NASA (\$10,000 to 20,000 per year) to provide student stipends, and annual meeting for students to present results.

UAM Medical Science Club: students provide a social outlet and promote pre-professional studies; sponsors visits by recruiters of medical, pharmacy, and veterinary schools.

UAM tutoring center: primarily majors that enjoy helping students; prepares students with teaching skills prior to going into the MAT or graduate programs.

UAM Biology Club: sponsored by faculty members, this club consists of biology majors and minors whose goal is to promote biology; performs service activities (the most impressive being a fundraiser to sponsor a clean water project for a village in Kenya); annual biology club trip to locations of biological interest.

UAM-RPMS: Research Program for Minority Students is a STEM program which provides underrepresented minority students with stipends and support for research.

Undergraduate Research Opportunities: all tenure track faculty members conduct scientific research and work hard to involve students, many of whom go on to graduate and pre-professional programs.

UAM is a member of the Arkansas Academy of Science: students and faculty attend annual meetings and are encouraged to present scholarly work. Students that present are eligible to compete for awards.

AR-INBRE: Arkansas Idea Network for Biomedical Research and Education is funded by the NIH to provide support for biomedical research and education. These grants have provided faculty summer internships, money for instrumentation, and a \$190,000 renovation grant for the UAM Botanical Research Center and Herbarium and for the Turner Neal Museum of Natural History (I toured this facility and believe it is a terrific teaching tool for students at the college as well as K-12).

Demand for science teachers in southeastern Arkansas is critically high. UAM School of Education and the Dean of Math and Sciences are regularly solicited by school districts in the region for possible applicants. For those graduates that go on to enter MAT programs, the job placement rate is near 100%. The state of Arkansas has recognized a shortage of physicians and implemented the Rural Medical Practice Program. Graduates from the Natural Science program are in high demand by medical schools (22 of 24 med-school applicants have been accepted over the last 10 years from biology, chemistry, and natural sciences). The Aggregate Demand Index rates Arkansas as the state with the highest demand for pharmacists. Demand for AUM pre-pharmacy students is very high (33 of 34 applicants have been accepted over the last 10 years).

The department uses several means of student assessment and program assessment. First, students are evaluated by their performance on exams, projects, presentations, homework, etc. Second, General Chemistry, Organic Chemistry, and Biochemistry use the American Chemical Society standardized final exam. Students at UAM that have taken the ACS exam have in most years achieved an average score at or above the national average for this exam. Third, junior and senior students may take some sort of standardized exam (MCAT pre-medical, PCAT pre-pharmacy, DAT pre-dental, GRE, etc.). Recent performance of students entering these programs is commendable (see Table 10, page 30). In addition, students in Natural Science are encouraged to take Chemistry Advanced Lab Techniques (Physical Science Option) or Biology Seminar (Life Science Option) both of which require library research and writing of a professionally formatted paper, with an oral presentation at the end of the term. In addition, assessment comes from placement of the graduates. Most graduates are successful in finding jobs or entering graduate and professional programs. Final assessment comes from the annual assessment reporting process. This is completed by the faculty on the basis of student learning outcomes and how they relate to the UAM mission (report submitted annually to Provost).

Additionally, the Dean of the School of Mathematics and Natural Sciences invites graduating seniors to an exit interview. Many, but not all, choose to visit with the Dean. Exit question responses provide student feedback that can be used to assist in the assessment process.

2. Program Curriculum

The Natural Sciences department provides courses that support their majors and minors. The Biology, Chemistry, Earth Science, and Physics faculty continually review their curriculum with the goal of best meeting the needs of their majors, minors, pre-professional students, and Natural Science majors. The curriculum is broad-based and provides an excellent platform for students to enter pre-professional programs, graduate school, or the workforce.

Per state of Arkansas law, UAM provides a curriculum that allows students to fulfill degree requirements in Natural Science with either a Life Science Option or Physical Science Option in four academic years. There are sufficient class offerings for the biology, chemistry, earth science, and physics departments (see tables 3a-3d page 10-11). Students are advised to take a Biology lecture and lab or Earth Science lecture or lab if they arrive on campus with a sufficient background in science and math. The faculty work through aggressive advising and enrollment in summer courses to help students that are deficient in one or more areas (i.e. remediation in math, low ACT scores, etc.) catch up.

Faculty are continually reviewing the curriculum. If changes are needed, then they are discussed with the faculty members and a proposal of changes is constructed. Faculty may also construct proposals for the assembly of new classes they wish to offer. There is a stringent review process by the faculty, Academic council, and Curriculum and Standards Committee before it is brought to the Faculty Assembly for a vote. If approved by the Faculty Assembly, then it is sent to the Chancellor, the Board of Trustees, and then the Arkansas Department of Higher Education. If the proposal passes all of the approvals, then it is sent to the Registrar's Office to be added to the official catalog. If it fails to meet approval, then it can be returned for review and revision.

Advising for declared Natural Science majors is a priority for the faculty, ensuring proper course sequencing and discussions regarding post-graduation options.

3. Academic Support

The department heavily supports a campus-wide initiative to promote retention and graduation. The initiative involves:

E-mentoring – goal is to teach students fundamental computer skills

First Four Weeks Program – goal is to get students engaged and interested within the first four weeks so they are better equipped to be successful.

First-Year Experience Program – goal is to improve student success by improving their study skills.

Student Services – goal is to increase effectiveness of student service programs

Remediation – goal is to work with students to get them caught up by revising schedules and course loads.

Other areas of academic support includes the large emphasis placed on academic advising, free tutoring is available at the tutoring lab, and faculty members work with graduating seniors on placement into a job in their field, graduate school, or pre-professional program.

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.

4. Program Faculty

The Natural Sciences department has 18 faculty distributed as 2 instructors, 5 associate professors, and 2 full professors in Biology; as 2 instructors, 1 assistant professor, 2 associate professors, and 1 professor/dean in Chemistry; 1 instructor in Earth Science; and 2 assistant professors in Physics. I believe the department is in the process of hiring another Assistant Professor in Biology.

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. A reduction in workload or credit hours for those instructors that involve students in research needs to be considered.

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. The evaluation process appears to be adequate and appropriate.

5. Program Resources

The University provides adequate technical support, and provides assistance to faculty as needed. The Dean has been supportive of Natural Science department initiatives and the faculty praised the

Dean's support. 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 building is in significant need of repairs to correct roof leaks, ventilation, rusted and crumbling parts of the heating units, and some of the outdoor cement stairs. My main concern is that students and faculty are in a potentially unsafe environment, and the present condition could be considered a serious liability risk to the University. There was little if any place for students to relax and study between class periods. I saw very nice architectural plans for a new Science Center, and the Chancellor has said that this will be the next facility built when funds are available. This should be sooner rather than later because, due to inflation, the \$25 million dollar anticipated price tag will continue to increase with each passing year.

The University encourages faculty to teach in areas of special interest, and develop special topics courses. Although UAM is primarily a teaching institution, faculty are encouraged to conduct research, and are provided funds for professional development. Although the budget is limited, the Dean does a great job (per faculty response) making sure that faculty have the resources they need in the classroom as well as support for research, meetings, and other areas of faculty development. The administration has provided generous support (matching grants and fund-raising) for equipment (Infrared Spectrometer, a workstation for molecular modeling, centrifuge with rotors, etc.) and construction of a new Plant Research and Herbarium Facility. The School of Mathematics and Natural Sciences receives library funds to purchase books, e-books, journals, e-journals, and databases. Faculty are given free library loan requests.

6. Program Effectiveness

The Natural Science department has an experienced, caring, and devoted faculty who recognize the mission of the university and strive to accomplish its goals. I witnessed first-hand the level of interest that faculty members took in the students. This included calling students by name, talking to them in the hall about how classes were going, congratulating students on test scores, just to name a few examples. I recognized these same qualities in the dean. He had pride in his department and is committed to the success of the faculty and students. In fact, students applying to pre-professional programs are allowed to write their name on a dry-erase board that is hanging in the dean's office. Upon acceptance into a pre-professional program, the student is allowed to cross his/her name off the list, and (per the dean) this is something the students take great pride in. It's these little things that can add major strength to a department. Another major strength of the program is the flexibility of the degree requirements, which serves the needs of science students seeking teaching certification as well as the many allied health programs. Even though UAM is an open-admissions university, math and science majors had an average ACT score above the general education population. The faculty and university can be very proud at the level of achievement of their graduates (Appendix G page 502). In fact, the "points of pride" shows the level of success of students at UAM, and could not be accomplished without the commitment of the administration, dean, faculty, and students.

The department has reported areas in need of improvement. Individual science programs need to improve equipment holdings, but an annual budget of \$10,000 is not adequate, especially given the fact that the money is split between Math, Physics, Geology, Biology, and Chemistry. As previously mentioned, the building is a hazard (leaking roof, breaking cement steps, mold,

security issues, etc.). I recognize there are plans for a new building, but in the meantime, students, faculty and staff are at risk. It is my strong opinion that this needs to be addressed given that it may be nearly 5-10 years (per speaking with administration and faculty) before the new Science Center is complete. Enrollment has grown, but the faculty has not. This has led to larger class sizes which diminishes the quality of education, and makes conducting research much more difficult. Faculty and lab instructor salaries, in addition to lab workloads, were noted as a drag on morale of the department. Many students in the sciences need research experience, but faculty is not given credit for one-on-one training with students. The upper administration needs to address these concerns, otherwise they risk losing faculty and students to other universities.

7. Instruction by Distance Technology

The School of Math and Natural Sciences has purposely avoided offering science courses using on-line or CIV. The department feels that face-to-face instruction (especially those involving labs) is far superior. Meteorology and Meteorology lab is considered a hybrid course because it is taught on-line but requires face to face testing.

8. Program Research and Service

UAM is primarily a teaching institution, but faculty are encouraged and supported in their research endeavors. UAM has a Research Program for Minority Students which provides underrepresented minority students with stipends and support for research. All tenure track faculty members conduct scientific research and work hard to involve students, many of whom go on to graduate and pre-professional programs. Students and faculty attend annual meetings (such as the Arkansas Academy of Sciences) and are encouraged to present scholarly work. Students that present are eligible to compete for awards.

9. Local Review Comments

The curriculum is broad-based and provides an excellent platform for students to enter pre-professional programs, graduate school, or the workforce. Demand for science teachers in southeastern Arkansas is critically high. UAM School of Education and the Dean of Math and Sciences are regularly solicited by school districts in the region for possible applicants. For those graduates that go on to enter MAT programs, the job placement rate is near 100%. The state of Arkansas has recognized a shortage of physicians and implemented the Rural Medical Practice Program. Graduates from the Natural Science program are in high demand by medical schools. Demand for AUM pre-pharmacy students is very high (33 of 34 applicants have been accepted over the last 10 years). Graduates from the Natural Science program are in high demand by medical schools (22 of 24 med-school applicants have been accepted over the last 10 years from biology, chemistry, and natural sciences). The Aggregate Demand Index rates Arkansas as the state with the highest demand for pharmacists. Demand for AUM pre-pharmacy students is very high (33 of 34 applicants have been accepted over the last 10 years).

Also, see sections 1,2,3, and 6 for more details.

10. Summary

The UAM Natural Sciences department is strong. The department faculty is doing a fine job meeting the needs of students and accomplishing the goals of UAM. The “points of pride” is a testament to the hard work of the Dean and faculty; and I commend the administration in the support of this endeavor. It is clear that the Dean has a good working relationship with the faculty, and strives to maintain a strong department. It is also clear that the faculty appreciates the hard work of the Dean.

There are areas that certainly need improving (see section 5 and 6). The administration should address these concerns as soon as possible. The forecasted \$25 million price tag for the new Science Center building will continue to increase due to inflation with each passing year, and will in turn make raising the funds more problematic. Additionally, there are faculty doing some exciting research, and they need to be supported in these endeavors (especially research activities involving students). The administration should strongly consider reducing the heavy teaching load for those faculty that utilize students in research programs. Students applying to graduate and pre-professional programs need research experience, and there is currently little incentive for faculty to conduct research that involves students.

The dedication and commitment of the faculty is one of the best I have witnessed. The stress placed on aggressive advising, retention of students, and placement of graduates is to be commended. The faculty should continue to monitor the curriculum on a regular basis and maintain the high standards that align with various post-graduate and pre-professional programs.