Georgia Southwestern State University

School of Computing and Mathematics

Mathematics Department

Comprehensive Program Review
Bachelor of Science in Mathematics

(Self-Study)

January 2015
Executive Summary

1. Conclusions about the Program’s Quality and Productivity

- Faculty within the department provides quality instruction and advisement.
- The Mathematics and Mathematics with Teacher Certification programs’ enrollment is shrinking even though the curriculum continues to build connections with applied mathematics and computer science.
- Students are active in the classroom as well as in providing tutorial services for the University community.
- Alumni have been successful in graduate schools (applied mathematics, mathematics education, financial engineering, and computer science).
- The Mathematics Department shares in the use of state-of-the-art computer systems and classrooms of the School of Computing and Mathematics.
- Faculty encourage mentored research projects in areas such as geometric topology, nonlinear partial differential equations, and elliptic curves with applications.
- Services – The department provides core courses for all disciplines, for the training of students in engineering transfer programs, for students in the BS in Mathematics program (including the options in financial engineering, computational science and engineering, and actuarial mathematics), for students in the BS in Mathematics with Teacher Certification program, for mathematical training of future early childhood and middle school teachers, and for graduate students enrolled in the MS in Middle Grades Mathematics. In addition it offers 18 credit hours of Board of Regents approved graduate mathematics courses to prepare teachers to teach Mathematics in two-year colleges and technical schools in Georgia.
- Small class sizes allow for more interaction between the students and the instructors.
- The growing job market in Computer Science, along with the emphasis on applied mathematics will help to increase enrollment in the Mathematics program.
- Faculty yearly offer “designer” courses in the MATH 4850 sequence to help both computer science and mathematics students become aware of the tremendous opportunities, which arise from “cross fertilization” between the two disciplines. Over the last three years, in particular, there have been 3 credit courses in elliptic curve cryptography, quantum computing, DNA and molecular computing, physical limits of IT, Big Data Analytics, Topics in Cryptography and Open Source Computer Algebra Systems, and currently, Disaster Modeling and Mitigation. Curiously, the MATH 4850 sequence grew from a first course, “Mathematics and Culture,” developed for the Fine Arts Department.
- Beacon Alert System helps the department monitor students’ academic success.
- Peer tutoring helps students who are struggling and also help to develop relationships among the students.
- ProctorU helps to eliminate academic dishonesty issues within online classes.
- The Mathematics Club and various computer science clubs and organizations offer students activities, which help them bond beyond the classroom. Clubs and Organizations offer activities and bonding students outside of the classroom.
2. List of Recommendations for Improving Program Quality

- Critical Thinking Skills Seminars/Contests should be organized each academic year for all mathematics and computer science majors.
- Mathematics majors need to be encouraged to seek minors in Computer Science, and to join both mathematics and computer science professional organizations open to undergraduates. In fact, the Mathematics Department needs to seek funding to underwrite at least one professional membership, e.g., AMS, MAA, SIAM for each of its successful juniors and seniors.
- Students/ Faculty Focus Group meetings should be included in the annual assessment process.
- All faculty need to make contributions to the mentored research program, which is vital for Mathematics majors.
- The department needs to use the alumni network for obtaining internships and exploring virtual internship opportunities.

3. List of Recommendations for Improving Program Productivity

- Together with the Academic Resource Center, the department needs to increase the availability and quality of tutoring.
- The existing three and four year plans of study should be discussed with advisees as possible targets.
- The advisors need to implement Beacon and DegreeWorks in their practices.
- Connections of advisors with freshmen should be developed from the first semester of students’ study at GSW.
- The department needs to increase the number of group social activities.
- The department should attract a range of students (from freshmen to seniors) for participation in Job Showcase events.
- The department should offer first-year seminars (development of logical thinking skills and career-oriented seminars).
- The department should experiment with new teaching and learning approaches in the high failure rate courses.
- The department should revive the two-year college agreements, and use these to promote its three options in applied mathematics (actuarial mathematics, financial engineering, computational science and engineering).
4. Conclusions about the Program’s Viability at GSW

- The department works with the local schools, which is one of the strategic goals of GSW. In particular, it collaborated with Computer Science to create and sustain a “Peer-Tutoring” program in local schools, starting with seed money from an AT&T grant.
- The faculty of Mathematics, with assistance from its students, and faculty of Computer Science, annually offers two mathematics tournaments for middle grades and high school students. These draw about 500 students onto campus each spring.
- The department provides service courses for hundreds of students each semester in the common core, for 3/2 engineering transfers, for training early childhood and middle grades teachers, and for its own bachelor degree programs.
- Mathematics is now collaborating with Computer Science to produce an MS in Big Data Analytics, and looks forward to other such collaborations, both in academics and in writing of joint grants.

5. Summary Recommendation

The mathematics program, with a focus on applied and computational mathematics has potential to grow, especially if it maintains a strong and fruitful relationship with Computer Science. With this caveat, the job market looks very favorable for Mathematics majors/Computer Science minors in the next 10 years [http://www.bls.gov/ooh/computer-and-information-technology/home.htm](http://www.bls.gov/ooh/computer-and-information-technology/home.htm). Growth will be driven by the very rapid progress in computer technology and its collaborative applications, which is projected to be the fastest expanding industry in the US economy. We recommend that this program be continued.
State of the Mathematics Department

Program Overview

The Mathematics (MATH) program at GSW had its beginning in 1962 when a GSW moved from two-year status, to a four year college under the University System of Georgia. The B.S. MATH degree was first offered two years later, with a separate B.S.Ed. in Mathematics Education.

The current program meets the needs of both the students who wish to pursue a career immediately upon graduation and those who plan for graduate studies in Mathematics, Applied Mathematics, Teacher Education, or Computer Science. The curriculum offers a good balance of computational skills and theoretical studies that are necessary for adapting to changing technology, and changing emphasis in the job market. The mission statement of mathematics is simple, and entirely congruent with that of the University Mission Statement:

The Mathematics faculty is dedicated to providing challenging core courses that support the University’s diverse academic programs, while at the same time offering outstanding degree programs in Mathematics and its applications.

<table>
<thead>
<tr>
<th>Program Learning Outcomes (PLO)</th>
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<tbody>
<tr>
<td>1. Majors will acquire analytical skills which guarantee</td>
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<tr>
<td>a. an understanding of the basic rules of logic,</td>
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<td>b. the ability to distinguish a coherent argument from a fallacious one, both in mathematical reasoning and in everyday life,</td>
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<tr>
<td>c. an understanding of the role of axioms and assumptions,</td>
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<td>d. the ability to abstract general principles from examples.</td>
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<td>2. Majors will become proficient the use of in problem solving and modeling skills, including</td>
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<tr>
<td>a. the ability to recognize which real-world problems are amenable to mathematical reasoning,</td>
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<td>b. the ability to make vague ideas precise by representing them in mathematical notation, when appropriate,</td>
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<tr>
<td>c. have a command of the techniques for solving problems expressed in mathematical notation.</td>
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<tr>
<td>3. Majors will have appropriate communication skills, in particular</td>
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<tr>
<td>a. the ability to formulate mathematical statements precisely,</td>
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<td>b. the ability to write a coherent proof,</td>
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<td>c. the ability to present a mathematical argument verbally,</td>
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4. Majors will acquire reading and research skills, which are based on
   a. sufficient experience in mathematical language and foundational material to allow them to be well prepared to extend mathematical knowledge through independent reading.
   b. exposure to, and successful experience in solving mathematical problems, which represent a substantial intellectual challenge.

5. Majors will have an appreciation for the culture of mathematics

These Program Learning Outcomes are in alignment with the University’s Mission Statement, which is listed below:

Georgia Southwestern State University cultivates excellence in learning and teaching that encourages intellectual, personal, and social growth for students, faculty, staff, and the community. Georgia Southwestern State University is a comprehensive state university within the University System of Georgia that offers a full range of bachelor degree programs, along with selected masters and specialist degree programs.

Approved by GSW Faculty April 30, 2010

**Highlights**

The B.S. MATH program is one of the two undergraduate programs in mathematics offered by the Department Mathematics. The BS in Mathematics has three applied options: financial engineering, actuarial mathematics, and computational science and engineering. These options differ from the principal BS, by substituting two upper level option courses for the upper level courses in modern algebra. The other BS program is Mathematics with Certification, which prepares candidates to teach in secondary schools. The School shares the following core characteristics and purposes with the Georgia Southwestern State University.

1. Commitment to excellence in teaching, both within and beyond the classroom through innovative curriculum and projects.
2. Preparation of students for successful careers by teaching with appropriate software and implementing faculty-mentored research projects.
3. High quality support of general education for a variety of academic programs at the baccalaureate level.
4. Contribution to local communities by providing public service, life-long learning, technical assistance, social and cultural offerings.
5. Dedication to scholarship and creative work. The department encourages faculty’s scholarly pursuits and promotes the efforts to enhance instructional effectiveness. The Dean of the
School of Computing and Mathematics supports faculty participation at regional and national conferences of the AMS and MAA.
1. Major Strengths

Faculty

The Mathematics department is made up of four full-time PhD faculty, two master level faculty, and five part-time faculty. The PhD faculty serves as program advisors and teach a full range of undergraduate mathematics courses. The master-level faculty dedicates their teaching to support our commitment to early childhood and middle grades mathematics, and our Learning Support Mathematics program respectively. The five part-time faculty teach some of the core courses (College Algebra, Elementary Statistics and Precalculus) during the day, and in our “core-at-night” program. It should be noted that three or four of these part-time faculty will be retiring by the end of the spring term, 2015. [This may well cause staffing problems in the fall.] Faculty members of the department of Mathematics hold expertise in various mathematical disciplines, including number theory/complex analysis, topology, algebra/analysis, and applied mathematics. Such an expertise is a result of years of previous professional experience and continuous development. It is worth mentioning that faculty members of the department of Mathematics are encouraged to conduct research, publish results of the research and attend conferences, workshops, trainings, seminars, and other events, although a great part of their professional lives are dedicated to teaching, program and course development.

Our faculty members can also be seen as active community servants. They prepare and conduct presentations for middle- and high-school students, lead chapters of various academic clubs, organize development seminars and workshops for students and other faculty members, and represent Mathematics on various campus-wide committees.

Curriculum Vitae of each faculty member can be found in the Appendix 1

Program

Traditionally, the mathematics programs attracted most students to its BS in Mathematics with Certification, reflecting the job security offered in the secondary teaching profession. As many as eight to ten students per year graduated from this program in the late nineties and the first decade of the 21st century. Entry to this program has fallen off for a variety of reasons: low teacher salaries and more fulfilling jobs in technical disciplines like computer science, and falling demand for mathematics teachers, owing to increasing classroom sizes. To counter this the mathematics department has created options in financial engineering, computational science and engineering, and actuarial science. All these options are supported by computer technology. On the other hand, students are told up-front that they will also need a strong background in computer science, as well as master level training in each particular option, to insure an appropriate job. This addition to the curriculum has yet to bear fruit. In the past three years, we had three graduates in financial engineering: one has not pursued graduate training, a second graduated with a master’s in financial mathematics from NYU Polytechnic Institute and will work in Taiwan, and a third is an associate portfolio manager in a major Shanghai bank. Currently, we have a senior in the computational science and engineering program; he’ll probably gravitate to a career with NATO.
or the International Red Cross. During the same time frame, one of our graduates received an MS in mathematics from Louisiana, another is starting a PhD program in applied mathematics at Oklahoma State, and a third has finished a PhD program in Mathematics Education from the University of Georgia. Official numbers show six-year enrollment falling from a high in around 2010, and then leveling to 5 or 6. Early indications give us reason to expect a slight rise, owing to a slight increase in interest in the Certification degree. [More details on Program improvement can be found in “Areas for Improvement” section of this document.]

Adjustment of course offerings, allowing students to meet requirements of today's job market, is one of the major strengths of the Program. More details about program improvement can be found in the “Areas for Improvement” section of this document. Official degree statistics are available in Appendix 2.

Students

Students of the department of Mathematics are recognized as active members of the academic community. They demonstrate a connection with classroom activities, not only while playing the classical role of receivers of the knowledge, but also by means of providing tutoring service to other students.

Infrastructure

Starting from the Fall of 2011 academic year, the School of Computing and Mathematics initiated development of the state-of-the-art computing infrastructure which was built on the basis of virtualization technology. The infrastructure allows addressing many challenging problems including but not limited to: (i) delivery of the equal service to in-class and online students by means of providing access to various computing resources, for instance, virtual servers, hybrid networks, development platforms, etc.; (ii) on-demand deployment of web-based solutions, such as document management system, wiki pages, user portal, and others; (iii) providing convenient and reliable access to various network resources via dedicated wireless facility, allowing to separate faculty and student traffic; (iv) providing controlled access to the network facility from the Internet by means of VPN technology.

Mathematics faculty and students profited from this development, which allow the introduction of Matlab into the labs, and the use of special packages like R (statistics), GAP, SciLab, and SAGE for classroom demonstrations and student use. Recall that R, GAP, SciLab, and SAGE are all free open-source software tools with great applications capability.

Research

Faculty members of the department of Mathematics conduct individual and joint research in geometric topology, analytic number theory, and algebra/analysis, with publication in peer-reviewed journals, a presentations at local and regional mathematics conferences. A list of recent publications can be found in the Appendix 1.
Department grants also can be found in the same appendix.

Services

The department of Mathematics faculty offer individual mentoring to Mathematics students, and even the formal class MATH 4495, Mathematical Preparation for Graduate School, which dispenses career advice in a classroom setting. Mathematics faculty also give presentations at special sessions of University 1000, directed at entering freshman, as well as focused advisement sessions with majors. MATH 3313, ordinary differential equations, taught one to two times each academic year, requires all students to offer a reasoned career-choice presentation, complete with focus on viability, attainability, and considerations of fall-backs, and transitions. The MATH 4850 sequence thrives by offering students a chance to learn about topics, which might be interesting as possible career areas. Faculty also maintain regular office hours to answer student questions, special labs for freshman students in MATH 1101 (elementary mathematical modeling) and MATH 1111 (college algebra). They also work directly in the Student Tutoring Center, outside of normal classroom hours. One faculty member also looks after the activities of the student Mathematics Club.
2. Areas for Improvement

Mathematics Curriculum

The program is based on AMS guidelines, and national trends for the involvement of Mathematicians in cross-disciplinary endeavors, as detailed in publications of SIAM, and the ACMS.

New Courses

Our three new options: financial engineering, actuarial mathematics, and computational science and engineering reflect our commitment to bringing interdisciplinary applied mathematics to the fore of our undergraduate programs. This is also buttressed by our exposition of new courses in the MATH 4850 sequence, and in our commitment to a joint MS in Data Analytics with Computer Science. [It should also be noted that the MATH 4850 sequence of courses is open to topic suggestion and participation by faculty across the campus community. There is a course in Systems Biology just waiting for some collaboration, or at least interest from our biology colleagues] These efforts need to be continued, and the department needs to come up with a marketing strategy to bring up enrollments.

Budget

The department’s budget is satisfactory. We benefit greatly from infrastructure improvements to the labs and facilities improvements provided by our membership in the School of Computing and Mathematics, and our Dean’s efforts to underwrite travel to conferences, and provide the department with appropriate software licenses. We also have a minimal budget (based on a cross-campus major proportion scheme) for library materials. As noted earlier, we may well need an additional faculty member, when three or four of our five part-time faculty retire at the end of spring, 2015.

The budget covers all memberships and software licenses. Example of the Budget Request for FY14 is in the Appendix 3.

Program Assessments

Each academic year the department conducts the MATH program assessment. Based on this data, faculty make note of program quality and make triggered improvement at the end of a two-year cycle. Materials on the program assessment can be found in Appendix 4.

Problem Solving Seminar

Three years ago, the department initiated MATH 4495, Mathematical Preparation for Graduate School. This course introduces undergraduates to a graduate environment with supervised writing assignments, exercises in course design, presentation of mini-lectures, participation in
seminars (on the level of expository papers in the American Mathematical Monthly, or the College Mathematics Journal), on-the-spot examinations, and exercises in problem solving, and problem solving strategies. We need to take such experiences, in a gentler form, to the upper-sophomore and junior level.

**Enrollment**

The BSMATH program needs to improve its recruitment, retention, and the graduation rate, none of which are sufficient. New funding formula forces the Mathematics department to analyze how higher admissions requirements vs. increasing enrollment effect grows of the graduation rate. Outcomes from that analysis will allow determining the strategy of optimal enrollment management. The department will be working on that assignment as soon as the funding formula will be released by BOR.

The enrollment of upper division courses is unsatisfactory, ranging from 3-8 students. There is space for growth. In summer of 2014, the chair of Mathematics and the Dean of the School of Computing and Mathematics visited our contacts in the Peoples’ Republic of China to explore ways of bring Chinese undergraduates to study Mathematics or Computer Science at GSW, and to encourage Chinese postgraduates to enroll in our MS in CS program. We found that cost is a major factor. USGS doesn’t allow a sufficient reduction in tuition to make such study attractive for most undergraduates. There is also the problem of making the curriculum efficient; an undergraduate degree sheet for a Chinese program doesn’t have a 60-hour “core.” So we have a problem: what do we substitute for courses like history, political science, etc., without requiring a Chinese student to spend an inordinate amount of time an money to earn an “American” degree. Needless to say, we are still engaged in dialogues with our Chinese counterparts on these issues. For the MS in computer science, GSW and our sister universities in China had a long-standing solution. Students would come to study CS at GSW after three and a half year of study in China, and then after and additional one and a half years of study at GSW, earn a dual bachelor’s degree (one form their university and one from GSW) and an MS in CS from GSW. Unfortunately a change in immigration law now voids such arrangements by requiring international students to already hold a bachelor’s degree before coming for postgraduate work in the US. GSW has filed an appeal. The Chinese, on the other hand, favor the previous arrangement, saying that once their students graduate from a Chinese university, that university has no influence, or concern in the student’s choice of school. The Dean and the Chair concluded that our best recruiting tool for international students would be to develop a joint Mathematics-Computer Science graduate program, like the one planned in Big Data Analytics. Here, we might be able to control tuition cost sufficiently to recruit Chinese, and perhaps, Indian post graduate students, and side step the real problems inherent in recruiting for undergraduate programs, give our program “core” requirements, and the perceived expense of our programs.

On the other hand, marketing our existing undergraduate program to local high school graduates and participants in our Annual State-Wide Mathematics Tournament will help to recruit more new students and improve their quality (Appendix 5). This extends to marketing in two-year colleges in the system. But the latter may not help a lot since the Board of Regents, which governs the University System of Georgia has, over the last few years, been raising many two-
year colleges to four year status, and then merging them with other four years schools, or universities.

Retention, Progression, and Graduation

Beacon

One of the biggest problems, related to retention and progression, is disconnect between freshmen and their advisors. In Fall 2014 semester GSW made Campus Labs Beacon available to students, faculty, and staff. Campus Labs Beacon is a web-based solution focusing on six factors that are the strongest predictors of student retention and persistence, asking students questions about everything from their social skills and confidence levels to their attitude toward learning. This system is especially important for the MATH 2221, Calculus II class, the key class for Mathematics majors. Passing rate in that class is around 60%. The MATH department is going to implement this system in spring, 2015.

DegreeWorks

DegreeWorks is a computerized degree audit program and academic advising tool designed to assist students and advisors in reviewing students’ degree progress. This academic advising tool reduces probability of mistakes and speed up graduation. All MATH department academic advisors attended training in Spring 2014. They will implement DegreeWorks in process of advising in the current academic year.

Independent Studies

The department offers a necessary number of independent studies, which are required for students’ progression and graduation. In the 2013-2014 academic year, the MATH department offered 8 independent studies. In many cases an independent study can be avoided if academic advisor and student would develop a plan of study based on the multi-year schedule (Appendix 6). The department developed three and four year plans of study (Appendix 7). In the current academic year, DegreeWorks will be used for creating individualized plans of study for junior students.

Job Fair

Each fall and spring the Mathematics department encourages its junior and senior students to attend Job Fairs in the Atlanta area. The university provides transportation, and over a hundred companies are represented. Our Career Services Center gives students help preparing for interviews and writing resumes. The GSW School of Education hoists a similar local event for our BS in Mathematics with Certification students by the School of Education. Local secondary school principals and superintendents attend.
3. Key Opportunities

**Growing Job Market**

The traditional job market for mathematicians is certainly not growing, but for mathematicians with a strong background in computer science, and a willingness to engage in interdisciplinary ventures in STEM related areas, employment opportunities are nearly as good as for traditionally trained computer science types.

**Modern Computer Infrastructure**

Recent development of the computer infrastructure of the School of Computing and Mathematics allows effectively address the following goals:

1. Equal service to students enrolled in online and in-class sections;
2. Access to state-of-the-art technology and software for students and faculty members;
3. Reconfigurable computing environment allows sharing classroom facility to deliver targeted course content.

Of course, Mathematics’ placement within the School of Computing and Mathematics assures our students access to these resources. We may need to push them, and we will.

**Grants and Research**

Faculty members are encouraged to conduct research in the field of their expertise. Twice a year every faculty can apply for a Faculty Development Grant and request financial support to compensate his/her expenses while attending conferences, workshops, trainings, etc.

**Beacon Alert System**

GSW has recently implemented the Beacon Alert System, which allows advisors, professors, coaches, Student Support Services, and other key people in each student’s academic career to have access to a central monitoring system. Beacon keeps everyone updated on how the student is performing and any situations that may occur. Through the use of Beacon, students can be advised and helped at a much earlier stage in their academic career.

**ProctorU**

ProctorU is a test proctoring system that is being implemented for use in GSW online classes. This allows the students taking online classes to take their tests in a place that is convenient to them without having to come onto campus or go to a testing center. One of the main goals of using ProctorU is to eliminate some of the academic dishonesty issues that are possible with online classes. It also allows the students to test in an environment that is more comfortable for them and hopefully will help increase their scores.
4. Key Challenges

Challenge 1: Insufficient Logical Thinking Skills of Mathematics Majors

In our opinions and that of most employers, logical thinking is more important than just computational skill. The Mathematics faculty has noted that the logical thinking skills of incoming freshmen are declining. This problem is closely related to the ability of students to successfully complete MATH classes, especially, classes in advanced mathematical modeling, real analysis and so on. For example, the failing rate in the MATH 2221, Calculus II is around 40%. This is a real challenge, which impact overall success of MATH students in the university and future work places.

Mitigation of the challenge 1

- Increase availability and quality of Tutoring.
- Allocate time for development logical thinking skills in the low level Math classes (labs).
- Provide scholarships to students, who successfully participated in the GSW’s High School Mathematics Tournament. (Every year GSW hosts around 500 students from dozens schools statewide).
- Work with local High Schools.
  (The Mathematics department created a program of training teachers and peer tutors in the Americus Sumter High School. The goal of the program is to introduce a teaching approach, which help teachers and peer tutors to improve students’ logical thinking skills).
- Increase admissions and degree requirements.
- Increase international enrollment.
  (As a rule, international students, especially from India and China, have good grades in mathematics and, consequently, good logical thinking skills. Such students create in the department atmosphere of appreciation of such skills.)

Challenge 2: Low Progression and Graduation Rates.

Graduation rate will be the main component of the funding formula, which will be in place from Fall 2016. Financial welfare of the university and department will be depending on retention, progression, and, as the result, a graduation rates. Current numbers of progression and graduation rates of MATH majors are below than GSW average rate.

Mitigation of the challenge 2

- Increase availability and quality of tutoring
- Discuss with advisees existing 3 or 4 year plans of study as a possible target
- Implement Beacon and DegreeWorks
- Improve advisement
• Increase a number of group social activities

**Challenge 3: Insufficient Connection between Freshmen and their Academic Advisors.**

As a rule, students in the university have majority of problems during their first two years of study but advisors spend more time working with junior and senior students. As result, after first several problems new students change their majors or withdraw from the university.

Mitigation of the challenge 3

• Meet with freshmen during UNIV 1000 classes
• Create profession-oriented presentations for freshmen
• Invite freshmen to participate in CS Club, Field Trips, Job Showcase events, and other activities.

**Challenge 4: Increasing Cases of Academic Dishonesty**

According to the MATH faculty the number of cases of academic dishonesty is growing. As said by many latest publications it is a nationwide problem (e.g. The Carnegie Foundation for the Advancement of Teaching [http://www.carnegiefoundation.org/perspectives/justice-or-just-us-what-do-about-cheating](http://www.carnegiefoundation.org/perspectives/justice-or-just-us-what-do-about-cheating)). These rapidly progressed cases of academic dishonesty are a result of ability to find almost any required information via the Internet in few minutes. Moreover, solutions of students’ assignments become a big business. Danger of academic dishonesty is obvious – students are able to obtain degrees without acquiring necessary knowledge and skills.

Mitigation of the challenge 4

• Use proctoring tests in all online classes
• Schedule an individual student’s presentation of assignments and projects, where it is possible.
• Enforce GSW Academic Integrity Policy in each class ([https://gsw.edu/campus-life/resourcesinformation/studenthandbook/gsw-academic-integrity-policy](https://gsw.edu/campus-life/resourcesinformation/studenthandbook/gsw-academic-integrity-policy)).

**Challenge 5: Low Number of Internships for Mathematics Majors**

Even nationally there are few summer internships for mathematics majors, and even fewer opportunities for Undergraduate Research Experiences for male students.

Mitigation of the challenge 5

• Create and use alumni network for obtaining internships

Explore virtual internship opportunities with Internmatch.com and Linkedin.com ([https://www.linkedin.com/job/online-intern-jobs/](https://www.linkedin.com/job/online-intern-jobs/))

• Encourage faculty to create UREs for regional mathematics majors
• Encourage mathematics students to build and market computing skills
Challenge 6: Low Number of Group Activities

The group activities are organized by the MATH Club. These activities are extremely important for increasing of the retention rate.

Mitigation of the challenge 6

- Develop plan of activities
- Raise funding for new activities
- Increase a number of events for freshmen and sophomores

Challenge 7: Declining Enrollment of International Students

Increase in International Enrollment is one of the strategic goals of GSW (Goal One, Objective 2: Recruit More International Students). Currently, the number of International students is not growing. Reasons of this problem are internal and external.

Mitigation of the challenge 7

- Develop new programs which will be attractive to International Students
- Create reasonable scholarships for students from MOU Universities
- Provide better services to International Students at the department and GSW levels.
- Collaborate with the newly created International Office in all aspects related to International Students.
# Mathematics Department Strategic Plan

## Draft Strategic Plan

Status: Not started, In progress, Done

<table>
<thead>
<tr>
<th>Goal</th>
<th>Activity (Implementation Term)</th>
<th>Status</th>
<th>Evidence</th>
<th>Aligned with GSW Strategic Plan Action Objective#</th>
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<tbody>
<tr>
<td><strong>Improving Program Quality</strong></td>
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<tr>
<td>Improve Critical Thinking Skills of MATH students</td>
<td>The Developing Critical Thinking Skills Seminars/Contests will be organized each academic year for all mathematics (Spring 2015)</td>
<td>Not started</td>
<td>Goal Two Objective 2</td>
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<tr>
<td>Implement the latest recommendations of the AMS</td>
<td>The MATH curriculum will be updated according to the latest recommendations of the AMS (Fall 2015)</td>
<td>Done</td>
<td>Goal Two Objective 2</td>
<td></td>
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<tr>
<td>Implement in the MATH curriculum the high demanding on the job market topics</td>
<td>The high demanding on the job market topics, such as virtualization, big data, and programming of mobile devices should be added in the CS/IT curriculum (Fall 2015)</td>
<td>Done</td>
<td>Goal Two Objective 2</td>
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<td>Include Students/ Faculty Focus Group meetings in the annual assessment process</td>
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<td>Improve MATH 4495</td>
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<td>Increase a number of internships</td>
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<tr>
<td>Increase the availability and quality of tutoring</td>
<td>Together with the Academic Resource Center, the department will increase the availability and quality of tutoring</td>
<td>In progress 50%</td>
<td></td>
<td>Goal One Objective 4</td>
</tr>
<tr>
<td>Inform advisees about the existing three or four year plans of study in CS/IT</td>
<td>The existing three or four year plans of study will be discussed with advisees as possible targets (Fall 2015)</td>
<td>Not started</td>
<td></td>
<td>Goal One Objective 4</td>
</tr>
<tr>
<td>Implement Beacon and Degree Works in the advisement</td>
<td>The advisors will implement Beacon and DegreeWorks in their practices</td>
<td>In progress 10%</td>
<td></td>
<td>Goal One Objective 4</td>
</tr>
<tr>
<td>Increase the number of group social activities</td>
<td>The department will increase the number of group social activities (Fall 2015)</td>
<td>Not started</td>
<td></td>
<td>Goal Two Objective 4 Goal Three Objective 1</td>
</tr>
<tr>
<td>Attract a range of students (from freshmen to seniors) for participation in Job Fairs</td>
<td>The department will attract a range of students (from freshmen to seniors) for participation in Job Fairs.</td>
<td>In progress 20%</td>
<td></td>
<td>Goal One Objective 4 Goal Three Objective 1</td>
</tr>
<tr>
<td>Experiment with new teaching and learning approaches in the high failure rate courses</td>
<td>The department will experiment with new teaching and learning approaches in the high failure rate courses s.(Fall 2015)</td>
<td>Not started</td>
<td></td>
<td>Goal One Objective 4</td>
</tr>
<tr>
<td>Objective Description</td>
<td>Description</td>
<td>Progress</td>
<td>Goal/Objective</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------</td>
<td>---------------------------------</td>
<td></td>
</tr>
<tr>
<td>Revive the two-year college agreements</td>
<td>The department will revive the two-year college agreements (Fall 2015)</td>
<td>Not started</td>
<td>Goal One Objective 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Goal Three Objective 2</td>
<td></td>
</tr>
<tr>
<td>Increase readiness of students from the local High Schools to study in a university</td>
<td>The Department Mathematics works with local High Schools to increase readiness to study in a university</td>
<td>In progress 20%</td>
<td>Goal One Objective 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Goal Three Objective 1</td>
<td></td>
</tr>
</tbody>
</table>
Summary Recommendation

The program has potential to grow. The job market looks very favorable for Mathematics majors in the next 10 years, as long as the Department maintains close program ties with computer science, and insists that its students work on minors and projects in that field. See (http://www.bls.gov/ooh/computer-and-information-technology/home.htm). Growth will be driven by the very rapid progress in computer technology, and cross-disciplinary applications of mathematics, science and computer science. We recommend that this program be continued.