Dr. Lauren Adamson, Dean
College of Arts and Sciences
Georgia State University
Atlanta, GA 30303-3083

Dear Lauren,

The Self-Study Committee consisted of Drs. Davis, Hsu, Miller, Vidakovic and Walker. Dr. Valerie Miller led this process, a task that she performed with superb diligence. I am in total agreement with the report, and find the analysis reasonable, and the report comprehensive and accurate. I am looking forward to working with faculty and upper administration in strengthening the department even further. Permit me to make a few comments.

The Department has an industrious faculty and support staff, and talented and enthusiastic majors and graduate students. The Department also has a high quality computing environment and a good research library with access to a wide variety of electronic databases and online mathematical journals. Much has been achieved by the Department since the past program review: the Department achieved a high level of research (with virtually all faculty members publishing), teaching, and service activity. Space is a serious problem as Department facilities are spread across four buildings.

The Department’s most serious problem is that program resources are not adequate to permit the Department to continue to meet the expectations that the University has for the Department. As described below, decreasing faculty size and increased demand for instruction in the mathematical sciences has resulted in the need to hire visiting instructors and part-time instructors to teach courses on a per-course basis. When instructors are hired “by the course” to teach, they cannot be asked to perform service work, hence the service responsibilities of the Department fall on a reduced number of faculty. This has a negative impact on the ability of the faculty to conduct research, and threatens to reduce or eliminate gains in research productivity. As described below, the approval of a PhD program in Mathematics and Statistics will alleviate the over-reliance on part-time instructors and visiting instructors, and also result in a more conducive research environment. We are also indebted to the Provost for providing us with a state-of-the-art instructional laboratory consisting of 85 workstations, called the MILE. The purpose was to redesign the structure of lower division courses with the goals of improving student success without increasing (and possibly decreasing) associated costs (and again reducing the reliance on PTIs and VIs).
The demands on the Department’s staff are equally high. Greater utilization of technology has made additional technical support necessary. Clerical demands are greater than current office staff can provide, and the demands on staff increase as the Department becomes more involved with sponsoring research conferences or outreach programs. Far too often the result is that faculty performs clerical functions that might normally be done by staff.

1 Two major initiatives: The proposed PhD program and the MILE

1.1 The proposed PhD program

Recruitment has not kept up with the rapid growth of the course load of the department. This has necessitated the increased use of visiting and part time instructors while other departments have been eliminating these positions. Current plans call for the replacement of the visiting instructors and most of the part time instructors by tenure track faculty. This will call for substantial financial resources. The adoption of a Ph.D. program in Mathematics and Statistics will allow for an alternative to this plan, which incorporates the use of graduate teaching assistants. This alternative will result in great savings.

The costs of introducing the proposed Ph.D. program must be compared to the greater costs of not introducing the program.

Support for Graduate Students: In 2003, 188 sections of mathematics and statistics were taught by part time and visiting instructors whose salaries totaled $572,400. These same 188 sections could have been taught by 37.6 half-time graduate teaching assistants (GTAs) being paid $15,000 for twelve months at a cost of only $564,000. On an annual basis half-time visiting instructors are currently paid $16,200 to teach five courses. If half-time GTAs are paid less, we can save money by converting these positions to support graduate students. Although this savings is rather small, the gain in workload money from the 1100 credit hours per year taken by these graduate students is more significant. There is no such gain from part time and visiting instructors since they do not take coursework.

Costs of Not Adopting the Ph.D. Program: The current staffing plan calls for replacing the present twelve visiting instructors by tenure track faculty. These twelve visiting instructors are currently paid $27,500 each for nine months for a total of $330,000. If these were immediately replaced by twenty-four assistant professors at $50,000 each for nine months the total would be $1.2 million. In addition there would be substantial additional costs for fringe benefits, office space, computer equipment, office furniture, travel money, support personal, recruitment, and summer support to name just a few items. The actual costs would be well over $2 million. This replacement is necessary since the percentage of sections currently taught by non-tenure track faculty is much too high. It will remain high (but much improved) because of the large number of instructors/lecturers remaining in the department. The use of graduate teaching assistants provides an attractive alternative to the current plan. At present the only GTAs in the department are students who have taken at least 18 hours worth of credit hours, including a pedagogy course or students who have received a master’s degree in mathematics and are pursuing a doctoral degree in another discipline. The initiation of a Ph.D. program in mathematics will make the wider use of GTAs possible. In this case visiting instructors could be replaced by a combination of GTAs and assistant professors. Such an alternative could save the university more than one million.

The viability of the Masters Program, the broader need for the PhD program, and the initial focus areas of the PhD program are discussed in Appendix A.
1.2 The MILE

As part of the plans to improve instruction in lower division courses, the department has initiated a redesign project for two courses that prepare students for the calculus sequence. These courses are Math 1111 College Algebra and Math 1113 Precalculus. In the 2003-04 AY the department offered 76 sections of these courses to over 2000 students. These sections are typically taught by a combination of part-time, visiting, and regular faculty. The department has chosen textbooks, developed course outlines, and written content standards for these courses. However, there are no consistent efforts to ensure uniformity of coverage or assessment across all sections. This project will attempt to improve the quality of instruction and consistency of performance standards among the various sections, while reducing costs of delivery.

As a first step the department has become associated with the Road To Reform project sponsored by the Center for Academic Transformation at Rensselaer Polytechnic Institute. This was accomplished by an ongoing competitive application process.

The model for the redesign of Math 1111 and Math 1113 is characterized by a variety of delivery modes including a computer laboratory. Currently we are establishing an eighty-five workstation student lab and designing a pilot project utilizing this lab. The two goals of improved instruction and reduced costs should be achieved by replacing some class time with lab tutorials, and improving organization and uniformity among the various sections.

2 Conclusions

The self-study makes a strong case that the Department of Mathematics and Statistics has undergone substantial improvement by virtually any external assessment available. The number of graduate students, majors, and students taking mathematics and statistics courses in the core has dramatically risen. In cooperation with Admissions and Student Services the department offers a mathematics placement examination to incoming freshman. Placing students in the correct entering mathematics course has greatly enhanced their chances of success. Entry-level requirements into the department’s programs have improved. The faculty have experienced an increase in the amount of external funding generated (even though it is extremely difficult to procure external funding in Mathematics and Statistics), and an increase in the overall quantity of their professional output.

However, there is clear evidence that the department lacks the resources necessary to fulfill its mission. Burgeoning enrollments have led to tenure track faculty with excessive service loads, an over-reliance on visiting instructors and heavy PTI teaching loads. Inattention to the replacement of aging computers and technological support for faculty research are hindering productivity.

Our goals for the immediate future are: establish a viable Ph.D. program, first in Collegiate Mathematics Education and Biostatistics, and then in Applied Mathematics and Pure Mathematics; continue innovations in teaching (enrollment management, assisted learning, course coordinators, outreach, and the optimal use of technology in learning); increase the percentage of tenured and tenure-track faculty; build on our nationally and internationally recognized department in some key areas: Graph Theory, Linear Algebra, Analysis, Biostatistics/Bioinformatics, and Collegiate Mathematics Education; establish a Statistical Consulting Center; increase summer research support for faculty; improve communication with our students; hire additional computer support staff and an additional staff member.

I have great pleasure in submitting the self-study and the accompanying report for review.
Sincerely yours,

Johannes H. Hattingh, Chair

CC Drs. Charles Derby, Associate Dean, and Joan Carson, Associate Provost
Appendix A

The Viability of the Masters Program

Admission statistics, compiled by the Director of Graduate Studies, shows an upward trend over the past five calendar years. The following table shows the number of applications received during calendar years 2000 through 2004:

<table>
<thead>
<tr>
<th>Year</th>
<th>Applications</th>
<th>Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>32</td>
<td>21</td>
</tr>
<tr>
<td>2001</td>
<td>45</td>
<td>30</td>
</tr>
<tr>
<td>2002</td>
<td>75</td>
<td>46</td>
</tr>
<tr>
<td>2003</td>
<td>104</td>
<td>63</td>
</tr>
<tr>
<td>2004</td>
<td>69</td>
<td>52</td>
</tr>
</tbody>
</table>

Although the number of applications for 2004 is down from the previous year, a greater percentage of applicants were accepted, indicating a stronger applicant pool. Much of the growth in the number of applications and admissions is due to the increased number of applicants in the statistics concentrations, while the mathematics demand has grown at a more modest pace. The concentration in biostatistics was added in Fall 2001, while the concentration in bioinformatics was added in Fall 2002. Again for calendar years 2000 through 2004:

<table>
<thead>
<tr>
<th>Year</th>
<th>Applications</th>
<th>Mathematics</th>
<th>Statistics</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>32</td>
<td>21</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>2001</td>
<td>45</td>
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<td>2003</td>
<td>104</td>
<td>41</td>
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</tr>
<tr>
<td>2004</td>
<td>69</td>
<td>31</td>
<td>33</td>
<td>5</td>
</tr>
</tbody>
</table>

The trend clearly indicates that the demand for our programs is growing. Adding a Ph.D. option will attract more students and raise the level of scholarly activity within the department. As another indicator of student demand, faculty members are advising four doctoral students either studying in different departments or at other universities. In 2004 (in just the Spring and Summer) we graduated 12 students. This is more than in 2002 and 2003 combined. Furthermore, two students received their PhDs from other universities with departmental faculty members as their PhD supervisors. In particular, graduation in our Statistics program has been strong: 6 students graduated in biostatistics, one in bioinformatics, and 2 in statistics with allied field (from Fall 2003 through Summer 2004). Job advertisements in the most recent AMSTAT News (July 2004) contain 34 statistics positions, of which 24 are in biostatistics/bioinformatics, indicating a strong demand for our students.

Current demographic trends suggest that Georgia in general and Atlanta in particular can expect an increasing demand for qualified tenure-track faculty over the next decade. This is a demand that will be difficult to meet through current doctoral programs. Georgia State University has faculty that are strong in core areas of mathematics and statistics and is in a very strong position to help meet this demand for Ph.D. graduates. For example, Clayton State University’s application to offer a B.S. in Mathematics was recently approved by the BOR, and their faculty will now be required to obtain a terminal degree in mathematics. Moreover, the department has a great deal of experience meeting the needs of non-traditional students. Many students and potential students in the Atlanta area hold down jobs or provide family care. The Department of Mathematics and Statistics has worked with such students at the undergraduate and M.S. levels. This could also be easily done at the Ph.D. level, thereby providing further career opportunities for a group that includes a large proportion of women and minorities. The areas of focus are discussed in Appendix A.

Areas of focus
Bioinformatics/Biostatistics: Developing a Ph.D. program in bioinformatics/biostatistics has become the top priority item in many universities across the nation. The Georgia Research Alliance (GRA) plans to devote a significant portion of its proposed budget to a bioinformatics initiative. Georgia State University has partially responded to the need for qualified scientists in this area by developing interdisciplinary Masters and Ph.D. programs in the Departments of Biology and Computer Science. The Department of Mathematics and Statistics has responded at the Masters level by developing a program with a concentration in bioinformatics. A component of the University’s strategic plan emphasizes the importance of bioinformatics, biotechnology, and computational neuroscience.

With the recommendation and support of the Provost, funds within the university were redirected to fund three interdisciplinary research initiatives: Brains and Behavior, the Molecular Basis for Disease and Urban Health. We participate in all three of these research initiatives. Many faculty members have expertise that may be utilized by these initiatives, and will supervise PhD students jointly with the Biology, Computer Science, Physics and the CIS Departments. However, we could have been benefited even more from these interdisciplinary programs if we had had a PhD program. For example, we were not able to avail ourselves to student support from the MBD program as we do not have a PhD program. Moreover, a workforce trained in biomedical computing with an emphasis in biostatistics has been a major focus for NIH. Recently, they have established a funding PA for predoctoral research training in biostatistics. However, the lack of a PhD program will restrict funding opportunities from this program.

GSU established an Institute of Public Health as an initiative to further the public health program. The institute will be delivering Masters in Public Health starting Fall, 2004. Evidently, biostatistics plays an essential role in the Institute, and our department has responded by offering a biostatistics course for them. There will be ample interdisciplinary research opportunities between our department and the Institute for PhD students in our proposed program.

Mathematics Education: Mathematics education at the collegiate level has emerged as a research field within the last decade. Emphasis on the importance of mathematics education has grown rapidly. This change started with the reform movement at the P-12 level and the development of the NCTM Principles and Standards for School Mathematics (http://www.nctm.org/standards). It continued through calculus reform (http://www.math.okstate.edu/archives/calcrefm.html) and the development of standards to improve student learning and understanding at the undergraduate level (QUE Quality in Undergraduate Education - http://www.gsu.edu/wwque/about/index.html). Over the past several years, Georgia has undertaken significant reforms of its educational system. In 1995, the Board of Regents of the University System of Georgia adopted the Georgia Pre-School to Post-Secondary Education Initiative (P-16 Initiative; http://www.usg.edu/p16/). One of the goals of the P-16 Initiative is to improve the education of P-12 classroom teachers. The goal of better aligning the P-12 and postsecondary systems will be accomplished by establishing academic and performance standards that define the level of work necessary in mathematics for admission into colleges and universities as well as entrance into the workforce.

The Department of Mathematics and Statistics at GSU has a goal of providing a Ph.D. program in collegiate mathematics education in which graduate students will study a wide range of courses in mathematics and mathematics education, conduct research in mathematics education, and train and supervise P-16 mathematics teachers. These students will engage in current educational efforts to improve students learning, understanding, and achievement in mathematics aligned with the efforts of the P-16 Initiative. Several faculty from the department are actively involved in various state and national reform efforts, such as the QUE and PRISM projects, and are capable of directing dissertations of future doctoral students in collegiate mathematics education.

Presently, there is no Ph.D. program in collegiate mathematics education in the state of Georgia that is offered in a department of mathematics. Most existing Ph.D. programs in the nation in mathematics education are programs in departments or colleges of education, with secondary education as the highest
level. Many universities are seeking qualified applicants in the area of collegiate mathematics education. In particular, in each of the last three years, the Department of Mathematics and Statistics at GSU searched for tenure-track faculty in this area. The number of applicants over these 3 years did not exceed 5 per year. The few applicants, together with the large number of positions in mathematics education, suggest that competition for applicants holding doctorates in mathematics education is keen.

Establishing a Ph.D. program with a concentration in collegiate mathematics education will be an additional attraction to applicants and, at the same time, will help meet the national needs in producing new doctorates. Illustrating the demand, a report from the Notices of the American Mathematical Society (AMS) published in February 2003 concluded that there is a serious shortage of doctorates in mathematics education. The results of a survey conducted during the 2002-2003 academic year indicate that 88 institutions announced searches for 111 positions in mathematics education. The positions were about evenly split between appointments in mathematics departments or schools of education. Of the positions announced, about 40 percent of the positions in mathematics departments and 35 percent of the positions in departments or schools of education were unfilled for the 2002-2003 academic year. About one-third of the new hires that were made resulted from a faculty member moving from one institution to another. Typically, there are less than 100 new graduates in the United States each year with a doctorate in mathematics education. Research suggests that due to other job opportunities, only about one-half of these new graduates seek new positions in higher education in the United States. Information about retiring faculty, and the current production of new doctorates in mathematics education, suggests that the current shortage of doctorates in mathematics education will become even more acute. It has been predicted that more than half of all faculty members in the field of mathematics education will be eligible to retire in the next two-three years. The job opportunities for doctorates in mathematics education (whether new graduates or faculty interested in changing positions) are great. The projected openings for doctorates in mathematics education for the 2003-2004 academic year will continue to exceed the number of new doctorates entering the profession.