Georgia Southwestern State University
School of Computing and Mathematics
Mathematics Department

Comprehensive Program Review
Bachelor of Science in Mathematics

(Report from the External Program Review Team)

March 2015
REPORT FROM THE EXTERNAL PROGRAM REVIEW TEAM

MATHEMATICS, GEORGIA SOUTHWESTERN STATE UNIVERSITY

Introduction

An external review team assembled on the campus of Georgia Southwestern State University on February 2-3, 2015 for the purpose of providing a review of the mathematics program as required by the University of Georgia Board of Governors. The names and contact information for the external review team members are appended to this brief report as Appendix I and their schedule as Appendix II.

The entire process was conducted as scheduled. A draft report was written and sent to all members of the team on March 23, 2015 for any final corrections or comments. Those responses were received and taken into consideration by the chairman on or before March 25, 2015; the final report was then sent to the Dean of the School of Computing and Mathematics, Dr. Boris Peltsverger.

The team wishes to acknowledge the cooperation, hospitality and candor of the Provost, Dean, Faculty and Students. They made our work both possible and pleasant.

Curriculum

An earlier internal review of the mathematics program, and its curriculum in particular, was completed and shared with the external team at its first meeting. During the entire two day period there was no indication from students or faculty that they were in any way dissatisfied with the curriculum per se. The only observation regarding the program for mathematics majors that was even close to being “critical” was the difficulty of scheduling required courses on a frequent basis. The small number of students majoring in mathematics, and the demands on the faculty to deliver service courses in mathematics to other departments, required that some courses in the regular curriculum were spaced at least two years apart. However, the students acknowledged that even though this may have caused some inconvenience, the university’s policy is that no student’s graduation would be delayed by the scheduling of required courses. In fact, in at least one case, a course was offered to a single student in order to allow that student to graduate on time.

The chairman reviewed the curriculum and concluded that it was a proper, complete and modern set of courses appropriate to a comprehensive undergraduate institution. There was no further analysis of the curriculum by the committee. In fact, as indicated below, the problem of low enrollments and marginal economics dominate the present review.

Enrollment

Enrollments are very low in terms of students majoring in mathematics. In fact, enrollments are down in most programs at GSW, except for business and nursing. The danger is that the mathematics department could become a “service unit” that would offer only basic required courses to students in
departments outside the School of Computing and Mathematics. These basic required courses are often populated by students who do not have even a rudimentary understanding of high school level mathematics. Although much of this discussion was based on anecdotal experiences, there was universal agreement that there are many students in the service courses who are severely deficient in their knowledge of basic mathematics.

**Faculty**

If the mathematics program as a major were to close, the full-time PhD level faculty would find themselves in a rather depressing environment, teaching students many of whom do not want to take courses in mathematics. Professors would no longer have the challenge and excitement of teaching students who love mathematics and wish to pursue careers related to mathematics. In turn, this would most likely lead to an exodus of the best qualified teachers.

The mathematics faculty is severely overworked, even though the ratio of faculty to full time mathematics majors is excellent. Again, this is due to a small number of faculty having to cover a large number of courses on a “service” basis.

**Economics**

The decision to continue to support the program in mathematics will, of course, be strongly influenced by economic realities. Apart from having only a handful of mathematics majors, Georgia Southwestern is “punished” by funding formulae and ratings that are geared toward institutions that almost exclusively serve traditional students – those who leave high school and attend college on a full time basis and graduate in four or five years.

**Graduation and retention rates**

GSW has many students who study part-time and who are going “back to school” during their mid-career or post-parenting years. Again, the statistics for graduation and retention rates favor schools that serve mostly traditional students. Part-time students stretch their time to graduation over at least twice as many years as four-year students. Also, many part-time students may skip a semester out of necessity, further aggravating the fair calculation of retention.

**Cultural influences**

The committee discussed at length the state of mathematics education in the United States making numerous observations regarding the attitude of parents, teachers, and thus of children regarding mathematics – “It is not useful,” “I will never need this,” “It is too difficult,” “It is just for smart kids.” Of course, as a committee we understand just the opposite to be true, but these attitudes have become engrained in our culture.

Because the faculty and the committee come from a wide-variety of “foreign” cultures, many of which have a reputation for generating excellent mathematicians, we discussed (without coming to a conclusion) how the multi-cultural nature of the faculty could be harnessed to affect an approach to
mathematics that would be stimulating and would over-ride the cultural norm that is pervasive in modern American culture.

The mathematics faculty made a distinction between students who were willing to put effort into learning the subject, vs those who would be satisfied to simply be told how to do it. One member of the faculty explained that in his native country you were praised for your effort rather than the assumption of intelligence: “You must have worked really hard,” is more motivating than being told, “You must be pretty smart.” The suggestion that mathematics is only for very intelligent persons, as opposed to motivated persons, does not serve the disciple well. The faculty appeared to agree that motivation, caring, and curiosity trump intelligence per se.

Early roots of the problem

The committee discussed and generally agreed that with the current shortage of well-trained mathematics teachers in our elementary, middle and high schools, many teachers are teaching mathematics “at the very edge of their understanding of the subject.” This is a formula for poor teaching and further undermines enthusiasm among students. Clearly there needs to be a strong alliance between mathematics education programs and the School of Computing and Mathematics if this trend is to be reversed in GSW’s catchment area.

Some issues related to methodology

It was suggested that one of the reasons mathematics education is weak in the United States is due to an over-reliance on multiple choice tests. They are easier to grade and are, arguably, more objective. However they require less of the student than having to tackle the problem without the aid of knowing the answer is right there in front of them. One of the arguments against multiple choice tests was the observation that each question was always answered either correctly or incorrectly, with no opportunity for partial credit. A method used at UCLA to give partial credit for multiple choice tests was explained by the chairman, and the faculty appeared to be quite interested. (The student can eliminate one or more answers as being incorrect, without necessarily selecting one correct answer.)

Another issue related to “methodology” concerned the time classes were scheduled. The argument was that better students (in the service courses) will be found in the 8:00 am sections than later in the day. Several persons were convinced this is true – it certainly could be researched for a definitive answer. It was not clear, however, how this information could be used to improve the program.

Proctor U

The problem of controlling cheating in on-line courses was discussed at length. For most of the topics listed above there was high convergence of opinion. However, with respect to Proctor U, feelings ran strongly both for and against. The biggest complaint by a student was logistical – long delays by Proctor U before a test could be started. Other students said they had experienced a little of that problem but that it was not severe.
At least one faculty member complained that he twice caught a student cheating and the GSW administration did not act strongly enough. There is a Judicial Committee, but apparently there is little oversight of whether or not the Committee’s recommendations are followed. For example, in a particular case the decision was made that a student could no longer take on-line courses, but after waiting a semester, the student successfully enrolled in such a course. In another case, a similar decision by the Committee was enforced by a faculty member who noted that the student was attempting to make a similar enrollment.

Marketing

The number one topic for the committee and for each of the groups and persons it interviewed was the urgent need to find creative ways to market the mathematics program and build enrollments. Visits to middle and high schools, greater participation in STORM, a professionally produced video that leads out with exciting applications (instead of mathematics by itself), and numerous other ideas were put on the table. However, the external review committee was not attempting to decide or recommend how this marketing should be done, but rather it was urging the university to expend resources in time and money to aggressively promote mathematics as a universally applicable subject that is intrinsically interesting and leads to many high paying careers.

The committee learned that there was a Math Club on campus that is led by one the students majoring in mathematics – a student who was also on the external review committee. He noted that the club is small and meets regularly for social activities and mathematical games. The review committee was interested to learn that the members of the club, apart from the organizer, were not mathematics majors, but rather represented several different disciplines in the GSW community. This discussion was held within the context of what can be done to make mathematics more interesting and appealing to students, such that the end result might be an increase in the number of mathematics majors.

Summary

It is quite apparent that the largest and most immediate challenge is the recruitment and retention of students who wish to major in mathematics. Almost everything else associated with the program is dependent upon finding a solution to that one significant problem. As one member of the external team noted, “It is unimaginable that a comprehensive university of this size would be without a mathematics program.” And yet, given the current level of enrollment and the trends, that is a painful possibility. We urge the administration and faculty to invest their most creative thinking and the necessary resources to transform a program that is rich in content and which presents great opportunities for students and make it into a program that is also economically viable.

Raymond G. Taylor

Professor Emeritus, North Carolina State University
Chair, 2015 External Review Committee, Mathematics, GSWSU
March 25, 2015
Appendix I

Department of Mathematics
Members of the Review Committee

External Reviewers:

- Dr. Raymond Taylor (Committee Chair)
  Professor Emeritus
  North Carolina Stat University
  Director, Big Data Analytics, State of Vermont

- Mr. Donnie Smith
  Superintendent of Sumter County Schools, Americus, Georgia
  Tel: 229-931-8500 or 229-931-8513
  Email: Donnie Smith [dsmith1115@gmail.com]; dsmith@sumterschools.org

  - (Unofficial visiting member)
  Dr. Peter Schiess, Professor Emeritus (Engineering)
  University of Washington, Seattle

Internal (GSW) Reviewers:

Faculty

- Dr. Alexander Yemelyanov (Department of Computing, School of Computing and Mathematics, Academic Affairs Committee)
  - Tel: (229) 931-2100 Ext. 2820
  - Email: alexander.yemelyanov@gsu.edu

- Professor Laurel Robinson (Department of Visual Arts)
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  - Alternate Phone: 229-931-2204
  - Email: laurel.robinson@gsu.edu

- Dr. Svilen Kostov (Geology and Physics))
  - Tel: (229) 931-2321
  - Email: svilen.kostov@gsu.edu

Alumni

- Mr. Donnie Smith (Mathematics Education, Alumnus)

Students

- Mrs. Jennifer Carranza  (MATH, Undergraduate Student)
  - jdillon@radar.gsw.edu

- Mr. Oliver Schiess (MATH, Undergraduate Student)
  - oschiess@radar.gsw.edu
Appendix II

Comprehensive Program Review (Mathematics)
External Review Team Schedule

**February 1, Sunday**
External Reviewer (Chair) arrives

**February 2, Monday**

9:30 a.m. to 10:30 a.m. Meeting of the External Review Team, Conference Room [All in attendance]

10:30 a.m. to 11:00 a.m. Meeting with the Dean and the Department Chair, Conference Room [All in attendance]

11:00 a.m. to 12:00 Noon. Meeting with the students, Conference Room [Four students in attendance]

12:00 noon to 1:00 p.m. Lunch

1:15 p.m. to 2:45 p.m. Meet with faculty, Conference Room, [Five faculty in attendance]

3:00 p.m. to 5:00 p.m. Work Session I, Conference Room [Attendance varied due to class obligations, adjourned early]]

**February 3, Tuesday**

9:00 a.m. to 10:30 a.m. Follow-up meeting with the students or the faculty representatives, Conference Room [No follow-up needed, committee met instead]

11:00 a.m. to noon. Presentation Big Data Analytics, Dr. Raymond Taylor, room CWH 104 [60 persons in attendance]

12:30 a.m. to 2:00 p.m. Working Lunch (Review Team members)
Preparations of recommendations for the exit interviews, Faculty Private Dining Room [All committee members in attendance]

2:15 a.m. to 2:45 p.m. Oral reports to the School faculty and Dean, Room 221

4:30 p.m. to 5:00 p.m. Oral exit report to the VPAA

5:00 p.m. Adjourn.
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(Department Response)

May 2015
Response to the CPR External Review Committee for Mathematics

The Mathematics Department is grateful to the External Review Committee for returning its report to GSW on March 25, 2015, for our comment. The report is insightful and comprehensive. The entire External Review Committee Report [ERC] is attached, and we summarize some of it here, in order to frame our response.

The ERC notes the following.

The curriculum is a proper, complete and modern set of courses appropriate to a comprehensive undergraduate program. The only observation that was even close to being “critical” was the difficulty of scheduling required courses on a frequent basis. However, the Department is willing to offer courses to even a single student, to allow for timely graduation.

The enrollment is very low in the mathematics major, but this is also the case in most GSW programs. For mathematics there is the danger that the department could become a “service” unit for other programs, and be constrained to teach only low-level courses. Should this happen, able faculty would leave GSW.

“The number one topic for the committee and for each of the groups and persons it interviewed was the urgent need to find creative ways to market the mathematics program and build enrollments. Visits to middle and high schools, greater participation in STORM, a professionally produced video that leads out with exciting applications (instead of mathematics by itself), and numerous other ideas were put on the table. However, the external review committee was not attempting to decide or recommend how this marketing should be done, but rather it was urging the university to expend resources in time and money to aggressively promote mathematics as a universally applicable subject that is intrinsically interesting and leads to many high paying careers.”

The ERC summarizes it findings as follows.

“It is quite apparent that the largest and most immediate challenge is the recruitment and retention of students who wish to major in mathematics. Almost everything else associated with the program is dependent upon finding a solution to that one significant problem. As one member of the external team noted, “It is unimaginable that a comprehensive university of this size would be without a mathematics program.” And yet, given the current level of enrollment and the trends, that is a painful possibility. We urge the administration and faculty to invest their most creative thinking and the necessary resources to transform a program that is rich in content and which presents great opportunities for students and make it into a program that is also economically viable.”
The Department Response

The Department agrees with the ERC’s findings and recommendations and now addresses the key issue: increasing mathematics enrollment. Here are our recommendations. These cannot all be implemented, for obvious reasons, either financial, manpower, or commitment of the University Administration to preserving Mathematics as a degree granting discipline. The Department fully realizes this, and comes to the Administration to discuss and select from among its recommendations, in exchange for its promise to support our program’s survival, and our promise to grow enrollment to a suitable level over a reasonable number of years, with levels to be set through discussion and negotiation.

Our Recommendations

The Department needs a professionally produced recruitment video “that stresses exciting applications of mathematics.” It should also be personalized to show our faculty interacting with students, our mentored research opportunities, and our “designer” courses. The video would be shown on our website, and GSW TV, and distributed to area high school guidance counselors.

The faculty seeks the opportunity for one of its members, or one of its student majors to join GSW’s professional recruiting team, so that the traveling team will have expertise in the discipline.

The faculty will visit area high schools and two-year colleges, and give talks about exciting applications of mathematics, report on great discoveries in math, and introduce students to the great Sloan Foundation STEM Careers site. Visits to two-year colleges will also focus on solving real problems, “The Mathematical Consultant Challenge…Can You Solve This?” Before such campus visits, the host school will provide GSW with a list of students with interest in math, and these will receive a “Can You Solve This?” problem, with an invitation to participate in an informal discussion on their campus.

Invite area high school students to attend our once monthly meeting of the GSW Math Club, where students, faculty and visitors will talk about their work, and their excitement about mathematics. High school students and high school faculty will also be encouraged to make presentations, and video clips will be posted in an archive on the GSW Math website.

The faculty will continue the Annual Math Tournaments for Middle Grades and High School Students, with a new wrinkle, the addition of a team “Mathematical Modeling Challenge,” with a focus on the solving a real problem, perhaps from OR, environmental issues, sustainable resources, et cetera.

The faculty will seek grants to support a summer program for talented mathematics students. There is a program already planned for this summer, for middle grades students.
The faculty will offer a grant supported summer program to encourage junior and senior females to learn about great careers available to them in math. See the attached grant proposal, “Ma’am, Is Math for You?”

Our goal is to increase enrollment to the University as well, so we offer two suggestions.

GSW should increase its program to recruit qualified faculty in local high schools to teach core mathematics on their campus (MATH 1101, MATH 1111, MATH 1113 and MATH 2204) for college credit.

The Mathematics faculty should submit our BOR approved “Graduate Certificate for Teachers of Mathematics in Two-Year Colleges and Technical Schools” for approval by the Graduate Council, so that it can be implemented, with cohort scheduling.