

External Review for the Department of Geo/Physical Sciences

By

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INTRODUCTION:

The following is a report stemming from my review of documents and my visit to the Department of Geo/Physical Sciences at Fitchburg State University on April 24th 2015. During the visit, I met with academic leadership and with members of the department. I would like to thank everyone involved for their hospitality during my visit.

The department of Geo/Physical Sciences at FSU has faculty who are good people that care deeply about their mission and about each other. They relish their roles as teachers and mentors and their students seem to flourish under their guidance. Unfortunately, that is only part of the story. What I also have observed is a department that desperately needs a change in outlook and philosophy. They need to recognize that they live in a competitive world and that they need to compete. It is a department that needs to become more aggressive, more creative and more entrepreneurial. It is also one that needs to develop a more realistic vision of its situation. As a colleague in the discipline, I share the department's concerns for its programs and its curriculum. As an administrator, and in the absence of significant changes, I see storm clouds on the horizon.

Thankfully none of this is insurmountable. I hope that this review will help the department to find the solutions that it needs to move forward. With a change in approach and with the development of a strong identity, the department can build on its strengths and overcome its weaknesses. In doing so, it will be able to satisfy all of its stakeholders and may eventually be able to create a strong case for additional resources. Some specific issues and recommendations follow.

SECTION 1: A PLAN FOR THE FUTURE

The department needs to develop a realistic plan for its future. In doing so, it needs to break away from the planning of the past. That planning has lacked detail, concrete objectives, and a realistic view of the department's situation. A prime example of this comes straight from the 'Vision and Plans' statements in their departmental overview (Self Study pages 8-9). The department hopes for another geography hire, but does not have a plan for the specialization. There is no statement of plan for Earth Systems Science. The plan for physics requires the hiring of another physicist, even though there is no plan for the development of enough majors to merit the hire. There is a list of new courses in the plan, in spite of the fact that there are too few students to fill them. There is a plan to generate more majors by sending out letters and information packets to schools when the real market for new majors is sitting in their general education courses. The department hopes that a name change will bring greater understanding of its offerings, something that did not occur with the last name change.

- Recommendation: The department needs to develop a detailed and goal-focused plan for its future. The plan should include a detailed analysis of its current situation, a statement of goals, a series of measurable objectives, and a methodology for achieving each of the goals and objectives. An outside review can provide hints at how this can be done and why it is needed, but the hard work has to be done in house. Where possible, this should be accomplished with

the support of an outside facilitator. The facilitator should know the realities of the institution. He or she should also be willing and able to stop and redirect the discussions if they should begin to shift from planning to wishful thinking. This would benefit from administrative support in identifying a suitable facilitator on-campus or in covering the cost if a facilitator from off-campus is needed.

SECTION 2: MORE MAJORS

The department absolutely has to do something about its unsustainably small number of majors.

Any plan for the future of the department must include mechanisms for increasing the number of majors. From an outsider's perspective this department appears to be failing. That is what outsiders (taxpayers, external reviewers, or a new president) are going to see when they look at the numbers. On average the department has as many graduating students as full-time faculty. There have been years without any graduating students. The ratio of majors to full-time faculty is four to one. The small size of the department may create an 'intimate environment' and there is little doubt that it 'enhances student retention' (Self-Study page 45), but it may also make staff reductions through attrition an administrative necessity.

An argument could be made that large numbers of general education students balance the small numbers of majors. That argument is counter-productive and should be avoided in any long-term departmental planning. General education courses do not require full-time tenure track faculty. Large numbers of majors do. This is the reality of higher education today. A dean needs PhD full-time faculty to provide the disciplinary depth that majors require, not for general education. With retirements on the horizon, the department must increase its majors. If it does not, then the department will lose its tenure-track lines. The equation is simple. Put a hundred or so general education students in Condike's big lecture hall, pay an entertaining part-time lecturer \$5,000 per section to teach them the basics, and put the tenure track lines into growth majors.

The department also needs to recognize that none of its programs are essential to the university. The number of full-time faculty has grown over the years to its current size. From an administrative perspective, that growth came with expectations. It is hard to imagine that the current numbers of majors and graduates are what was expected. So the numbers of majors needs to grow in order to keep pace with those expectations.

Our disciplines suffer from really poor visibility. To most Americans, Geography is place-name trivia, Earth Science is rocks, and Physics is geek theory. It does us no good to lament those facts. It is like complaining about growing old. Overcoming this reality requires that we self-market. We need to tell our students, and through them to their parents, what our disciplines can do for them. They are spending four or more years and a LOT of money to study at our institutions in order to achieve something. We need to show them that their investments of time and money can pay off in our departments and programs.

- Recommendation: The department needs to develop an energetic marketing plan that is part of its overall development strategy. It should help potential students see all of the interesting stuff that your majors see. Use success stories and use data as part of this marketing. Figure out the skills you teach which are key to your students getting jobs upon graduation, and build upon them. Your programs have to be seen as desirable for what the students get out of them, not because we feel that our disciplines are inherently valuable. The plan has to be long-term and persistent. The message may need to be repeated many times and/or delivered in many different ways. It should be delivered to teachers, students, potential students, their parents, and really anyone who will listen. Deliver it via ALL of the following.
 - Connections to high school teachers offering relevant Advance Placement courses
 - AP Human Geography
 - AP Environmental Science
 - High School Teachers in Allied Fields
 - Develop contacts within local teaching organizations
 - Massachusetts Geographic Alliance
 - New England Chapter of the National Association of Geoscience Teachers
 - National Earth Science Teachers Association
 - Networking and Social Networking with;
 - High School Guidance Counselors
 - The on-campus advising community
 - Colleagues at the community colleges
 - Advertising so that everyone who steps into your classrooms or walks through your halls can see your successes and what your programs can do for them. Change those displays regularly so that the message remains dynamic.

ABOVE ALL, recognize that your future majors are the students who are sitting in your general education courses. They have selected Fitchburg. They have selected your classes out of lists of potential general education courses. All you have to do is to guide them to that next step. It does not need to be shameless advertising. Put your best teachers in those classrooms. Increase the cycling of those general education courses that produce the most majors. Down cycle the courses that do not. Work in-class examples so that students learn BOTH the material and the professional activities linked to that material. Help them to visualize how real people do the work and the interesting stuff that they encounter. And let the students feel the fun that comes with doing your work. This may not change the mind of the student who is taking your class because it fits their schedule. But it may serve to spark the interest of the handful of students who picked your classes because they looked more interesting than the rest. If you can do that with a couple of students in each class, then you will begin to generate the kinds of numbers that you need.

This has to be an all-hands-on-deck activity. This cannot be left to the department chair or to any one 'popular' professor. Unless personalities indicate otherwise, this marketing effort should involve the entire department. Other than serving your majors, this has to be THE priority of the department because it is the future of the department. If this is not part of the department's skill set, then find people who can help you to develop those skills.

Building your majors does not mean that you need to open the flood gates. That would be contrary to everything that you believe in. That said, if everyone was an active participant then high quality, personalized service could still be provided even if you tripled your majors (60-75 majors instead of the current 20-25). In doing so you could provide additional courses for your majors, more rigor to your program, teach the specialized courses that correspond to your research interests, and strengthen your core without constantly running into problems with minimum enrollment threshold.

SECTION 3: EDUCATIONAL INFRASTRUCTURE

Condike Science Building provides the department with a great work environment. The department has a wealth of up-to-date classrooms, work rooms, and office spaces. According to the self-study the spaces are not exactly what the department asked for and come with some limitations (page 46). The reality is that you are not going to find better. So while it may not be the perfect work space, perfect is an ideal that will never be met. It would be hard to imagine a better work environment for a department, especially one which survived so many years in sub-standard conditions. The newly renovated space could be a great asset for recruiting students, impressing their parents, and for attracting top-notch job candidates in future searches. As it stands now, the department's work spaces appear rather lifeless, a bit barren, and under-used. It just seems like the department is still grappling with what to do with their new-found resources. That is not at all surprising for a department that has just recently moved into its new space. Hopefully the department can make use of the coming summer break to develop creative ways to breathe some life and make better use of its existing spaces. A bit better signage might help as well.

Computing capabilities within the department are focused on one lab and individual faculty computers. Individual faculty computers appear to be adequate to the task. The computer lab appears to be well-stocked. Access to the computer lab is limited as the room is used extensively for classes. Students also hinted that there may be issues with such a computer lab operating on a remote server. In the future, it may be necessary to run the lab and other departmental work spaces off of a separate, dedicated, server. This would be consistent with the operations of GIS-based programs in larger departments.

- Recommendation-Include the building and the computer lab in departmental planning and in any marketing efforts. They are strengths that set you apart from your competitors.

What is missing is a computing work space for high-end student projects, and for collaborative faculty-student research. The hours involved in GIS projects makes for problems when computing time is interrupted for classroom use. The loss of time becomes even more acute when that work involves the extensive use of supporting materials. The set-up and clean-up time that is lost when the room needs to be vacated for classes (some of which do not even use the computers) further limits productivity.

The infrastructure is in place for a 'fix' to this problem. That would be the creation of a GIS workroom. Small working labs that are already set up with hardware hookups could easily be converted to a GIS work space with the addition of three or four computers. Those could be new computers or,

temporarily, computers moved from the existing computer classroom. Such a space would allow students to work on projects without the interruption. It would also have benefits to the faculty and the institution. A dedicated work space would allow faculty to employ students to do GIS-based consulting with outside agencies. This would create a source of departmental/faculty income. It could be used to generate jobs/internships for students. It would also be a credit to the university as it would increase outreach to the community. In addition, the creation of a space where students and faculty could conduct GIS-based research would also aid faculty in developing publication-quality works. As such, it would aid young faculty in achieving promotion and tenure.

- Recommendation-Develop a plan for the reallocation of a space for the development of a GIS work room.

The students did raise the issue of printing capabilities within the department—especially as it relates to GIS work. Admittedly there is a problem with high-end printers and plotters that are left unattended in a classroom setting. The availability of an on-campus printing center which provides for high-end printing and plotting does alleviate the need for such capabilities within the department. That said, a lower-end and local alternative for test prints and low-quality edit prints would be helpful. If placed within a limited access GIS work space, a basic color printer with 11x17 printing capabilities would be a valuable asset at a relatively low cost.

Software packages used in the labs are disciplinary standards. Exhibits in the building indicate that the students and faculty members are capable of delivering high-quality work with the existing computing infrastructure.

Library holdings appear to be suitable to the needs of the department. Electronic serials provide access to all of the major journals used in Geographic/Geoscience research. Inter-library loan is available to supplement the existing library resources. The department faculty and students appear to be satisfied with the availability of these resources.

SECTION 4: CURRICULUM

The department has a curriculum problem. It is a problem in the form of a causative loop that prevents it from growing. The department has program labels that students do not understand. Those labels do not accurately reflect the course curriculum. The curriculum also has unnecessary prerequisites that are red flags for any students who are not drawn to technology or to the lab sciences. All of these things serve to scare off the large numbers of students who are interested in softer, policy-oriented and socially responsible science. They are an electric fence to anyone interested in the social-science offerings that would be available in larger Geography programs. This keeps the number of majors unsustainably low. As a result, the department cannot offer enough non-core advanced-level courses that students would like to take as major electives.

So the curriculum scares off the vast majority of potential majors. The department struggles to offer courses that might attract more majors. It has a limited number of offerings that are suited to students not scared off by the curriculum. This reinforces the existing curriculum which scares off students and brings us back to the beginning. It is a causative loop that will not be changed by renaming the department or its programs.

- Recommendation-Any departmental planning MUST include curricular concerns. Curriculum is part of the problem, but it can also be part of the solution. The following sections outline issues that should be considered in any future curricular planning.

Earth System Science

The Earth Systems Science (ESS) curriculum has a core of non-Earth Systems course work that exceeds the disciplinary courses. The only disciplinary requirements are lower-level courses that provide a broad overview of the discipline. The advanced-level courses that should form the core of the program are relegated to the category of electives. This means that the few students who are in the program have no high-level focus. They are left to browse the offerings such that they inevitably have to take independent study offerings just to get through the program. Given that Fitchburg students come from the region and graduate to jobs within the region, it would make real sense to focus student attention on the advanced courses that correspond to the jobs that are available in your marketplace. The current program lacks such a focal point. As it stands now, students could potentially complete the major with only one 4000-level course. That is unlikely and inadvisable. That said, it is an eventuality that needs to be addressed.

What the current program does have are seven required non-GEOG courses that are not necessary to most of the advanced courses. There is a place for a higher level MATH prerequisite, but only in one or two of your advanced courses. Likewise, a BIOL or a CHEM requirement could be very useful in SOME of the advanced ESS courses. And while it is a departmental offering, the PHYS courses have little to offer outside their possible application in Geomorphology and or Structural Geology. Requiring all of those courses within the program is unnecessary and limiting.

At a very basic level the curriculum needs to be rebuilt around a theme or at least around a set of well-defined outcomes. That rebuilding should aim the students at a core of high-level (4000-level) courses that will prepare them for jobs within the region. That would drive the work of the students to higher levels. It would allow faculty the opportunity to teach their more advanced courses with less risk of them failing to make minimum enrollments. It would also prove the value of your program to potential students and skeptical parents.

Geography and GST

The Geographic Science & Technology (GST) curriculum suffers from many of the same problems identified in the ESS curriculum. It lacks an identity because, as with the ESS program, it is focused on a buffet of lower-level courses. The upper-level core consists of a handful of GIS courses. So that might

appear like a focus for the program. At the same time, the available electives offer little opportunity to build on that core. If GIS is the core, then the electives should support it. If it is not, then the program is mislabeled. If GIS is not the core, then CSC1500 should not be a program requirement. And even if GIS is the core, a Pre-Calculus requirement is out of step with most GIS programs at other institutions.

By far the biggest problem with the GST program is that it is completely reliant on a single faculty member. That is not good pedagogy and is basically a problem waiting to happen. This is not a condemnation of the individual faculty member, far from it. An individual professor cannot offer the range of courses necessary to run an entire program. Students will not be able to see the full breadth of a discipline through the eyes of a single faculty member. So their view is limited and the pedagogy compromised regardless of how good that faculty member might be. Right now the department has sufficient GIS expertise to run its new minor in GIS. It is woefully understaffed to do anything else in the broader field of Geography. The limited number of Geography offerings and the extensive list of courses that have only been cycled once in the last four years is testament to this problem. A program run by a single person is also just a slip on the ice or a juicy job offer from another institution away from disaster.

As with the ESS program, the Geography side of the curriculum needs to have a direction. The hope that another department will hire a geographer (Self-Study page 6) is not the answer. The department needs to decide what it wants to do with Geography-side of the equation and needs to hire based on that decision. The department can experiment with Geography offerings by hiring part-time faculty from Clark University. Clark has one of the highest profile PhD Geography programs in the U.S. It also specializes in those areas of Geography where Fitchburg has courses, but no faculty to teach them. In doing so, the department can see what applications might work well and which ones will not. That said, if the department does not commit faculty resources to Geography then it should drop any pretense of having a Geographic program (regardless of what you call it).

4c) Physics

The offerings in Physics face the same limitations at Fitchburg as they do at other regional state universities. PHYS courses are an option within the general education curriculum. This is quite normal and the selection of available PHYS courses seems appropriate to the task. Physics courses are also core requirements in some other programs. This is where things at Fitchburg differ somewhat from the norm. Seeing PHYS courses as requirements in industrial technology, engineering, and mathematics programs is not at all unusual. Seeing PHYS courses the way that they appear in Fitchburg's Biology and ESS curriculum is a bit more unusual. To be honest, I never got a good answer as to why PHYS courses are required in the Biology curriculum. That said, one look at the Biology curriculum will tell you that the PHYS requirement would be the first thing to go if they ever needed to make room for more required BIOL courses. Given the course descriptions of the PHYS courses in the ESS program, it also appears that the requirement is more of an acknowledgement of the PHYS faculty in the department than a meaningful inclusion in the ESS curriculum. Can PHYS be a valuable contributor to an ESS program? Absolutely it can. Geophysics course work could be a valuable inclusion in the program. PHYS faculty could also be valuable contributors to an advanced research methods course.

The department's physicists expressed all of the concerns that one would expect of faculty in their situation. An academic career teaching exclusively in the general education program, while valuable to the institution, is really tough on the faculty. Service offerings to other programs may benefit those programs, but force faculty to teach to programmatic needs elsewhere. Time spent in the development of advanced courses that fail to achieve sufficient enrollment is understandably demoralizing. In the Fitchburg context, there may be no ready-made solutions to these problems.

Although PHYS enrollments may be growing, that fact should not be misread. It is consistent with the requirement of PHYS courses in other high-growth majors. It does not reflect a change in the way students at regional state universities view the discipline. Efforts should be made to find opportunities where physicists can be active participants in higher level (ie. non-general education) offerings within existing programs. This would allow faculty to create markets for more challenging courses. Building up the advanced courses will admittedly be a long hill to climb. Otherwise, physics at Fitchburg will succumb to administrative realities. Faculty lines that are vacated by physics retirements could be moved elsewhere. The remaining 1000- and 2000-level physics courses will then be consolidated and covered by part-time/adjunct faculty. It may not be an appealing prospect, but that is the writing on the wall.

SECTION 5: OTHER CONCERNS

The following are a series of additional concerns that come from the review of documents and the department visit. While they may not be of extreme concern, they could be quite important in any future departmental planning.

Assessment

The assessment reporting is problematic. It is focused on a myriad of basic factual information that is acquired almost exclusively in lower-level course (Self-Study pages 104-105). When upper-level courses are included, they are often electives. Given that the lower-level courses are offered to non-majors and the upper level courses are not part of the core curriculum, what then are the expectations of graduating majors? The department does have an alumni survey, but the response rate is too low to make it valuable. The department also seemed to lack information on what courses generate majors and what things the students value most in the programming. The departmental report could also have been a bit less anecdotal more data driven.

Admittedly, there are very few people out there that enjoy assessment. There are even fewer who enjoy it when it is being forced on them by a university administration. That said, information gathered in assessment can be exceedingly valuable stuff. So even if the department has to co-opt the required university assessment program, they should take what they are forced to do and make it work to their benefit. They should also not be shy about asking tough questions just because the answers may not be easy to stomach.

Internships

Internships are valuable for students. They build connections to the community and to employers. The existing structure is a bit rigid, but workable. Finding the internship, a task that should be undertaken by the students, can be an important part of the learning process. Internships, as a measure of student readiness for the job market, can also be a great tool for assessment. Internships are also highly valued by parents who see them as career builders for their children. So make the internship program a strength of the department and a key piece of the marketing plan.

Faculty Research and Outreach

Research is identified as one of the strengths of the department. That is problematic given the statement that “research in the department is largely the work of the younger faculty (Self-Study page 46).” Research should be the bread and butter of all faculty members regardless of their location on the career continuum. Research contributes to teaching. It can be used as a mechanism for recruiting students and as a model in preparing students for careers in the discipline. Research built around outreach activities is a great mechanism for creating connections. Those connections can then be developed for classroom projects, internships, and for contributing to the university’s community engagement activities. Without research, national-level conference presentations, service involvement in the community or in discipline-specific organizations, it is very difficult to stay concurrent and relevant in any area of study.

Post-Graduation Status

In the department self-study, there is one paragraph that is extremely troublesome.

The department takes the view that we train our students in critical thinking, data analysis, problem solving and other aspects of the mental life and work habits of scientists. We do not pretend that our alumni will find employment explicitly in Earth Systems Science or Geographic Science & Technology. We do expect that the education our students achieve here will enable them to succeed in whatever careers emerge in the future. (Self-Study page 21)

The first sentence is basically the NEASC general education language for science instruction. The second sentence negates the value of the major in providing any specialized disciplinary employment for its students. The third sentence appears in one form or another in almost every university mission statement anywhere in the US. So what it says to the reader is that there is no value to the program other than as a piece of the university’s general education program.

CONCLUSION

The Geo/Physical Sciences Department at Fitchburg State University faces some significant challenges. Key to overcoming those challenges is to build a plan for the future. The plan should be one that defines the core philosophy and mission of the department. It should also define what that mission means in

generating majors and in building the curriculum. The department seems to be attracting some really bright and inquisitive students. The department should come to recognize what it is that attracted those students. In doing so, the department will learn valuable lessons from its students just as those students learn from their faculty.

While the department does face significant challenges, they do appear to have the two most important tools that are necessary to overcome those challenges. They care a great deal about the work that they are doing. They also care and trust in each other. Those will be invaluable as they move forward in their planning efforts.

In closing, I would like to thank the department and the administration of Fitchburg State University for their hospitality during my visit. And I hope that the material in this review provides some help as the department builds its future.