

Fitchburg State University Environmental and Earth Science Program
External Program Review Evaluative Report

Dr. Brad Hubeny, Professor and Chair, Geological Sciences, Salem State University
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On Friday, October 16, 2020, Dr. Brad Hubeny (Professor and Chair, Geological Sciences, Salem State University) visited Fitchburg State University as part of the Environmental and Earth Science program review. The visit was coordinated with Dr. William Hansen's visit associated with the department's Geographic Science and Technology program review. My visit was very informative, both in terms of the Environmental and Earth Science Program specifically, and the department and university broadly. I appreciate the time and energy of everyone who met with us, and particularly thank Dr. Elizabeth Gordon for the work she did during and in preparation for our visit. Here I offer observations and recommendations based on my review of the program's self-study and my campus visit.

The Earth and Geographic Sciences Department offers three majors: Environmental and Earth Science (EES), Environmental Public Health (EPH), and Geographic Science and Technology (GST). In addition, four minors are available: Earth Science, Geographic Information Systems, Geographic Science and Technology, and GIS Crime Mapping and Analysis. This report documents my evaluation of the EES program; however, the other two majors and the four minors are interwoven and therefore some thoughts will cross lines into these other programs.

The EES program has a strong curriculum and faculty and is currently in a state of growth. Students are trained to be Earth system scientists who are prepared to bring critical scientific thinking skills to current and emerging regional and global environmental challenges. The future promises to require individuals with these skills and passions so that society can overcome a variety of environmental issues. I believe that the program is doing great things, and I believe that a few investments can lead to large growth. Specifically, I suggest the following four actionable items, followed by specific observations and thoughts on a number of aspects of the program:

1. I believe that the program and department will benefit greatly from a marketing investment, both internally and externally. A first step might be to consolidate the vision, mission and objectives to form a clear and concise self-identity that can be used to more efficiently promote itself. Then with help from the marketing department to efficiently get the word out to the community about the program.
2. The geospatial component of the EES program is a strong feature of FSU's program as compared to other similar programs in the region. The geospatial resources, especially with the GST and new EPH programs, are stretched thin in terms of personnel (one faculty member). I believe that the investment in a new faculty line that can support the EPH and geospatial needs of the department is warranted. A health geographer, perhaps, can help to support all three programs in the department, and allow for further expansion of the programs.

3. I applaud the interdisciplinary connections that the department clearly values as evidenced by the new EPH program. I encourage the department to consider new cross-campus interdisciplinary partnerships for new programs, perhaps with Computer Science of Engineering Technology Departments.
4. The facilities, labs, and teaching spaces are very modern and pleasing with the new science center. In order to maximize these spaces, I think that it would be beneficial to explore avenues for investment in modern environmental and/or water chemistry lab and field equipment. A combination of external grant funds with internal investment from the university can lead to a creative partnership that will open up numerous opportunities for students, faculty, and the community.

Curriculum

The required curriculum for the EES major includes nine required courses in physical and geospatial topics, three elective courses focused on environmental interactions and applications, and seven support courses from cognate disciplines. The progression of courses is clearly articulated to students within the structure of a suggested four-year plan. The content knowledge and skills associated with the nine course courses is routed in best-principles for the geosciences. The major elective courses are a nice blend of topics that can help to tailor to a given student's career interests, and the cognate support courses are critical for a BS degree in order to train a well-rounded scientist.

Two specific strengths are apparent in the EEG curriculum and I think that these items help to booster the program and make it distinct in the region. First, the EEG skills courses provide a very strong geospatial technology component, which is not always common in geoscience programs, but that this department is well equipped for. The development of such skills provides alumni of the program a clear advantage in the job sector as well as post-graduate education opportunities. Second, the program has a strong field component built into its courses and research opportunities. When I spoke with current students, they were clearly passionate of these experiences and were interested in maintaining, and perhaps even increasing, such learning opportunities. Students really appreciated project based real world experiences, and they highlighted the summer research program that some of them were involved in.

Based on the clear student passion for field work and project-based learning I think that the department may consider developing a field-based course that can help with recruitment to the major and provide critical student training. Such a course can be developed at an introductory level and attract students to the major through an initial exposure. An alternative plan is to use a field-based course as a capstone that is advertised widely and that students look forward to taking due to its novelty, professional experience, and excitement. Some examples that come to mind are field camps out west, mapping in upstate NY or Maine, Coastal Geomorphology with trip to Cape Cod, fluvial geomorphology/environmental chemistry using a river's watershed as the lab, etc.

From my experience I am accustomed to laboratory periods that are either 2 or 3 hours per week and was interested in the fact that the EES labs are typically 1.25 hours long.

Although easier for scheduling, this length of time may limit specific high-impact laboratory activities such as field work, longer experimental labs, etc. I recognize that there are pros and cons to longer labs, and I encourage the faculty to investigate this option for some or all of their lab sections. I think that this may provide new opportunities for student experiences, recruiting efforts, training, and field work.

The department provides a clear 4-year plan to progress through the curriculum, which is an excellent resource for students and advisors. This four-year plan, however, may seem intimidating to a transfer student or student considering declaring the major after her first year. I recommend considering the development of non-traditional curriculum matrices that can complement the current plan and be more appropriate for transfer students, both internal and external, who may want to progress through the program in 3 or even 2 years. This effort may also include articulation agreements with local community colleges for students who earn an Associate Degree and then look to get a BS in 2 years.

Programmatic Considerations

The department made a number of curricular and programmatic changes since the last review. The largest of which is a new major that bridges nursing with the Earth and Geographic Sciences Departments: Environmental Public Health. This is an exciting new major that benefits from cross-departmental collaboration and I imagine that this major will do quite well as it rolls out over the next few years.

I believe that further cross-campus collaborative efforts have the potential to provide novel student opportunities with double majors or combined majors, and ultimately increase enrollment to the university. The geospatial side of the program has a clear potential to partner GIS studies with the Computer Sciences or Business programs. Other potential partnerships might be found in Environmental Chemistry or the Engineering Technology programs.

In addition to the standard major and minor structure, certificate programs have gained in popularity across the nation. Such programs can serve both current students in other majors as well as new outside students who are interesting in gaining critical skills as non-matriculating students. A GIS certificate may be the clearest option with the most potential for growth. Other thoughts include certificates in environmental sampling, wetland delineation, etc.

The department may also consider programs that can capitalize on the Physics expertise in the department. For instance, a combined interdisciplinary major or minor that focuses on Physical Science, or partners with Engineering Technology may attract a new population of students. Perhaps gateway courses to such programs could be a first-year seminar or team-taught courses such as geophysics.

Scholarship

The faculty of the Earth and Geographic Sciences Department are impressive scholars who are active in scholarship while maintaining the heavy teaching load of the MA State

University system. Faculty clearly value the positive impact that scholarship has on their teaching, and such a belief clearly improves teaching and provides professional caliber research opportunities for students.

As part of their scholarship pursuits EES faculty have had success with external grant support as well as planning for international study abroad trips. As I met with faculty, we discussed that these efforts would be more fruitful with additional university support, such as a more robust grants office, course releases, and financial support for travel scouting trips and proposal support. I think that clear transparency from the administrations with regard to the granting of Alternate Professional Responsibility (APR) release time will help with morale in this realm.

Facilities and Equipment

The Antonucci Science Complex is an impressive facility that provides modern laboratory and teaching spaces, research labs, and office space. This facility is a showpiece of the university and program and should be highlighted widely for recruiting purposes. In addition to the traditional lab spaces, the complex has an outstanding modern computer lab for GIS and other computing needs. Such a lab space is critical for the geospatial component of the programs within the department. I was also impressed by the Physics labs and lab equipment for teaching. The faculty understand that collaborations with other universities can increase the analytical capabilities for their students and such arrangements are maintained by EEG faculty.

A logical next step in terms of facilities at FSU is to further build up appropriate EEG analytical equipment in the lab spaces to give students experience and training with modern equipment. I encourage the department to prioritize a piece of analytical equipment and associated field sampling gear, perhaps slanted toward environmental chemistry, that can be an end goal. Between university funds, donations, and perhaps equipment funds from NSF or the equivalent it should be possible to acquire a modern piece of analytical equipment that can train students for environmental employment, enable faculty and student research opportunities, open outreach and community partnerships, and potentially serve as a revenue generator for the department and university.

Faculty mentioned a desire to acquire a drone for geospatial applications. I think that this is a high impact, low risk acquisition that can give students a modern edge with current technology. It will also produce excellent PR through demonstrations, outreach, and resulting imagery of the campus and community. A drone will be applicable to geospatial applications as well as many geology and geomorphology studies.

Finally, there appears to be a very productive and good working relationship between the library and department. Of note were LibGuides embedded in Blackboard, controlled digital lending, and information literacy support and initiatives at various levels of the curriculum.

Staffing

The Earth and Geographic Sciences Department currently has six full-time faculty, a shared administrative assistant, and a shared laboratory technician who I understand primarily assists with setting up Physics labs. With the addition of adjunct instructors, the department currently meets its staffing needs. It is apparent, however, that the growing burden of the GIS component of the department is becoming more than one faculty member should be able to handle. Especially with projected growth in EEG, the emerging EPH program, potential certificate programs, and likely new collaborative efforts across campus, it will be prudent to spread the workload. I believe that the best option for this will be to hire a new tenure track faculty member who is a Health Geographer. Such a member can take a leading role in the EPH program to ensure its success and serve as a second GIS faculty member. An additional thought is to hire a laboratory technician with expertise in computer networks and geospatial technology to take the lead role in GIS and other software logistics. Such a position would reduce the burden on the faculty who currently maintain this ever evolving and complex role. In addition, a new laboratory technician can assist with EEG field work and faculty research, helping to enable more externally funded research grants.

Community

During my visit was clear that the Earth and Geographic Sciences Department consists of an excellent, vibrant, and supporting community. In the faculty meeting and throughout the day it was clear that colleagues are supportive of each other and are all passionate about the department, program, and their students. I thoroughly enjoyed meeting with four students, each of whom glowed as they talked about the program, their professors, and the opportunities that they have had.

I think that this department's community is unusually strong and invigorating. It would be excellent to promote and expand the community in various ways. One approach that the department may consider is a departmental newsletter, perhaps digital, that is published 2-3 times per semester. Such a publication can highlight activities and events. Each issue can highlight a brief piece written by a student and another by a faculty member addressing a current research project, teaching strategy, or professional development opportunity. The newsletter can be sent to alumni, current students, prospective students, high schools, and community colleges; it can also be distributed around campus and shared with local newspapers and reporters.

Program Growth

The EEG program is a strong program that is ripe for growth. They offer a modern and relevant curriculum that prepares students for a wide range of career and life opportunities after graduation. Since the last program review there is evidence for growth and serious potential for continued growth. In past 5 years the EEG program increased from 24 to 47 total majors as well as 21 minors spread fairly evenly across the three established minor offerings.

The department recognizes that continued efforts are needed to further grow the program and department. I believe that the issue is primarily a marketing one since the program is strong and the students in it are doing well. Such marketing should continue within FSU to recruit new majors. For instance, I understand that the new general education model provides opportunities for new and creative ways to recruit students from a variety of categories such as procedural and logical thinking, scientific inquiry, history, first year seminars, and perhaps others. In addition, a concerted effort is needed to promote the program externally. Such efforts can be associated with items discussed in previous sections of this report (department newsletter, interdisciplinary programs) as well as other recruiting strategies.

The self-study proposes an idea of current majors conducting outreach to their alma mater high schools, which I think is a very good idea. In fact, one current student told me that he had no idea what this department did while in high school and wishes to share his knowledge and passion with his high school to try to recruit new students. Another path that may bear fruit is to work with local community colleges to produce articulation agreements that will not only make a transfer to FSU easier, but can also act as a recruiting tool in its own right as students see new opportunities that are within their reach. In all of these efforts the department should not forget its current diversity and to promote that. Many underrepresented students may not know that the geosciences provide excellent opportunities, and to see others in the field can be very beneficial.