

Central Washington University
Department of Mathematics Program Review
External visitor's report

Rick Gillman, Valparaiso University
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I visited the CWU campus on May 12 and 13, 2011. While on campus I met with Provost Marilyn Devine, AVP Tracy Pellett, College of Sciences Dean Kirk Johnson and Associate Dean David Darda. I met with the chairs of the departments of Biology, Chemistry, Geology, Science Education, and Physics. Through a variety of group settings, I was able to meet most of the faculty in the mathematics department itself, including tenured, tenure-track, and non-tenure-track. I also met with two large groups of students, spanning all three of the undergraduate programs in the department.

I was given a tour not only of the departmental facilities, but of the whole campus by a very nice student named Cody. The weather was delightful and I enjoyed the visit as campus and area community reminded me of the good years that I spent at Idaho State University.

Curriculum

The department offers a BA in Mathematics Education, a BS in Mathematics, a BS in Actuarial Science, and a MAT in Mathematics Education. All of the programs are reasonably well enrolled, but all have significant capacity for additional students. While still very small, the BS in Mathematics has grown significantly in the last several years.

Strengths

The Mathematics Education program is an area of excellence in the department, and is apparently one of the largest such programs in the state. The curriculum is well aligned with the NCTM standards for teacher preparation and proposed changes to include more practicum experiences will strengthen this alignment. The Lynnwood transition to teaching program is of particular value and should be nurtured and expanded.

Similarly, the Actuarial Science program is of exceptionally high quality, and nearly able to apply for certification as the Pacific Northwest's only Center for Actuarial Excellence. It is only lacking enrollment numbers; to address this CWU might consider expanding the marketing effort for this program to a national audience.

The University Math Center appears to be a successful at its task at preparing students for the appropriate general education courses. Its use of strong undergraduates as instructors for select courses provides a model for providing in-house practicum experiences for pre-service teachers (mentioned above).

Challenges

While the department uses a wide range of technology in its teaching, it has not developed a systemic approach to doing so. What is the value of the required programming course? Are there alternative programming experiences (Mathematica, Excel, Minitab, etc.) that would be more appropriate for the students? When and how should these be introduced to the curriculum? Some faculty teach a variety of electronically supported courses. Are these serving the correct audiences? Are there other audiences that might be served in this fashion?

Similarly, while the department has an increasing involvement in undergraduate research activities, there is apparently no departmental plan for systematically incorporating this experience into the curriculum for all students.

The curriculum does not offer a formal plan of study that focuses on traditional applied mathematical topics. This may be an area of opportunity to partner closely with the other science departments, resulting in an increase in the number of majors. However, it would be a new programmatic area and may distract the department from focusing on its current areas of strength.

Some (small) staffing efficiencies may be possible by considering consolidation of the parallel sequences of courses offered for the BA and BS programs in mathematics. There are also many concerns over the high enrollments in the general education courses, which presents difficulties on many fronts. As the department is not satisfied with this situation, it may wish to consider alternative models of instruction. For example, which courses really do need to be offered in small discussion based sections and which might be offered in a significantly larger section, utilizing technological support and Supplemental Instruction support by undergraduates? Which courses require tenure-track faculty and which are well served by highly qualified lecturers?

More generally, the university suffers from having low quantitative expectations of its students. Many students can leave the remediation program without completing intermediate algebra, a level lower than the Washington State high school graduation requirements. This then suggests that the non-STEM general education courses are at the intermediate algebra level (high school) rather than at the beginning college level (at least post-intermediate algebra). Further, these low expectations seem to be wide spread: the Physics chair commented that pre-calculus is the first level college course; the Geology chair suggested that the general education statistics course doesn't sufficiently prepare students to do statistics; and the College of Business has no calculus or true finite math requirement.

Program Planning and Assessment

The department has a set of general objectives for the department as well as an extensive set of learning objectives for the majors. It should be commended for preparing these with such thoroughness. However, a number of concerns are apparent here. The departmental objectives have neither criterion for success attached to them or, more importantly, have no plan for achieving them. The student learning objectives seem to be presented in many different formats and raises the question

as to whether more time is being spent manipulating the forms than is being spent actually measuring and analyzing student performance.

Faculty

The faculty in the department are very amicable and seem to work well together. Their morale is surprisingly high given the persistent and repeated budget cuts. But this is a fragile situation and needs to be addressed before conditions get worse.

Strengths

All of the evidence indicates that the faculty are active scholars, collectively engaged in scholarship across the spectrum of areas described in Boyer's *Scholarship Revisited*. Several of the faculty are engaged in interdisciplinary projects and have collaborators in other disciplines. One example of this is the partnership that Professor Chen has had with the Department of Computer Science to create a student developed software product which has gained the attention of the wider actuarial science community. Another example is Professor Englund's partnership with biology faculty to study nutrition.

Of particular note is that the department is capable of, and successful at, obtaining external grant money. Continued successful pursuit of these resources through programs such as the NSF's TUES program and through K-12 outreach programs may provide resources to address non-staffing budget concerns in the department. To that end, the department may wish to become very intentional in the grant opportunities that it encourages faculty to pursue.

The faculty are active in the appropriate range of professional organizations including the MAA, NCTM, and the SOA. Several of the faculty have leadership roles in the MAA.

Based on conversations with their major students and the small amount of data presented in the self-study, the faculty appear to be conscientious, caring, and effective teachers.

Challenges

The primary challenges facing the faculty are the very real budget constraints and the perceived heavy workload in the form of large class sizes.

The budget constraints limit the faculty from participating fully in the scholarly community by limiting their travel and by limiting their ability to bring in colloquium speakers. Although this is partially eased by the use of electronic communications, the difficulty of having direct interactions with peers is a serious limiting constraint. The budget constraints also impact the department's ability to continue to offer quality programs. The department is unable to upgrade computing facilities, support co-curricular activities by students, or offer attractive facilities.

It may be possible for the department to leverage its resources in partnerships with other departments. For example, the department purchases the licenses for Mathematica in sufficient quantity and locations to also support the needs of the Department of Physics. Is it possible to find partners to

collaborate with in the reverse direction? In particular, might the department develop a closer partnership with the Department of Communication, with which it shares a building?

It is less clear whether the tenure-track faculty currently have an unreasonable teaching burden as measured by student credit hours taught. It is clear that the lecturer staff do, since they teach most of the first year general education sections that are very full. As these lecturers are replaced with tenure-track faculty, this will become a burden which the department will need to resolve.

The heavy dependency on lecturers (1/3 of the full time staff) has only developed over the past decade. While it is entirely appropriate to utilize several high quality non-tenure track lecturers, this high dependence is a significant risk to the department. In general, lecturers do not contribute to the current or future leadership of the department, do not participate in the service work of the department, contribute to curricular and pedagogical innovations less frequently than tenure-track faculty, and are less likely to be involved in entrepreneurial enterprises within the academy.

Students

As suggested above, I met with two large groups of students representing all three of the undergraduate programs in the department. Collectively, these students were articulate and very thoughtful in their comments about the department. Surprisingly, I discovered that the three groups had minimal interactions with each other.

The students were very positive about the instruction that they obtain in the department and the opportunities that the faculty provide for them. They noted that the faculty are generally, but not universally, available to them. They expressed concerns in two areas: (a) a desire for a more pro-active advising system, and (b) a desire to have a student common space.

On multiple occasions, administrators, faculty, and students mentioned concerns for and about transfer students. Everyone seemed to be genuinely interested in their success and in being able to help the complete programs in a timely fashion.

Library and Info Literacy

The students claim that they are aware of and utilize the information resources available to them on campus. They noted that most non-transfer students get an introduction to information resources through a course called University 101. Transfer student seem to accept that they are expected to bring this knowledge with them. The students' primary complaint was with the availability of the resources: software tools for mathematics seem to be in scattered locations that are frequently not available when students need them. Access to the wireless network is inconsistent across campus. The university's websites are uninformative.

Facilities

Although not part of specified components of this report, a discussion of the facilities available to the department is necessary. Having the department physically located across multiple building and

teaching in various places and conditions is clearly not optimal. The quality of the classrooms is very uneven. While there is talk of new building, funding and construction are far into the future and the space pressures are likely to increase before it is built. However, steps can be taken in the short and medium term to alleviate some issues. For example,

- Classrooms using arm-pad chairs can quickly be improved by replacing the chairs with tables and regular chairs.
- A classroom in Bouillon might be converted into a student common space. (The room with all the windows would be great for this as it increases the visibility of the mathematics program.) The loss of this classroom would need to be compensated for somehow; one idea might be to increase the number of evening sections of courses taught by the department; another idea might be to teach some course in large sections. This would also free up the space immediately outside the primary faculty office pod for faculty use.
- Grant money may be found to create an additional teaching/computer lab for the department.
- The university may be convinced to support a complete overhaul of the currently horrendous classrooms in Hertz: new furniture, appropriate technology and sound systems, student response systems, etc.

While these improvements have an immediate impact when they are implemented, they also provide the department with continuing experience at exploring, identifying, and implementing facility projects that will help them to move quickly on a capital project in the long-term future.

Future Directions (Recommendations)

There are suggested actions scattered among the commentary of the previous several pages. Generally, those are of a very specific nature relating to the topic at hand and are meant to be thought provoking. The recommendations offered here are more general and more intentional.

1. The department should work with the university to achieve long term stable leadership in the department at the chair's level. This is not a comment on Aaron's work as chair, but rather on the departmental culture of short-term chairmanships. The solutions to the issues facing the department will require a long time to implement and having a long term chair will facilitate keeping the department focuses on its vision and goals. In fact, most of the following recommendations will fail without long term planning and persistence in implementing the plan. (I am thinking of chairs who complete 2 four year terms as long term.)
2. The department should begin holding regular departmental meetings. While many mundane items can be completed at these meetings, their broader purpose is to develop a common vision of the direction that the department will go and the strategic steps that the department will use to move in that direction. The budget crisis will eventually pass; the department needs to be in the position of being the first unit on campus with a productive plan to capitalize on the new resources.
3. The department should develop a long term strategic plan that aligns with – and which is specifically keyed to - the university's strategic plan. How does the department plan to attract new students to campus? How does the department plan to strengthen the teaching and

learning on campus? How does the department plan to enhance the university's scholarly reputation? How does the department plan to be engaged with the larger public?

4. The department should work with the university administration to systematically increase the quantitative expectations of the institution and its faculty constituents.
5. The website is completely inadequate. The department should develop a plan for what content that it needs on the website; who is the audience? Then the department needs to work with IT to make the improvements and to maintain the improved website.
6. Both the mathematics education program and the actuarial science program are areas of strength. The department should work closely with the admissions staff to design and implement a plan to market these programs aggressively. Alternatively, the department may consider developing a new focus on applied mathematics to enable it to collaborate more closely with the other units within the College of Science.
7. The department should immediately develop a plan, including a timetable, for replacing lecturers with tenure- track faculty at a 3 for 2 ratio. As its part of this plan, the department should develop an argument as to how these new faculty members will address the goals of CWU's strategic plan as well as the goals of the department's own strategic plan. It is never sufficient to say "we need more faculty because we work hard and need more faculty."