University of North Alabama

Department of Mathematics and Computer Science

Program Review

Name and Signature of Chair: ______________________________
Dr. Henry David Muse

Date of Report: May 29, 2009

This program review reflects a commitment by the University of North Alabama to ongoing, integrated, and institution-wide research-based planning and evaluation processes. To this end, the Department of Mathematics and Computer Science has undertaken this program review to ensure that departmental goals, strategies, and projected outcomes are consistent with UNA's mission and strategic plan. Specifically, this document is intended to demonstrate that the goals and subsequent practices of this department 1) incorporate a systematic review of institutional mission, goals, and outcomes; 2) support and enable a process that results in continuing improvement in departmental quality; and 3) lend support to the institution's mission and strategic plan. Furthermore, the presentation that follows is organized in accordance with the template provided by the OIRPA (Office of Institutional Research, Planning and Assessment). In the broader context of concerns and issues that are emerging within the Department of Mathematics and Computer Science, this document is intended to provide a measure of the state of this department as it seeks to address relevant issues that belong within the scope of its mission.

1. Five-Year Departmental Enrollment and Faculty Data

- **Review Five-Year report for trends, patterns, and/or significant changes.**

The Five-Year report from OIRPA is given below. Relevant comments pertaining to each table follow the presentation of the table.

1. Number of Unduplicated Majors (Summer, Fall, and Spring Semesters Combined)						
Bachelor	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Status						
Full-Time	127	98	121	149	158	130.60
Part-Time	71	57	79	109	99	83.00
Total	198	155	200	258	257	213.60
FTE Students	150.67	117.00	147.33	185.33	191.00	158.27

The number of unduplicated mathematics or computer science majors seems to be in a continual state of flux particularly with regard to new students. Many students are attracted to computer science (CS) because successful CS majors are assured of well-paying jobs in CS upon graduation. Similarly, students are attracted to a major in mathematics because there are well-paying job opportunities, particularly in public education, for those graduates who are certified to teach mathematics. Consequently, the Mathematics and Computer Science Department probably attracts its fair share of hopeful majors. Since the core requirements for each major are especially demanding, many students discover that they are either not academically prepared to pursue the major or not committed to doing the work required for success in the major. The end result is that the department loses several majors each year particularly among those students who are in the early stages of their programs. It is probably accurate to conclude that our number of majors in each area has remained fairly stable during the past five years.

2. Number of Degrees Conferred						
Bachelor	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Degrees Awarded	15	7	17	14	19	14.40
Computer Science	10	3	7	7	6	6.60
Mathematics	5	4	10	7	13	7.80

For the past three years, the department has averaged 10 graduates each year in mathematics and less than 7.5 graduates each year in computer science. The CS faculty members are certainly aware that program viability could be an issue, and they are working to attract promising computer science majors without sacrificing program content.

3. Majors/Degrees Conferred Ratio						
Bachelor	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Ratio	13.20	22.14	11.76	18.43	13.53	15.81

4. Student Credit Hours (Summer, Fall, and Spring Semesters Combined)						
Level	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Undergrad	11,811	11,875	12,112	12,718	12,970	12,297.20
Graduate	252	258	202	171	201	216.80
Total	12,063	12,133	12,314	12,889	13,171	12,514.00

Student credit hour production associated with the mathematics major and the computer science major has remained fairly steady during the last five years. During this same period, student credit hour production in service courses has been increasing. A large percentage of the student credit hour production in this department comes from offering service courses including CS 110, MA 099, MA 100, MA 105, MA 110, MA 112, MA 121, MA 122, MA 147, MA 181H, and MA 306. As total student enrollment has increased, the total number of mathematics sections devoted to service courses has increased dramatically especially during the fall semesters when demand tends to be highest. The number of sections of mathematics service courses offered during the fall terms from the fall of 2002 through the fall of 2008 was as follows: Fall 02 – 40, Fall 03 – 42, Fall 04 – 44, Fall 05 – 45, Fall 06 – 46, Fall 07 – 52, and Fall 08 – 59. As enrollment in these courses has increased, the department has been able to offer more sections because of both an increase in faculty lines and an increase in the availability of adjunct faculty. The department has also been able to gradually reduce the maximum class enrollment in such courses as MA 099, 100, 105, 110, and 112 where teacher interaction with students is critical.

5. Average Class Size						
Division	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Undergrad	25.4	24.2	23.9	25.5	24.6	24.72
Graduate	9.3	8.6	8.5	7.1	5.6	7.82

Class enrollments in the lower level mathematics service courses have tended to be too large. While mathematics faculty members would like to have no more than 25 students in each section of MA 099, 100, and 105, enrollments of 36 or more (even 40 or more) have often been the case. Similarly, enrollments in MA 110 and MA 112 sections have usually had to exceed 36 even though enrollments of 30 or less are highly desirable for student-teacher interaction. One of the department's long term goals is to gradually reduce class enrollments to 30 or less in all sections of MA 099, 100, 105, 110, and 112.

6. Number of Faculty (Fall Semester)						
Faculty	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Full-Time	16	16	16	16	17	16.20
Part-Time	3	3	4	4	9	4.60
Total	19	19	20	20	26	20.80
FTE Faculty	17.00	17.00	17.33	17.33	20.00	17.73

7. FTE Student/FTE Faculty Ratio (as per U.S. News definition)						
	2003-04	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Ratio	8.86	6.88	8.50	10.69	9.55	8.90

8. Credit Hours/FTE Faculty						
	2003-04	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
CH/Faculty	709.59	713.71	710.42	743.60	658.55	707.17

9. Department Expenditures (including Actual Personnel and Non-Personnel)						
	2003-04	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Budget	$955,417	$1,066,936	$1,147,486	$1,224,879	$1,400,941	$1,159,131.76

10. Cost Per Credit Hour (Total Department Expenditures/Total Credit Hours)						
	2003-04	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Cost	$79.20	$87.94	$93.19	$95.03	$106.37	$92.34

2. Assess the department as it relates to students

➢ Enrollment

The student-related goals of this department support the general university goal – to offer high quality programs. Department goals are as follows:

- to offer strong academic programs in mathematics and computer science
- to offer a strong component of general studies work designed to provide a diverse educational background and a suitable foundation for specialized study.

- to offer the teaching field component for a graduate program in mathematics education.

In accordance with these goals, the department offers coursework that supports five areas of endeavor as follows: major in computer science, major in mathematics, general education component, service courses beyond the general education component, and the graduate program teaching field component in mathematics education.

A large portion of departmental resources is directed toward supporting students who are not pursuing a major in this department. For example during the fall of 2008, the number of sections offered in support of each of the above stated areas of endeavor was as follows: mathematics major – 13; computer science major – 9; general education component – 6 in computer science and 48 in mathematics; service courses beyond the general education component – 11; and graduate program – 1. Thus, 75% of the sections offered during the fall of 2008 were directed toward non-majors.

- **Degree productivity**

Related OIRPA five-year data from part 1 above is repeated below for convenience.

2. Number of Degrees Conferred						
Bachelor	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Degrees Awarded	15	7	17	14	19	14.40

As noted in part 1, the department is probably averaging about 10 graduates each year in mathematics. Recent numbers in CS have been considerably lower. The CS faculty members are certainly aware of this problem, and they are working to attract promising computer science majors without sacrificing program content.

3. Majors/Degrees Conferred Ratio						
Bachelor	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Ratio	13.20	22.14	11.76	18.43	13.53	15.81

Table 3 ratios suggest that the number of majors in relation to the number of graduates varies considerably. With the exception of 2004-05 when only seven students graduated, this variation is due largely to variation in the total number of majors.

- **Student services**

During the last five years, this department has consistently demonstrated a commitment to deliver student services that are oriented toward enabling students to complete their mathematics/computer science requirements without sacrificing course content. The mathematics and computer science majors are disciplines where knowledge of course content is critical. Successful graduates of our programs must have a strong knowledge base in the discipline in order to succeed in their fields of endeavor. For example, mathematics majors who are certified to teach secondary mathematics must demonstrate competence in the mathematics classroom while majors who choose to go to graduate school in mathematics must have sufficient background to be competitive at the graduate level. In like manner, computer science graduates must have strong content knowledge in order to function in a government/industrial environment while majors who choose to continue their pursuit of computer science at the graduate level must have sufficient preparation to support continued progress beyond the undergraduate curriculum. Both mathematics and computer science are disciplines where mastery of the subject matter is both sequential and necessary. If the student has not demonstrated a mastery of the subject matter, then further study in either field is generally not an option. Consequently, the department is very attentive to course content within each major, and the courses offered at UNA are comparable to courses offered in peer institutions. It should be noted, however, that one of the issues insofar as service of our majors is concerned involves community college transfers.

The department is very much concerned about the general disconnect between community college preparation and university level preparation in mathematics for majors in mathematics or computer science. Community college transfer students who receive transfer credit for Calculus 1 (MA 125), Calculus II (MA 126, Calculus III (MA 227), and Applied Differential Equations I (MA 238) are almost always seriously deficient insofar as preparation for continuing the mathematics major is concerned. Consequently, transfer students who manage to persevere in the mathematics major usually graduate with a low math GPA. On the other hand, community college transfers with very little transfer credit in calculus have a much easier transition to university level mathematics.

In recent years, this department has undertaken several initiatives to improve course delivery for our students. For example, the department initiated a Calculus Enhancement Seminar course (MA 191) that was intended to help community college students to remove deficiencies in their calculus. The course carried three semester hours credit, and it could be taken twice, if needed. A student enrolled in MA 191 would be allowed to attend a regular calculus class and receive 3-hours credit while doing so. During a three-year trial period, only one student actually took advantage of this option. A more successful endeavor at the general education component level involved repackaging MA 100, a credit-bearing remedial course in intermediate algebra, with MA 112, pre-calculus algebra, so that both courses can be taken in one semester on an accelerated basis. After a two year trial period, it is apparent that this approach has merit and that there is sufficient demand to support continuing to offer one MA100/MA 112 accelerated class each semester. We have also found that transition from MA 100 to MA 112 is easier in this accelerated sequence, but students tend to become exhausted by the end of the semester. Still another endeavor has involved the standardization of course content and course assessment in MA 100. Each semester the department offers about 14 sections of MA 100. These sections are currently taught by adjunct faculty, non-tenure-track faculty, and tenured faculty. For the past two years, the department has tasked a MA 100

Oversight Committee composed of current MA 100 teachers to oversee the delivery of MA 100.

With regard to student advisement, the departmental goal is to provide advisement and guidance for mathematics majors including majors who are also pursuing certification to teach secondary mathematics, computer science majors, and pre-professional engineering majors. The department is conscientious about helping majors to plan their programs of study, to prepare their semester schedules, and to plan their transition to post-undergraduate endeavors as graduation approaches. Advisement for pre-professional engineering students includes planning for a smooth transition from UNA to the intended professional engineering school while also building a strong program at UNA in the event that the student chooses to remain at UNA. Advisement is conducted in a one-on-one format. Each major has an assigned faculty advisor. Advisement is mandatory.

- **Outcome information including student performance on licensure/certification exams, job placement of graduates, student, alumni and employer surveys**

Graduates in computer science have no problem becoming employed in the field especially when they are willing to leave this area. CS graduates with strong GPA's in computer science usually find employment in CS at higher starting salaries than the current salaries of their CS professors. Many of our CS graduates are employed in Huntsville. Mathematics graduates who enter the teaching profession at the secondary level are readily employed. Mathematics graduates who do not pursue certification at the secondary level usually either enter graduate school to pursue graduate study in mathematics or a mathematics-related area or find employment in a government/industry applied mathematics/statistics position.

3. Assess the department as it relates to faculty

Related department goals are as follows:

- to offer strong academic programs in mathematics and computer science
- to offer a strong component of general studies work designed to provide a diverse educational background and a suitable foundation for specialized study.
- to offer the teaching field component for a graduate program in mathematics education.
- to promote excellence in the quality of instruction
- to promote faculty development by encouraging participation in research, attendance at professional meetings and seminars, and taking of appropriate graduate courses

In March of 2007, this department adopted a set of evaluative criteria that will be used to guide departmental evaluation of faculty performance with regard to teaching effectiveness, scholarly activity, and professional service. The process of development for this policy spanned two years. The underlying motivation was to establish a credible basis for the evaluation activities that our tenured faculty undertake as required by the Faculty Handbook. The opening paragraph of our evaluative criteria document states, “This policy is intended to serve as a shared governance document whereby the tenured faculty in the Department of Mathematics and Computer Science, the Department Chair, and the Dean of the College of Arts and Sciences shall jointly engage in a process of faculty evaluation for tenure, promotion, or reappointment purposes. The initial adoption of this document was based on consensus of the tenured faculty and concurrence of the Department Chair, the Dean of the College of Arts and Sciences, and the Vice President for Academic Affairs and Provost.” This document is available in downloadable form on the department’s website under Faculty.

- **Teaching productivity and activities designed to enhance teaching and the curriculum**

Faculty members in this department have been actively involved, as appropriate, in planning and managing the department’s programs for the mathematics major, the computer science major, the general education mathematics component, and the service program that extends beyond the general education component. Faculty members who are routinely involved with the mathematics major strive to maintain a program that compares favorably with programs in peer institutions. In a general sense, these faculty members have, by necessity, always been concerned about student learning outcomes in the mathematics major; however, recent emphasis on student learning outcomes has led to the identification of specific learning outcomes that are critical to the major. Similar comments hold for the faculty members who are closely involved with the computer science major. Furthermore, computer science faculty are also engaged in evaluating and revising the CS program to comply with requirements for ABET accreditation.

Faculty activities related to the general education mathematics component have focused on standardizing curriculum and assessment in multiple section courses. Two years ago, the department established a MA 100 Oversight Committee (MA 100, Intermediate Algebra, is a pre-general studies credit bearing remedial class that many of our entering freshmen take before taking a general education component mathematics course.). The charge to this committee involved standardizing across sections of MA 100, Intermediate Algebra, with regard to curriculum and assessment. Today, the midterm and final exams are standardized with the midterm and final exams counting 20% and 30%, respectively, of the final grade.

After two years of experience with oversight activities in MA 100, the department has now added comparable oversight committees in MA 105, MA 110, and MA 112. These committees consist of faculty members who are currently teaching these courses. Since these courses are multi-section courses, each committee has begun to address issues involving standardization in course content and course assessment. The MA 110 and MA 112 Oversight Committees are also charged with assessment of student learning outcomes associated with the mathematics portion of the Area III General Education Component. To this end, assessment tools for both MA 110 and MA 112 have been developed, and these tools will be implemented and evaluated during the spring of 2009.

Faculty activities in relation to service courses beyond the general studies component courses have generally involved ensuring that our courses are comparable to the courses that are offered by peer institutions. Since these courses tend to be multiple section courses with a relatively small number of sections, standardization has not been a significant issue. On the other hand, MA 306, Mathematics for the Elementary School Teacher, has been a course where improvements in curriculum content and course objectives were obviously needed. About three years ago, this department started the process of improving our MA 306 course offering by critically examining curriculum content for successful programs at peer institutions, by investing in up-to-date hands-on materials for the course, and by opening channels of communication with the Department of Elementary Education. Recently, the department's Elizabeth Gaines Mann Professorship was awarded to a faculty member who devoted her associated release time to improving MA 306. The department has also established a MA 306 Oversight Committee to continue departmental efforts to improve this service course.

Faculty ownership of departmental programs has been a primary consideration in the establishment of oversight committees. This mission of this department is too broad for any one person, including the department chair, to keep track of all programs. Therefore, shared governance and faculty ownership of programs are essential ingredients to offering high quality programs. Consequently, issues involving a departmental program are referred to the appropriate committee and recommendations for change are originated by the committee. Current standing program-related departmental committees include: the Faculty Evaluation Advisory Committee, the Computer Science Committee, the Mathematics Major Committee, the Math 100 Oversight Committee, the Math 105 Oversight Committee, the Math 110 Oversight Committee, the Math 112 Oversight Committee, and the MA 306 Oversight Committee.

With regard to usage of new technology, three mathematics faculty members have found constructive ways to utilize new technology in the classroom. Ms. Katie Motlow, Instructor in Mathematics, is in the process of developing lectures for a MA 105 online class. She is learning the software, Captivate, in order to develop these lectures. If she is successful in this project, then the department will begin to offer an online course as a different form of course delivery for MA 105. Furthermore, if this endeavor proves to be worthwhile, then we will be more open to the possibility of offering an online version of MA 100 or MA 110 or MA 112. Ms. Karen Driskell, Instructor in Mathematics, used Sympodium and Tegrity to record a MA 100 class during the fall of 2008 and is in the process of recording a MA 099 class during the spring of 2009. These videos have been made available to her students through the class homepage on WebCT/Blackboard. During the fall of 2007, she began using a document camera in two of her classes, and beginning with the spring of 2008, she has been using a document camera in all of her classes. At an appropriate time, the department will probably encourage her to give one or more seminars to share her experiences with this technology. Mr. Jay Jackson, Instructor in Mathematics, has developed power point presentations for use in his MA 105 classes. Of course, computer science faculty members routinely employ technology in the classroom in various forms.

During the last five years, several members of this department have attended professional meetings that were directed toward teaching activities and professional development. Ms. Karen Driskell, Instructor in Mathematics, attended the National Association for Development Education annual conference in March of 2007 while Dr. Cindy Stenger, Associate Professor of Mathematics, participated in an invitation only conference, The Future of High School Mathematics: New Priorities and Promising Innovations, in September of 2008. In January of 2009, Dr. Stenger attended the joint meetings of AMS and MAA in Washington, D.C. Ms. Jayne Prude, Assistant Professor of Mathematics, attended two national conferences sponsored by NCTM (National Council of Teachers of Mathematics - Atlanta, GA in 2007 and Salt Lake City, Utah in 2008) in order to participate in workshops that covered all areas of teaching mathematics from elementary school through college pre-service mathematics classes. Dr. Janet Jenkins, Instructor in Computer Science, attended the ABET Commission Summit for Computing in October of 2008.

The department has also participated in several learning community endeavors. Ms. Katie Motlow taught in a learning community during the fall of 2008 involving MA 112 and EN 111. Ms. Karen Driskell taught in learning communities during the fall semesters of 2007 and 2008. These learning communities involved MA 100 or MA 112 paired with EN 111. During the fall of 2008, she used Winning at Math during her portion of the 1-hour LC course to help her students in the development of study skills.

Research productivity

The associated departmental goal is "to promote faculty development by encouraging participation in research, attendance at professional meetings and seminars, and taking of appropriate graduate courses ".

Given the degree of commitment that is necessary for conscientious faculty members to deliver quality courses in mathematics and computer science, it is commendable that individuals in this department have been able to complete doctoral coursework and/or to publish scholarly papers in their fields of expertise while carrying 12- or 13-hour loads. It should also be noted that the university has helped to facilitate several of these scholarly endeavors through judicious use of release time and leaves of absence when requested.

Beginning with the 2003-2004 academic year, this department has invited applications for the Elizabeth Gaines Mann Professorship in Mathematics. This endowed professorship recognizes outstanding teachers in the Department of Mathematics and Computer Science. It includes both a 3-hour course load reduction and a stipend to support scholarly activity. Recipients of this award include Dr. Cindy Stenger, Associate Professor of Mathematics, (2003-2004), Ms. Patricia Roden, Assistant Professor of Mathematics, (2004-2005), Dr. Gary Childs, Associate Professor of Mathematics, (2005-2006), Ms. Jayne Prude, Assistant Professor of Mathematics, (2006-2007), Ms. Jean

Henderson, Assistant Professor of Mathematics, (2007-2008), and Dr. Cindy Stenger, Associate Professor of Mathematics (2008-2009) .

Degrees

During the past two years, five members of this department have been awarded the doctoral degree as follows:

Dr. Jason Briley, Assistant Professor of Mathematics, received his doctorate in Secondary Mathematics education from the University of Alabama in Tuscaloosa in December of 2007. His dissertation was entitled, "*An Investigation of the Relationships among Mathematical Beliefs, Self-Regulation, and Achievement for University-Level Mathematics Students.*"

Dr. Jean Henderson, Assistant Professor of Mathematics, received her Ph.D. in Computer Science Education from Florida Institute of Technology in Melbourne, Florida in December of 2007. Her dissertation was entitled "*Restructuring the CS 1 Classroom: Examining the Effect of Open Laboratory-based Classes VS. Closed Laboratory-based Classes on Computer Science 1 Students' Achievement in and Attitudes toward Computers and Computer Courses.*"

Dr. Janet Truitt Jenkins, Instructor in Computer Science, was awarded a Ph.D. in Computer Science from the University of Alabama in Tuscaloosa in August of 2008. The title of her dissertation was "*Increasing Emphasis of Non-Functional Requirements throughout the Software Process.*"

Dr. Miranda Roden Bowie, Assistant Professor of Mathematics, received a Ph.D. in Applied Mathematics from the University of Alabama in Huntsville in December of 2008. Her dissertation was entitled "*Liars Domination and the Domination Continuum*."

Dr. Patricia Roden, Assistant Professor of Computer Science (and Mathematics), was awarded her Ph.D. in Computer Science from the University of Alabama in Huntsville in December of 2008. Her dissertation was entitled "*An Examination of Stability and Reusability in Highly Iterative Software*."

Publications

Mr. David Cope

Cope, D.D., "Disability Law and Your Classroom," *Academe*, November, 2005.

Cope, D.D., "The Courts, the ADA, and the Academy," *Academic Questions*, September, 2006.

Dr. Janet Truitt Jenkins

P.G. Bradford, B.M. Grizzell, G.T. Jay, J. Truitt Jenkins: ``Pragmatic Security for Constrained Wireless Networks", Chapter 4 in Security in Distributed, Grid, and Pervasive Computing, edited by Yang Xiao, Auerbach – Taylor & Francis, 69-86, 2007.

Dr. Patricia Roden

Roden, P.L., Virani, S., Etzkorn, L.H., Messiner, S., "An Empirical Study of the Relationship of Stability Metrics and the QMOOD Quality Models over Software Developed Using Highly Iterative or Agile Software Processes," Seventh IEEE International Working Conference on *Source Code Analysis and Manipulation, 2007, SCAM 2007*, September 30-October 1, 2007, pp171-179.

Roden, P.L., Etzkorn, L.H., Virani, S., Messiner, S., and Vinz, B., "A Validation of the Entropy-based SDI_eMetric," Proceedings of the 11th IASTED *International Conference on Software Engineering and Applications,* November 19-21, 2007, pp 57-65.

Virani, S., Messiner, S., Roden, P.L., and Etzkorn, L.H., "Software Quality Management Tool for Engineering Managers," *Proceedings of the Industrial Engineering Research Conference,* May 17-21, 2008, pp. 1401-1406.

Virani, S., Messiner, S., Etzkorn, L.H., and Roden, P.L., "Proposed Solutions to Software Product Quality Estimation Issues," Paper accepted for the IERC 2009 Conference.

Dr. Cynthia Stenger

Arnon, I., Dubinsky, E., Stenger, C., Weller, K., Vidakovic, D. Thinking Processes of GCM: A cognitive inquiry. *Abstract, in the proceedings of the 5th International Conference on Creativity in Mathematics and the Education of Gifted Students in Haifa, Israel February, 2008, p. 73.*

Stenger, C., Weller, K., Arnon, I., Dubinsky, E., Vidakovic, D. (2008). A Search for a Constructivist Approach for Understanding the Uncountable Set P(N). *Revista Latinoamericana de Investigación en Matemática Educativa,* Volume 11(2008).

Dubinsky, E., Weller, K., Stenger, C. and I., Vidakovic, D. (2008). Infinite Iterative Processes: The Tennis Ball Problem. *European Journal of Pure and Applied Mathematics,* 1(1), 99-121.

Dubinsky, E., Weller, K., Brown, A., McDonald, M., Stenger, C. (2008). "Intimations of Infinity", Notices, American Mathematical Society, 51(7), 741-750.

Stenger, C., Weller, K., Vidakovic, D. and Arnon, I. "Where did the tennis balls disappear to? Things you can see from over there, behind infinity, you can not see from here." Abstract in the proceedings of the 2005 yearly conference of the mathematics teachers of Israel, p. 18.

Presentations

Dr. Gary Childs presented a paper on "*Solutions of Differential Equations Using Hypergeometric-type Functions*," at the National Mathematics Meetings in San Antonio, Texas, in January of 2006.

Dr. Patricia Roden attended and presented a paper at the Seventh IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM) 2007.

Dr. Patricia Roden presented a paper at the IASTED International Conference on Software Engineering and Applications (SEA) 2007.

Dr. Cindy Stenger was one of seven contributing authors on Paper Presentation, *Thinking Processes of GCM: A cognitive inquiry*. The 5th International Conference on Creativity in Mathematics and the Education of Gifted Students, Haifa, Israel, February 24-28, 2008.

Dr. Cindy Stenger was one of three contributing authors on Paper Presentation, *Students' Conception of Infinite Iteration: A follow-up study*. RUME 2005. Phoenix, AZ. 2005.

Dr. Cindy Stenger. Paper Presentation, "*Students Conceptions of the Natural Numbers in a Problem Involving Infinite Iteration, Part I.*" Southeastern Sectional Meeting of the Mathematical Association of America. Clarksville, TN. 2004.

Dr. Cindy Stenger. Paper Presentation, "*Students Conceptions of the Natural Numbers in a Problem Involving Infinite Iteration, Part II.*" Southeastern Sectional Meeting of the Mathematical Association of America. Clarksville, TN. 2004.

Dr. Cindy Stenger. Paper Presentation, "*Improving Mathematical Thinking Through Involvement in a Cooperative Research Project.*" Mathfest 2002. Burlington, VT. 2002.

Dr. Cindy Stenger. Paper Presentation, "*A Characterization of Differentiating Mathematical Thinking Skills and Views in Immature Undergraduates Before and After a Cooperative Research Project.*" RUME 2002. Burlington, VT. 2002.

- **Service, including service to public schools**

Every faculty member in the department is serving on at least one of the following standing committees: Faculty Evaluation Advisory Committee, Computer Science Committee, Mathematics Major Committee, Preview Day Committee, Math 100 Oversight Committee, Math 105 Oversight Committee, Math 110 Oversight Committee, Math 112 Oversight Committee, and the MA 306 Oversight Committee. In addition, Tom Center and Janet Jenkins are serving as faculty advisers for our student chapter of ACM. In his capacity as advisor to our ACM student chapter, Mr. Center took two student programming teams to the ACM Southeastern Programming Competition that was held at the University of South Alabama (Mobile, AL) in 2007, and in 2008, he took one team to the ACM Mid-Central Programming Competition held at Tennessee Tech University in Cookeville, TN.

The department also has substantial involvement in university service beyond the department. Phil Robinson, Pat Roden, and Cindy Stenger represent our department in the Faculty Senate. Dr. Stenger is serving on the Faculty Senate Constitution Review Committee. Dr. Jason Briley and Mr. Chuck Shull serve as faculty mentors in the Academic Resource Center. Faculty participation on other university committee includes the following: University Committee on Discipline – Dr. Janet Jenkins and Ms. Katie Motlow, Human Subjects Committee - Dr. Cindy Stenger, Teacher Education Council – Dr. David Muse and Dr. Cindy Stenger, Arts and Sciences Research Awards Committee – Dr. Eddy Brackin, Shared Governance Infrastructure Committee – Dr. Pat Roden and Dr. Phil Robinson, ADA Committee – Mr. David Cope, Faculty Senate Secretary – Dr. Pat Roden, Faculty Athletics Representative to the NCAA – Dr. Pat Roden, Athletic Committee – Dr. Pat Roden, Shared Governance Academic and Student Affairs Committee – Dr. David Muse, Faculty Senate Academic Affairs Committee – Dr. David Muse, the General Education Assessment Advisory Committee - Dr. David Muse, and Chair Ad hoc Committee on Faculty Senate Constitiution Review – Dr. Pat Roden. Dr. Patricia Roden also serves: as Faculty Representative on the Executive Board of the National Alumni Association, as Alumni of the Year Committee member, as Festival of Trees Committee member, and as Faculty Advisor, Campus Relations advisor and Financial Advisor for Alpha Gamma Delta Sorority.

Other service activities of departmental faculty members include the following:

Mr. David Cope

- Conducted an extensive review and analysis of federal court decisions relating to the Americans with Disabilities Act, in an effort to assess whether the practices of our Disability Services Office were consistent with the legal standards for disability accommodation as interpreted by our courts.
- Conducted an extensive review and analysis of federal and state laws relating to the Clean Water Act, in an effort to assess whether the preliminary permit issued by the Alabama Department of Environmental Management (ADEM) for a sewage disposal facility in Lauderdale County was consistent with applicable environmental law.
- Made a presentation in a public hearing held by ADEM in March of 2008 in which we presented evidence that the preliminary permit issued by this agency was not legally defensible. After considering the testimony presented at this public hearing, ADEM declined to issue final approval for this permit, and the permit request was withdrawn.
- Is a member of the ADA Committee, which reviews the clinical documentation provided by a student seeking disability accommodations in order to assess whether the requested accommodations are warranted.

Dr. Janet Truitt Jenkins

- Made a computer science presentation to college bound math students at Lexington High School in the fall of 2008.

Dr. David Muse

- During the December break of 2005, Dr. David Muse, Professor of Mathematics, served as the external examiner of a doctoral thesis for International Islamic University Malaysia in Kuala Lumpur, Malaysia. He examined the thesis entitled "Teachers' Achievement in Problem Solving and Metacognitive Thinking Strategies Among Undergraduate Calculus Students" by Br. Logendra A/L Stanley Ponniah, a 1995 UNA mathematics alumnus.

Dr. Patricia Roden

- Reviewed a paper for *The International Journal of Computers and Applications*: "Implementing a Hybrid Object-Oriented Framework Documentation Approach."

➢ **Faculty development plans**

Dr. Janet Truitt Jenkins is continuing to work weekly with a group from the University of Alabama – Tuscaloosa on research involving Non-Functional Requirements.

Ms. Katie Motlow is working on a Ph.D. in Statistics from the University of Alabama – Tuscaloosa.

Mr. Jay Jackson is planning to begin working toward a doctorate in mathematics or a mathematics-related area.

4. Assess the department as it relates to facilities and resources

Address the adequacy of resources and support services to address the goals and objectives of the program.

Department goals are as follows:

- to offer strong academic programs in mathematics and computer science
- to offer a strong component of general studies work designed to provide a diverse educational background and a suitable foundation for specialized study.
- to offer the teaching field component for a graduate program in mathematics education.
- to promote excellence in the quality of instruction
- to promote faculty development by encouraging participation in research, attendance at professional meetings and seminars, and taking of appropriate graduate courses

➢ **Library**

Library resources are adequate for our programs both with regard to teaching and with regard to some aspects of faculty development.

- **Laboratories**

The department has a computer laboratory located in MAB 7, and a smart classroom located in MAB 10. The lab is utilized primarily for CS 110, Introduction to Computers, and also for other CS classes as needed. The smart classroom is dedicated to the CS program. These facilities are adequate for our needs.

- **Equipment**

Since the relevance of the CS program, is directly related to the quality of supporting technology, our primary concern is that the hardware in MAB 7 and 10 be replaced as early as feasible. Equipment in other mathematics/computer science classrooms is largely limited to computers and projectors. Two of our classrooms also feature a Sympodium and Tegrity.

Another issue involves the adequacy of white boards. We have found that white boards are especially sensitive to variations in room temperature. More specifically, cold white boards will not erase. While we are certainly aware that chalk boards and computer equipment are not a good working combination, it has also become crystal clear that our teaching mission involves a whole lot more than simply having acceptable compatibility between board utilization and computer technology.

- **Space**

Space is not adequate for the Department of Mathematics and Computer Science. Our adjunct faculty members have no assigned office space. We are utilizing every office that we have to accommodate regular faculty. We are also short of classroom space. Every classroom is being fully utilized each day until two o'clock in the afternoon. We are also utilizing classrooms in Stevens Hall and Bibb Graves Hall when available. In addition, some classrooms and offices in the Mathematics Building tend to be too cold in the winter and too warm in the summer.

- **Support personnel**

The department has one full-time academic secretary and one student lab worker. These support personnel are adequate for the current needs of this department.

5. List any notable achievements by the department

- **Departmental achievements**

A number of departmental achievements have already been noted in this report as follows:

- Developmental of departmental evaluative criteria for reappointment, tenure, and promotion – Tenured faculty members have established a credible basis for assigning ratings of “Excellent”, “Favorable”, Satisfactory”, and “Unsatisfactory” in regard to effectiveness in teaching, research and scholarly activity, and university service.

- Oversight of multiple section service courses – The department has taken a major step toward shared faculty governance of the pre-general studies and the general studies mathematics component of our mathematics service curriculum. As indicated above, this department has responsibility for five program areas, four of which are rather substantial. We recognize that substantial faculty involvement in these four areas is important for continued success of our programs.
- Recent Doctoral Degrees – The department is fortunate to have five faculty members completing their doctorates in the last two years. The department has made a substantial commitment of resources to assisting faculty members in their professional development. We expect to continue to do so where possible.
- Elizabeth Gaines Mann Professorship – The department is also fortunate to have an endowment that enables us to award the Elizabeth Gaines Mann Professorship on an annual basis. Recipients of this award are allowed to use the proceeds to purchase release time for professional development and/or to directly fund their scholarly activities.

➢ **Student achievements**

The primary student achievement for majors in mathematics and computer science involves their success upon graduation. Students who do well in our program have no difficulty finding employment or moving on to graduate school endeavors. Many of our graduates in computer science move on to well paying jobs in industry or government. Our graduates in mathematics who are also certified to teach have no difficulty finding employment at the secondary level, especially if they are willing to leave this area. Our graduates in mathematics who also have sufficient background in statistics or computer science find that entry level mathematics/statistics/computer science jobs were open to them in industry or government. We also have had a number graduates who have gone on to study successfully at the graduate level. At any given point in time, we are aware of graduate students who are hoping to be able to return to UNA upon graduation as tenure-track faculty members.

➢ **Grants and other funds generated by department**

Nothing of interest to report

➢ **Other awards and distinctions**

Nothing of interest to report

6. **How has the department responded to previous program review recommendations?**

- **Itemize each major recommendation and state the response**

This is the first program review that this department has undergone. Previously, most recommendations for change have originated from within the department because of our awareness of changes that were taking place in comparable departments at peer institutions. Recommendations for change have also originated because of changes in state or university requirements. In the past, this department has been quite aware that change is sometimes necessary, and recommendations for change, however they were originated, have been carefully considered. If a recommendation was deemed to have merit, then appropriate well-considered change was undertaken. This department continues to be open to change whenever a recommendation for change is able to withstand close but careful scrutiny.

- **Summarize how previous program review results have been used to inform any of the following that apply: The refinement of mission and goals/ objectives; program planning, development and improvement; and budgeting decisions.**

This is the first program review that this department has undergone.

7. State the vision and plans for the future of the department

Any statement of vision and plans for the Department of Mathematics and Computer Science should probably begin with a realistic description of the teaching mission of this department. The department is currently involved in at least seven program areas. These program areas include pre-general studies mathematics, lower level general studies mathematics, general studies computer science, the mathematics major, the computer science major, the post-general studies mathematics service component, and the graduate education mathematics service component. The courses offered within this department may be grouped by area as follows:

1. Pre-General Studies Mathematics – MA 099, 100 and 105
2. Lower Level General Studies Mathematics – MA 110 and MA 112
3. General Studies Computer Science – CS 110 and CS 120
4. The Mathematics Major – MA 115, 125, 126, 227, 238, 325, 345, 355, 421, 431, 437, 445, 447, 448, 451, 461, and 471
5. The Computer Science Major – CS 155, 245, 255, 310, 311, 355, 360, 315, 325, 335, 390, 410, 420, 421, 447, 455, and 470
6. Post-General Studies Mathematics Service Component – MA 113, 121, 122, 147, 181H, 306, and 425
7. Graduate Education Mathematics Service Component – MA 537, 547, 551, 571, 601, 611, 612, 615, 617, 621, 623, and 625

Clearly, faculty expertise, student demand, student potential, curriculum considerations, and likely university support must all play a role in articulating a vision for this department. For example, faculty with considerable training in computer science should be teaching computer science; faculty members with strong backgrounds in statistics should be teaching the department's statistics courses; faculty with backgrounds in mathematics education and/or considerable experience teaching mathematics in public schools should be involved in the graduate component and undergraduate post-general studies education service courses; and faculty with a strong interest in teaching lower level mathematics service course should be teaching in program areas 1 and 2.

Student demand for services offered by this department are largely directed toward program areas 1 and 2. For many of these students, MA 110 or MA 112 will be their terminal course in mathematics. Some MA 110 and MA 112 students will continue on to take a statistics course, usually MA 147, Elementary Statistics. Some MA 112 students will continue on to MA 113, Pre-Calculus Trigonometry, or MA 121, Applied Calculus I, or MA 345, Applied Statistics I. Consequently, credit hour production associated with serving our majors is relatively low, while credit hour production directed toward serving our non-majors is substantial.

Student potential is another matter. It is a sad reality that about 70% of our incoming freshmen are so deficient in mathematics background as indicated by their ACT scores in mathematics that remediation at the high school Algebra I level or below is necessary. Indeed, MA 100, Intermediate Algebra, is largely equivalent to high school Algebra I. Another sad reality is that in recent years, the pool of students that UNA has recruited is substantially under-represented insofar as the percentage of students who have a strong potential to succeed in a mathematics or computer science major is concerned. More specifically, about 9% of high school graduates nationwide have sufficient mathematics background to begin with MA 125, Calculus I, but only about 3% of UNA's incoming freshmen meet this requirement. Could it be that the better prepared high school students perceive UNA to be a poor academic choice because of our relaxed admission standards? Could it be that the best high school students have branded UNA as a school of last resort because we admit and graduate students who they recognize to be academically weak? Yet another sad reality involves the under-preparedness of community college transfers in mathematics or computer science. Under the Statewide Articulation Agreement, these students must be given university credit for mathematics courses taken in a community college that are critical to success in these majors, and yet the necessary preparation, especially in calculus, is usually lacking.

Curriculum considerations within each area are generally up to date. The department is conscientious about identifying and attempting to address issues that involve curriculum.

In general, university support for this department has been quite good. Since the number of fulltime faculty has increased in recent years, the department has begun to reduce class sizes in lower level mathematics service courses. The likely consequences of proration are a matter of considerable concern. For example, on August 1, 2009, Dr. Gary Childs, Associate Professor of Mathematics, will retire. Because of proration, the department has requested that this faculty line be retained but not filled until funds become available. It is likely that several additional retirements will occur in the near future. Indeed, it is quite conceivable that as many as ten of the twelve tenured members of this department will retire within the next five years. While we do not wish to forego filling other faculty lines that may become vacant, we recognize that current economic realities could trump critical department goals. This department chair believes that budget constraints are likely to severely limit departmental options for several years to come.

The reality is that this department will continue to make effective use of its available resources.

- **Provide a vision statement of where the department would like to be in five years; assuming only costs to continue, with no additional state resources**

Five years from now, this department is likely to be doing many of the same things that we are doing now. Our goals will continue to be directed toward graduating quality majors in mathematics and computer science, helping students satisfy their general studies mathematics and computer literacy requirements, providing post-general studies service courses, and working with graduate-level secondary mathematics education students.

With regard to faculty, the department will continue to rely on adjunct faculty to enable us to lower class enrollments in general studies and pre-general studies mathematics courses by offering more sections. As indicated above in Section 1, having a lower enrollment in these classes is desirable because it helps to foster effective teacher-student interaction which is a critical element for student success. The department will also continue to rely on non-tenure-track faculty to teach many sections of general studies and pre-general studies mathematics. The department will need to resolve how adjunct faculty and non-tenure-track faculty will be allowed to participate in departmental governance. Clearly, these faculty members make a large contribution toward the success of departmental programs. Where possible, these faculty members should also share in the ownership of these programs.

Promotion and tenure issues will probably continue to be areas of considerable concern in this department. The department has developed evaluative criteria that guide our recommendations for promotion and tenure and also give notice to candidates that substantial evidence of accomplishment will be necessary before favorable recommendations will be forthcoming. The fact remains, however, that conscientious teachers of mathematics and computer science must necessarily choose to sacrifice effectiveness in teaching in order to excel in research unless considerable release time is granted at critical times. The department would benefit considerably if two or more tenure/promotion tracks were available for faculty at UNA. Many of our faculty would probably opt for a track that places a stronger emphasis on teaching with considerably less emphasis on scholarly activity. On the other hand, faculty members in this department understand that strong evidence of scholarly activity is essential for creating an attractive portfolio in the event that a position at another university becomes desirable.

With regard to the feasibility of launching a graduate program in mathematics or computer science during the next five years, it is unlikely that a program in either area could materialize for several reasons. First, UAH has a strong competing interest, and we would probably have considerable difficulty in overcoming their substantial objections. Second, mathematics teachers in this region would probably be our main draw for graduate students in mathematics. It is much easier for these teachers to complete a master's degree in secondary education than it would be to complete a graduate degree in mathematics. Given our current pool of potential students, it is highly unlikely that graduate classes in mathematics would even make. Third, the available pool of potential graduate students in computer science appears to be too small to support a graduate program in computer science.

The computer science faculty are in the process of assessing the feasibility of pursuing ABET accreditation in computer science. If their assessment is favorable, then the department will probably pursue ABET accreditation in computer science. In this event, we would like to have an accredited CS program within the next five years.

The department will continue to look for ways to improve student success in our pre-general studies and lower-level general studies mathematics courses. It may be feasible to make other forms of course delivery available. It may be possible to improve student retention by requiring the most at-risk mathematics students to delay their enrollment in a mathematics course until their second or third semester at UNA. If, in fact, lack of academic maturity is a major cause of student attrition in these courses, then advising these students to begin their university experiences with a mathematics course could be a major mistake. Furthermore, the limited resources of this department might be better utilized if they are focused on students who have already made strong commitments to getting a university education.

- **Provide a vision statement of where the department would like to be in five years, if additional state resources are available**

In addition to the above considerations, the department is aware that it may be feasible to develop a program, perhaps a practicum or internship, where mathematics majors who are also pursuing secondary certification would play an integral role in our general studies and pre-general studies mathematics programs as teaching assistants/tutors. The department would have to develop a clear picture of how this program would operate and what it would accomplish both for these students and for the general studies/pre-general studies mathematics programs. If the program could be justified, then the department would need additional funds to remunerate these students.

8. Program Overview

- **Brief overview of all programs**

As indicated above under Section 7, the programs of this department may be grouped into seven areas. Each area supports the general university goal – to offer high quality programs. These areas together with associated courses are repeated below for convenience:

1. Pre-General Studies Mathematics – MA 099, 100 and 105
2. Lower Level General Studies Mathematics – MA 110 and MA 112
3. General Studies Computer Science – CS 110 and CS 120
4. The Mathematics Major – MA 115, 125, 126, 227, 238, 325, 345, 355, 421, 431, 437, 445, 447, 448, 451, 461, and 471
5. The Computer Science Major – CS 155, 245, 255, 310, 311, 355, 360, 315, 325, 335, 390, 410, 420, 421, 447, 455, and 470
6. Post-General Studies Mathematics Service Component – MA 113, 121, 122, 147, 181H, 306, and 425
7. Graduate Education Mathematics Service Component – MA 537, 547, 551, 571, 601, 611, 612, 615, 617, 621, 623, and 625

One goal of the Department of Mathematics and Computer Science is to offer strong academic programs in mathematics and computer science. The mathematics and computer science majors are disciplines where knowledge of course content is critical. Mastery of the subject matter in either major is sequential, and failure to master the subject matter at any level will severely limit continued progress in the major. Thus, successful graduates in either major will have the necessary background to work in the field or to continue further study at the graduate level.

A second goal of the department is to offer a strong component of general studies work designed to provide a diverse educational background and a suitable foundation for specialized study. Many of our non-majors will take MA 110, Finite Mathematics, or MA 112, Pre-Calculus Algebra, as their terminal course in mathematics. Non-majors may choose MA 110 because it is a non-algebra alternative that satisfies the general education mathematics component or because it is also a prerequisite to MA 147, Elementary Statistics. Non-majors may choose MA 112 because it is the algebra alternative that satisfies the general education mathematics component or because it is required by their chosen major or because it is a prerequisite to another required course in their program such as MA 113, Pre-Calculus Trigonometry, or MA 121, Calculus for Business and Life Sciences I, or MA 345, Applied Statistics I.

A third goal of this department is to offer a strong mathematics remediation program for students who are not ready to begin with a general studies mathematics course. Since about 70% of incoming freshmen are not qualified to begin with MA 110 or MA 112, based on an ACT math score placement criterion, the department must allocate considerable resources to a pre-general studies mathematics program. Students with ACT math scores below 16 are strongly advised to begin with MA 099, Beginning Algebra. Students at this level are usually very much at risk, and successful completion of MA 099 provides little reassurance that remediation at the next level (MA 100 or MA 105) will be successful. MA 100, Intermediate Algebra, serves as a prerequisite for both MA 110 and MA 112. MA 105, Mathematics for Liberal Arts, offers a better preparation for MA 110 than does MA 100; however, MA 100 is allowed since some students will change their major and need to take MA 110 after having taken MA 100. Students with ACT math scores between 16 and 21, inclusive, are strongly advised to begin with either MA 100 or MA 105.

The department has conducted several studies of student performance in MA 100/105 to investigate whether or not placement criteria might be further refined to better predict student success in these courses. These studies have included ACT math scores, high school mathematics background, teachers and class offering patterns. To date, the only worthwhile predictor that we have been able to identify has been the ACT math score. It now appears that, given the requisite ACT math score, the individual student's determination to succeed is the biggest single factor for success in the mathematics remediation process.

The primary goal of the general studies computer science program is to offer strong computer literacy courses that meet the Area V General Education Component requirement for computer instruction. The computer science faculty is currently engaged in reviewing the course content of CS 110, Introduction to Computers, to make the course more viable as a computer literacy course. This review will also invite input from other departments regarding desirable content for the course. CS 120, Intermediate Computer Topics, also serves to meet the Area V Computer Literacy requirement.

Area 6 features post-general studies mathematics service courses that are directed primarily toward students who require additional training in other mathematical courses. These courses include Pre-Calculus Trigonometry, Calculus for Business and Life Sciences I & II, Calculus I, II, & III, Elementary Statistics (or Applied Statistics I), Mathematics for the Elementary School Teacher, Methods and Materials for Teaching Secondary School Mathematics, and Freshman Honors Seminar. The goal of the department is to offer strong courses in this area such that students are adequately prepared to continue study if further study is needed. For example, many students will find that additional study in applied statistics is required as they continue their professional training. Consequently, students in Elementary Statistics (or Applied Statistics I) should be sufficiently prepared to continue their statistical training regardless of where the second course may be taken.

As a participant in the graduate program offered through the Department of Secondary Education, our departmental goal is to offer the teaching field component for a graduate program in mathematics education. In this regard, the department offers one 600-level course each semester and one or two courses during the summer terms. The direction of these courses is focused on mathematics content in secondary mathematics classrooms. A primary goal involves the development of supplementary materials that may be used to inform and to challenge secondary students. The department also offers a 600-level elective service course for master's level elementary teachers.

The above overview recognizes departmental responsibility in seven program areas. In the discussion that follows, attention will be directed primarily toward three programs -

the computer science major, the mathematics major, and the general education mathematics component. Other program areas will be addressed when appropriate.

- **Mission statement for the program: Reference its relationship to college and institutional mission, as well as state priorities where appropriate**

According to the 2008/2009 Undergraduate Catalog, the institutional mission involves "engaging in teaching, research, and service in order to provide educational opportunities for students, an environment for discovery and creative accomplishment, and a variety of outreach activities meeting the professional, civic, social, cultural, and economic development needs of our region in the context of a global community." In the context of this statement of mission, this department is committed to providing quality educational opportunities for its students, both majors and non-majors. To this end, this department is open to purposeful change in its programs given evidence that such change is likely to benefit the university community, especially our students.

- **Goals and objectives of the program relative to teaching, research and public service, and assessment of program performance in relation to them**

Given the understanding that this item addresses how the goals and objectives of departmental programs complement faculty performance in the three areas of endeavor whereby faculty are evaluated for reappointment, tenure, and promotion, at least three general points are evident. First, realistic assessment of effectiveness in teaching within the context of our programs is a sensitive matter especially since the university's assessment strategies are so closely tied to student evaluations. Many of our students would not choose to take a mathematics course, but they are compelled to take at least one course in order to satisfy either a general education requirement or a specific requirement prescribed by their major. When this fact is coupled with considerable likelihood of under-preparation in mathematics, low student evaluations of faculty teaching effectiveness are a likely outcome in the evaluation process. Indeed, several mathematics faculty members believe that the following two questions should be a part of the student evaluation process: 1) Do you like your teacher? 2) What grade do you expect to receive in this course? Clearly, the responses to these two questions provide a basis for evaluating student perceptions as a measure of teaching effectiveness. Since a primary goal of this department is to offer strong academic programs in mathematics and computer science and student success in these courses depends heavily on preparation and willingness to engage the subject matter, our faculty may fare less well compared to other faculty at UNA insofar as student evaluation of teacher effectiveness is concerned. Consequently, it is not unreasonable to expect a measure of discordance between the goals and objectives of our programs and student perception of teacher effectiveness especially in our lower-level general studies and pre-general studies programs.

Second, mathematics and computer science are two highly-structured, well-defined disciplines where undergraduate program goals and objectives have little influence insofar as complementing faculty research and scholarly endeavors is concerned. In each discipline, there is very little opportunity to develop and introduce "cutting-edge" concepts in the undergraduate classroom. Indeed, scholarly activity that rises to the level of publishable research is generally far beyond undergraduate course content. Many of the mathematical concepts that we teach have been in the literature for hundreds or even thousands of years. For example, algebraic and geometrical concepts go back more than 3000 years to the ancient Babylonians and Egyptians; calculus was invented in the early part of the 17th century; research in abstract algebra extended beyond the undergraduate level more than 100 years ago; and most undergraduate statistical concepts were well developed by the early 20th century. Computer science is a comparatively young field, but the undergraduate curriculum is already highly structured. The undergraduate CS curriculum must necessarily evolve within this structure because available hardware and software technologies are evolving and the market demands CS majors who can utilize these technologies. Furthermore, our computer science faculty depends heavily on ABET accreditation standards for guidance in our CS program. Consequently, it is reasonable to conclude that our mathematics and computer science programs are unlikely to have much impact on faculty endeavors that rise to the level of publishable research. On the other hand, our mathematics and computer science programs may offer several opportunities with regard to research that is pedagogically related.

Third, the goals and objectives of departmental programs may well complement faculty endeavors with regard to effectiveness in service especially as it relates to students. For example, several of our faculty members have undertaken independent studies with senior-level students in mathematics or computer science primarily to broaden the subject matter preparation of these students. This semester, Dr. Bowie is meeting with a graduate student on a regular basis to assist his study of selected topics in Real Analysis. This student has undertaken this special study as a preparation to enter UAH in the fall to pursue a doctorate in applied mathematics. This semester, Dr. Childs is teaching an independent study course in Numerical Analysis, MA 461. Since student success in mathematics and computer science is partially dependent on having accessible teachers, program driven faculty service necessarily includes being available to our students outside of class. Many faculty hold far more than the required seven office hours per week. Furthermore, program driven faculty service also extends to other areas such as involvement in learning communities and development of alternate forms of course delivery where feasible.

- **Student Learning Outcomes of the program: Student learning outcomes should identify in behavioral terms the broad skill area students should master as a result of the program by the time they graduate. *A matrix indicating which courses address each of the outcomes identified may be included***

Computer Science Major Student Learning Outcomes

Statement of Purpose: The goal of the computer science major is to provide students with a solid understanding of the fundamental concepts of the discipline of computer science, provide educational experiences to enhance their analytic, design, and implementation skills for formulating and solving computer problems, and produce graduates who can function effectively and responsibly as computer science professionals.

Student Learning Outcomes: Upon completion of a major in computer science, students will be able to achieve:

1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
3. An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
4. An ability to function effectively on teams to accomplish a common goal.
5. An understanding of professional, ethical, legal, security and social issues and responsibilities.
6. An ability to communicate effectively with a range of audiences.
7. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
8. Recognition of the need for and an ability to engage in continuing professional development.
9. An ability to use the current techniques, skills, and tools necessary for computing practice.
10. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
11. An ability to apply design and development principles in the construction of software systems of varying complexity.

Mathematics Major Student Learning Outcomes

Statement of Purpose: The goal of the mathematics major is to enable students having strong mathematical ability to develop the skills needed to continue the study of mathematics at the graduate level. The undergraduate who succeeds in the mathematics major will also have sufficient training to be qualified to teach mathematics at the secondary level or to work in an entry level mathematics position in industry or government. This means that a qualified mathematics major should be able to demonstrate an appropriate level of achievement in mathematics, to communicate a clear understanding of mathematics, to reason inductively and deductively, and to apply mathematics in a variety of situations.

Student Learning Outcomes: Upon completion of a major in mathematics, students will be able to:

1. Demonstrate an acceptable level of mastery of mathematical skills and concepts.

2. Communicate mathematical ideas with clarity and accuracy in a logical, well organized format.
3. Apply inductive and/or deductive reasoning skills in the development of rigorous mathematical arguments.
4. Draw upon a wide range of mathematical skills in the solution of applied problems.

The above student learning outcomes are each addressed at an appropriate level within each core course required for the mathematics major.

General Education Mathematics Component Student Learning Outcomes

Statement of Purpose: The general studies mathematics component is designed for students to develop the capacity for mathematical thinking and to gain an understanding of its role in solving real-world problems.

Student Learning Outcomes: Upon completion of the general education mathematics component, students will be able to:

1. Use mathematics to solve problems and determine if the solutions are reasonable.
2. Apply mathematical concepts to the solution of real-life problems.
3. Identify connections between mathematics and other disciplines.
4. Use technology, where appropriate, to support mathematical reasoning and problem solving.
5. Apply mathematical and/or basic statistical reasoning to analyze data and graphs.

The above student learning outcomes are each addressed at an appropriate level within each mathematics course that is included in the general education component.

- **Governance structure of the program**

Computer Science Major Program

The Department of Mathematics and Computer Science has primary responsibility for governance of the computer science major program and the general studies computer science program. The Computer Science Major Committee has a major role in the governance process. All computer science faculty members belong to this committee. Recommendations for modifications in the computer science area come through this committee and are normally submitted to the entire department for review and approval before submission to the broader university community. This committee also has responsibility for assessment of student learning outcomes in the CS major.

Mathematics Major Program

The Department of Mathematics and Computer Science has primary responsibility for governance of the mathematics major program. The Mathematics Major Committee has general oversight responsibilities for this program Membership on this committee usually consists of four or five faculty members who regularly teach courses in the mathematics major. Recommendations pertaining to the mathematics major come through this committee for consideration by the entire department. Proposals that are approved by the entire department are then implemented or submitted to the broader university community as appropriate. This committee also has responsibility for assessment of student learning outcomes in the mathematics major.

General Education Mathematics Component Program

The Department of Mathematics and Computer Science has primary responsibility for governance of the general studies mathematics component program. The following courses satisfy the mathematics requirement in the General Education Component Program.

MA 110. Finite Mathematics – 3 hours.
MA 112. Pre-calculus Algebra – 3 hours.
MA 113. Pre-calculus Trigonometry – 3 hours.
MA 115. Pre-calculus Algebra and Trigonometry – 4 hours.
MA 125. Calculus I – 4 hours.
MA 126. Calculus II – 4 hours.
MA 227. Calculus III – 4 hours.
MA 237. Linear Algebra – 3 hours.
MA 238. Applied Differential Equations I – 3 hours.

Since most students take MA 110, Finite Mathematics, or MA 112, Pre-calculus Algebra, to satisfy their general education component requirement, assessment of general education mathematics learning outcomes is directed toward students in these courses. A small group of students earn general education mathematics credit at UNA without taking either MA 110 or MA 112. Usually, these students begin their general education mathematics with MA 125, Calculus I, or a MA 125 prerequisite other than MA 112 such as MA 113, Pre-Calculus Trigonometry, or MA 115, Pre-calculus Algebra and Trigonometry. Typically, MA 125 students are mathematics majors, computer science majors, or majors from other areas where MA 125 is a requirement for their program of study. Since success in MA 125 requires mastery of pre-calculus algebra at the MA 112 level, it follows that further assessment of mathematics learning outcomes for this small group of students can be more appropriately addressed within their individual programs of study, if needed.

The MA 110 Oversight Committee and the MA 112 Oversight Committee have general oversight responsibilities for MA 110 and MA 112, respectively. Membership on each of these committees consists of those faculty members who are currently teaching the course. The oversight committee for each course has responsibility for assessment of the previously identified student learning outcomes.

- **Admissions requirements (including limited access requirements if applicable)**

There are no special admissions requirements other than UNA's current admission standards for programs in the Department of Mathematics and Computer Science. It should be noted, however, that mathematics placement is based on a student's level of mathematics preparation as indicated by the ACT math score.

- **Degree requirements (including limited access requirements if applicable)**

Computer Science Major Program

Degree requirements for the Computer Science major include 42 semester hours of major core requirements beginning with CS 155, Computer Science I. Prescribed supporting courses for this major consist of 14 semester hours of mathematics including MA 125, Calculus I, MA 126, Calculus II, MA 345, Applied Statistics I, and MA 431, Advanced Linear Algebra.

Mathematics Major Program

Degree requirements for the Mathematics Major include 36 semester hours of major core requirements beginning with MA 125, Calculus I. Computer Science I, CS 155, is a prescribed supporting course for all mathematics majors. Prescribed supporting courses for mathematics majors who are also pursuing secondary certification consist of 7-9 semester hours of mathematics including MA 425, Materials and Methods for Teaching Secondary Mathematics, and either MA 112, Pre-Calculus Algebra, and MA 113, Pre-Calculus Trigonometry, or MA 115, Pre-Calculus Algebra and Trigonometry.

General Education Mathematics Component Program

The General Education Component requirements for an undergraduate degree at UNA include at least 3 semester hours of credit in a general studies mathematics course.   The general studies mathematics courses are: MA 110, MA 112, MA 113, MA 115, MA 125, MA 126, MA 227, MA 237, or MA 238.

- **Curriculum (including common prerequisites)**

Computer Science Major Program

Major Core Requirements (Prerequisites are shown in parentheses):
CS 155 - Computer Science I (CS 120 and MA 112 or departmental approval)
CS 245 - Introduction to Discrete Structures (CS 155 and MA 112)
CS 255 - Computer Science II (C or better in CS 155)

CS 310 - Computer Organization and Assembly Language Programming (CS 245)
CS 311 - Computer Architecture (CS 310)
CS 355 - Data Structures and Algorithms (CS 255)
CS 360 - Computer Networking (CS 245 and CS 255)
CS 410W - Programming Languages (CS 255)
CS 420 - Operating Systems (CS 310 and CS 355)
CS 421 - Automata Theory and Compiler Construction (CS 355)
CS 447 - Theory and Application of Database Systems (Corequisite: CS 355)
CS 455 - Software Engineering (CS 355)
CS 470 - Artificial Intelligence (Corequisite: CS 355)
A Computer Language Elective Course:
CS 315 – Graphical User Interface Programming (CS 255)
or CS 325 – Programming for the Web (CS 255)
or CS 335 – New Developments in Programming (CS 255)
or CS 390 – Software Development in Ada (CS 255)
(Each of the above courses is a 3 semester hour course.)

Prescribed Supporting Courses for the computer science major are listed above under degree requirements.

Mathematics Major Program

Major Core Requirements (Prerequisites are shown in parentheses):
MA 125 – Calculus I (ACT math score of 28 or higher; or MA 115; or both MA 112 and MA 113)
MA 126 – Calculus II (MA 125)
MA 227 – Calculus III (MA 126)
MA 238 – Applied Differential Equations (MA 126)
or MA 355 – Differential Equations (MA 126. Not open to students with credit in MA 238)
MA 325 – Introduction to Discrete Mathematics (MA 115 or MA 112 and MA 113)
MA 345 – Applied Statistics I (MA 112 or equivalent)
or MA 447 – Mathematical Statistics I (MA 227)
MA 431 - Advanced Linear Algebra (MA 126; CS 245 or MA 325)
MA 437 - Modern Algebra I (MA 126 and MA 325)
MA 451 – Introduction to Analysis (MA 227 and MA 325)
MA 471W – Applied Mathematics (MA 227 and MA 325)
MA 345 - MA 491 - A Mathematics Elective Course (not already taken above) – Most students take one of the following courses:
MA 421 – College Geometry (MA 126)
or MA 345 – Applied Statistics I (MA 112 or equivalent)
or MA 445W – Applied Statistics II (MA 345 or equivalent)
or MA 447 – Mathematical Statistics I (MA 227)
or MA 448 - Mathematical Statistics II (MA 447)
or MA 461 – Numerical Analysis (CS 155; MA 227)

(With the exception of the three calculus courses, each of the above courses is a 3 semester hour course. The calculus courses are 4 semester hour courses.)

Prescribed Supporting Courses for the mathematics major are listed above under degree requirements.

General Education Mathematics Component Program

General Studies Mathematics Courses (Prerequisites are shown in parentheses):
MA 110 - Finite Mathematics (minimum ACT math score of 22; or grade of C or higher in either MA 100, Intermediate Algebra, or MA 105, Mathematics for Liberal Arts)
MA 112 - Pre-calculus Algebra (minimum ACT math score of 22; or grade of C or higher in MA 100, Intermediate Algebra)
MA 113 - Pre-calculus Trigonometry (MA 112 or permission of department chair)
MA 115 - Pre-calculus Algebra and Trigonometry (minimum ACT math score of 22; or grade of C or higher in MA 100, Intermediate Algebra)
MA 125 - Calculus I (ACT math score of 28 or higher; or MA 115; or both MA 112 and MA 113)
MA 126 - Calculus II (MA 125)
MA 227 - Calculus III (MA 126)
MA 237 - Linear Algebra (MA 126)
MA 238 - Applied Differential Equations I (MA 126)
(Note: MA 115, MA 125, MA 126, and MA 227 are 4 semester hour courses. MA 110, MA 112, MA 113, MA 237, and MA 238 are 3 semester hour courses.)

- **Associated institutes and centers**

None

- **Involvement of external constituents in establishing goals, objectives, learning outcomes and curriculum**

Computer Science Major Program

Computer science faculty members are very much aware of ABET accreditation guidelines. These guidelines will continue to have a strong influence on the computer science major insofar as establishing goals, objectives, student learning outcomes, and curriculum are concerned. Also, many of our graduates in computer science have found employment in defense or space related industries located in Huntsville, Alabama. Several of these graduates have retained sufficient ties with our computer science faculty to make us aware of new industry trends, employment opportunities for graduates, and how trends in the applications of computer science could affect our curriculum.

Mathematics Major Program

Unlike computer science, there is no accrediting agency for mathematics. Consequently no external constituents are directly involved in establishing goals, objectives, learning outcomes and curriculum for the mathematics major program; however, this program is influenced by several outside sources. For example, curriculum requirements imposed by the State Department of Education on our teacher certification programs are included where appropriate in our course syllabi. Other influences include existing programs at other peer institutions, information gained by attendance of our faculty at professional meetings where program requirements are discussed, and to a great extent, our perception of the preparation that our students need for successful transition to a graduate program in mathematics.

General Education Mathematics Component Program

The Undergraduate Catalog states, "The General Education Program is fully compatible with the Alabama Articulation and General Studies Committee (AGSC) agreement, and UNA welcomes transfer students who have completed all or part of the General Education Program in other institutions whose courses are compatible with those in UNA." To this end, the mathematics component of the General Education Program at UNA was reshaped to comply with state guidelines. For example, MA 101, College Algebra, became MA 112, Pre-Calculus Algebra, and MA 103, College Trigonometry, became MA 113, Pre-Calculus Trigonometry. Several of our five semester hour courses were replaced with four hour courses with considerable change in course content. For example, MA 151, Algebra and Trigonometry (5 semester hours), was replaced by MA 115, Pre-Calculus Algebra and Trigonometry (4 semester hours), and our three course sequence in calculus MA 251 - 5 semester hours, MA 252 - 5 semester hours, and MA 353 – 3 semester hours was replaced by MA 125, Calculus I - 4 semester hours, MA 126, Calculus II - 4 semester hours, and MA 227, Calculus III – 4 semester hours, respectively. These changes became effective about 1998.

Clearly, external constituents have had considerable influence on the mathematics component of the General Education Program. One benefit of this influence is that general studies mathematics curricula have been largely standardized in public higher education across the state of Alabama. Thus, general studies credit for a course taken at one institution of higher education is readily transferable within the State of Alabama under existing articulation agreements, despite the fact that standards for assessing student achievement in such a course vary widely among the participating institutions. On the other hand, this program has substantially increased student demand for mathematics courses at the MA 099 through MA 112 levels.

Furthermore, the impact of the mathematics portion of this program on both this department and this university has not been perceived as completely positive by the university community. Prior to the creation of a statewide, reasonably standard, general studies mathematics program, students had additional options for satisfying UNA's 3-semester hour general studies mathematics requirement. At that time, MA 100, Intermediate Algebra, and Mathematics for Liberal Arts, (MA 115 at that time) were also options for satisfying the general studies requirement. Consequently, severely under-prepared students in mathematics could elect to enter a major that required little or no mathematics background, take a mathematics course that was more realistic (and practical) for them, and satisfy their mathematics requirement and move on. Furthermore, students who needed more mathematics took it as a requirement for their majors. Today, many of our mathematically at-risk students have been essentially stymied by their mathematics general studies requirement. Simply put, some students with ACT math scores below 18 may be overwhelmed by mathematics requirements that seem insurmountable. The consequence is poor attendance, low performance and high attrition in their mathematics classes. The extent to which student withdrawal from the university can be attributed to the additional mathematics requirement is unknown, but our anecdotal evidence suggests that this effect is not negligible.

Whether or not there is a demonstrable educational benefit in requiring all majors to complete a mathematics course at the MA 110/MA 112 level or higher is unknown. On one hand, it seems reasonable that every undergraduate should demonstrate mathematics competence at the level of high school Algebra II, or equivalent, as a general studies graduation requirement. If, on the other hand, an otherwise intelligent person is simply not mathematically able to handle an additional mathematics course at the MA 110/MA 112 level, then it makes no sense to require such a person to take MA 100 six or seven times in order to achieve success in MA 100 and then take MA 112 for five or six times in order to satisfy a general studies mathematics requirement for the bachelor's degree. Perhaps the time has arrived for a rational reexamination of what should constitute an appropriate resolution of this matter at a considerably earlier point in the student's academic program.

- **Community college articulation where appropriate**

Computer Science Major Program

With the possible exception of mathematics preparation, community college articulation is not an issue for computer science transfer students. Community college transfers usually begin with CS 155, Computer Science I, which is the first core course in the CS major.

Mathematics Major Program

Community college articulation can be a major issue for transfer students who expect to pursue a major in mathematics. We have found that many of our community college transfer students are seriously under-prepared in mathematics. Students with transfer credit in Calculus I, II, and III (and perhaps Applied Differential Equations I) are usually so far behind compared to our own students that completing a major in mathematics is extremely difficult, even though they may have received A's and B's in such classes. In addition, many of these students plan to pursue secondary certification to teach mathematics. Consequently, many of the community college transfer students who complete our mathematics program have minimally acceptable GPA's in the mathematics major, but they find employment as mathematics teachers in the public schools.

General Education Mathematics Component Program

Whether or not community college articulation is an issue in the General Education Mathematics Component Program depends on the level of mathematics preparation that students need to continue in their chosen majors. Students who require additional mathematics courses at UNA are usually under-prepared; however, the extent to which under-preparedness in mathematics affects future success at UNA depends on the additional mathematics courses needed. For example, students who require one or more courses in calculus are usually just as disadvantaged as transfer majors in mathematics or computer science while students who need a course in statistics are better able to cope.

Based on a departmental analysis of CAAP Exam mathematics scores for fall of 2004, the department has evidence to indicate that community college articulation is an issue insofar as assessment of the general studies mathematics preparation of transfer students is concerned. This analysis of the CAAP exam results revealed several important findings. First, the exam is directed toward students who have completed MA 112, and students who have completed MA 110 are at a disadvantage insofar as performance on the CAAP Exam is concerned. Second, the distribution of test scores for UNA students who had earned credit in MA 112 compared favorably to the norm population (based on non-parametric statistical analysis using the Kolmogorov goodness-of-fit test). Using the same test procedure, we found that students who had earned credit in MA 110 did not perform as well as the norm population. Third, transfer students did not perform as well as the norm population; however, we did not attempt to separate MA 110 and MA 112 transfer students for additional analysis.

- **Program productivity including number or majors and degrees conferred**

Information provided under Section 1 is repeated below for convenience.

2. Number of Degrees Conferred						
Bachelor	***2003-04***	***2004-05***	***2005-06***	***2006-07***	***2007-08***	***Average***
Degrees Awarded	15	7	17	14	19	14.40
Computer Science	10	3	7	7	6	6.60
Mathematics	5	4	10	7	13	7.80

The department is probably averaging about 10 graduates each year in mathematics. Recent numbers in CS have been considerably lower. The CS faculty members are certainly aware of this problem, and they are working to attract promising computer science majors without sacrificing program content.

9. Program Evaluation

- **Describe briefly the department's continuous improvement plan utilized to assess and improve the program on an on-going basis. Summarize improvements made as a result of the continuous improvement plan**

In the early 1960's under the leadership of Dr. John Locker, this department began utilizing a de facto continuous improvement plan for improving its programs. Over the years, this plan evolved as the character and mission of the department changed. Today, our plan is based on comparison with similar programs at peer institutions, consideration of apparent trends in the student populations that we currently serve, consideration of current recommendations of various professional organizations such as ABET, voluntary input from our alumni, and awareness of graduate program requirements in mathematics and computer science. We expect that the inclusion of student learning outcomes assessment will add yet another significant data point for consideration in the program improvement process.

Recent improvements made as a result of the department's continuous improvement plan include the following:

1. Made substantive revision of the mathematics major
2. Made substantive revision of the computer science major
3. Included the secondary education – mathematics teaching field major in the mathematics major
4. Implemented standardized departmental midterm and final exams in MA 100
5. Offered accelerated MA100 / MA 112 as another form of course delivery for students who must take both MA 100 and MA 112
6. Made substantive changes in course delivery for MA 306, Mathematics for the Elementary School Teacher
7. Conducted annual reviews of the mathematics and computer science majors and made adjustments as appropriate
8. Began reducing class sizes in MA 099, MA 100, MA 105, MA 110, and MA 112 as available faculty resources permitted
9. Began to replace damaged student desks, using departmental funds, with larger, more durable, student desks. To date, the department has purchased 54 new desks for use in MAB 2 and MAB 6.

- **Describe briefly the means of assessing student learning outcomes, and recent improvements based on the results of such assessment. Means of assessing outcomes may include but are not limited to standardized tests, capstone course/program examinations, analyses of theses, portfolios and recitals**

Computer Science Major Program

Departmental plans for assessing student learning outcomes in the computer science major are currently under development. We expect that the implementation of these plans will begin during the fall of 2009. These plans are described below.

Modes for Assessment**:** Various modes of assessment will be used in determining the extent students meet each learning outcome. These include: the Major Field Test (MFT), a standardized multiple choice exam, department-developed group and individual assignments and test questions embedded within various senior level courses, and a department developed survey to be administered in the beginning major course (CS 155) and at the end of a senior level course (CS 455). A committee of tenured faculty along with current CS course instructors who are normally involved in teaching CS majors will jointly develop and validate assignments, surveys and test questions used to assess learning outcomes.

Student Learning Outcome 1: An ability to apply knowledge of computing and mathematics appropriate to the discipline - The Major Field Test (MFT) will be used to assess students' ability to apply knowledge of computing and mathematics. Performances on these tests will be correlated with the CS GPA and Math GPA to investigate the extent to which these measures are in concordance. For example, students with high GPAs should also perform well on these tests, and students with GPAs in the interval from 2.0 to 2.5 should perform considerably lower on these tests. A committee of tenured faculty who are normally involved in teaching computer science majors will jointly plan assessment methodology and jointly assess this learning outcome. An assessment of this learning outcome will occur each semester after this test has been administered.

Student Learning Outcome 2: An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution - CS 455, Software Engineering, is the logical, senior-level course for embedded assessment of students' ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. Well-defined assignments where students develop their ability to work on large problems will be used to assess this learning outcome. A committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the spring term.

Student Learning Outcome 3: An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs - CS 455, Software Engineering, is also the logical, senior-level course for embedded assessment of students' ability to design, implement, and evaluate a computer-based system, process, component or program to meet defined needs. Well-defined assignments where students develop their ability to design, implement, and evaluate such systems will be used to assess this learning outcome. As in learning outcome 2, a committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the spring term.

Student Learning Outcome 4: An ability to function effectively on teams to accomplish a common goal - CS 455, Software Engineering, is also the logical, senior-level course for embedded assessment of students' ability to work effectively on teams. Well-defined assignments where students develop their ability to work on teams will be used to assess this learning outcome. As in learning outcome 2 and 3, a committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the spring term.

Student Learning Outcome 5: An understanding of professional, ethical, legal, security and social issues and responsibilities - The professional, ethical, legal, security, and social responsibilities of computer science professionals are taught in a variety of courses including CS 155, 255, 355, 410, and 455. A well-defined survey will be developed to determine the students' level of understanding related to this outcome. A committee of tenured faculty who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the fall and spring terms in the CS 155 course and during the spring in the 455 course. Common statistical measures will be used to compare the results from students at the beginning of their computer science studies to the results from students near the end of their studies.

Student Learning Outcome 6: An ability to communicate effectively with a range of audiences - CS 410, Programming Languages, is the logical, senior-level course for embedded assessment of students' ability to communicate effectively. A well-defined assignment where students develop their oral and written communication skills will be used to assess this learning outcome. A committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the fall term.

Student Learning Outcome 7: An ability to analyze the local and global impact of computing on individuals, organizations, and society - The local and global impact of computing on individuals, organizations, and society is discussed in a variety of courses including CS 155, 255, 355, 410, 455, and 470. A well-defined discussion question will be developed to determine the students' ability related to this outcome. A committee of tenured faculty who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the spring term in the CS 470 course.

Student Learning Outcome 8: Recognition of the need for and an ability to engage in continuing professional development - The need for and ability to engage in continuing professional development is discussed in a variety of courses including CS 155, 255, 355, 410, and 455. As in outcome 5, a well-defined survey will be developed to determine the students' ability related to this outcome. A committee of tenured faculty who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the fall and spring terms in the CS 155 course and during the spring in the 455 course. Common statistical measures will be used to compare the results from students at the beginning of their computer science studies to the results from students near the end of their studies.

Student Learning Outcome 9: An ability to use the current techniques, skills, and tools necessary for computing practice - CS 455, Software Engineering, is also the logical, senior-level course for embedded assessment of students' ability to use current techniques, skills and tools necessary for computing practice. Well-defined assignments where students develop their ability to use current techniques, skills and tools will be used to assess this learning outcome. As in learning outcome 2, 3 and 4, a committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the spring term.

Student Learning Outcome 10: An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices - The Major Field Test (MFT) will also be used to assess students' ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices. As in Learning Outcome 1, performances on these tests will be correlated with the CS and Math GPA to investigate the extent to which these measures are in concordance. An assessment of this learning outcome will occur each semester after this test is administered.

Student Learning Outcome 11: An ability to apply design and development principles in the construction of software systems of varying complexity - CS 470, Advanced Algorithms and Artificial Intelligence, is the logical, senior-level course for embedded assessment of students' ability to apply design and development principles in the construction of software systems of varying complexity. A well-defined assignment where students develop these abilities will be used to assess this learning outcome. A committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching CS majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the spring term.

Mathematics Major Program

The implementation of department plans for assessing student learning outcomes in the mathematics major began with the fall of 2008. These assessments are outlined below.

Student Learning Outcome 1: Demonstrate an acceptable level of mastery of mathematical skills and concepts - The Major Field Test (MFT) and Praxis II exam (PIIE) will be used to assess student mastery of mathematical skills and concepts. If feasible, student performance on these tests will be correlated with mathematics GPA to investigate the extent to which these measures are in concordance. For example, students with high mathematics GPAs should also perform well on these tests, and students with GPAs in the interval from 2.0 to 2.5 should perform considerably lower on these tests. A committee of tenured faculty who are normally involved in teaching mathematics majors will jointly plan assessment methodology and jointly assess this learning outcome. An assessment of this learning outcome will occur each semester after these tests have been administered.

Student Learning Outcome 2: Communicate mathematical ideas with clarity and accuracy in a logical, well organized format - An assessment of this learning outcome will be conducted in MA 471W, Applied Mathematics. MA 471 is a course that includes an emphasis on writing. This course is a capstone course that is designed to draw upon a wide range of mathematical skills in the solution of applied problems. A well-defined writing assignment will be used to assess this learning outcome. A committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching mathematics majors will jointly plan assessment methodology and jointly assess this learning outcome. An assessment of this learning outcome will occur each year during the fall term.

Student Learning Outcome 3: Apply inductive and/or deductive reasoning skills in the development of rigorous mathematical arguments - MA 451, Introduction to Analysis, is the logical, senior-level course for embedded assessment of reasoning skills in the development of rigorous mathematical arguments. Well-defined assignments or exam items where each student develops his/her own mathematical proofs will be used to assess this learning outcome. A committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching mathematics majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the spring term.

Student Learning Outcome 4: Draw upon a wide range of mathematical skills in the solution of applied problems - MA 471W, Applied Mathematics, is a natural course for assessing the abilities of undergraduate mathematics majors to apply a wide range of mathematical skills in developing one or more solutions to applied problems. Individual student performance on applied problems including exam items and/or other assignments will be the basis for assessing this learning outcome. A committee of tenured faculty, likely to include the current instructor, who are normally involved in teaching mathematics majors will jointly plan assessment methodology and assess this learning outcome. An assessment of this learning outcome will occur each year during the fall term.

Since the creation and/or implementation of the student learning outcome assessment plans for the computer science major program, the mathematics major program, and general education mathematics component all began this year, the department has no recent improvements to report. However, the mathematics major assessment activities conducted to date suggest that mathematics majors have difficulty communicating mathematical ideas with clarity and accuracy in a logical, well organized format and drawing upon mathematical skills learned in one course to apply in another situation.

General Education Mathematics Component Program

Departmental plans for assessing student learning outcomes in the general education mathematics component program are currently being finalized. We expect that the implementation of these plans will begin during the spring of 2009. These plans are described below.

Since MA 110, Finite Mathematics, and MA 112, Pre-calculus Algebra, are the courses of choice for almost all students who earn general studies mathematics credit at UNA, assessment of general studies mathematics learning outcomes is directed toward students in these courses. A small group of students earn general studies mathematics credit at UNA without taking either MA 110 or MA 112. Usually, these students begin their general studies mathematics with MA 125, Calculus I, or a MA 125 prerequisite other than MA 112 such as MA 115, Pre-calculus Algebra and Trigonometry. Typically, MA 125 students are mathematics majors, computer science majors, or majors from other areas where MA 125 is a requirement for their program of study. Since success in MA 125 requires mastery of pre-calculus algebra at the MA 112 level, it follows that further assessment of mathematics learning outcomes for this small group of students can be more appropriately addressed within their individual programs of study, if needed.

Fulltime faculty members assigned to teach MA 110 are responsible for jointly planning the assessment methodology associated with each learning outcome including the determination of each assessment item, when and in what manner the assessment item will be administered, and how the item will be assessed and jointly reported. In like manner, fulltime faculty members assigned to teach MA 112 have joint responsibility for assessing learning outcomes in MA 112. Where possible, test items that are already being used in the course examination process will also be identified for learning outcome assessment purposes. If necessary, other items may be devised to directly address the assessment of a specific learning outcome. Learning outcome assessment items should be either common to all sections of a course or else closely comparable. Plans for assessing specific student learning outcomes are given below.

Student Learning Outcome 1: Use mathematics to solve problems and determine if the solutions are reasonable - Assessment of this learning outcome is already a routine practice in the teaching of mathematics. Well-defined exam items will be used to assess this learning outcome.

Student Learning Outcome 2: Apply mathematical concepts to the solution of real-life problems - In the context of MA 110 or MA 112, this learning outcome pertains to the solution of word problems. Well-defined word problems will be used to assess this learning outcome.

Student Learning Outcome 3: Identify connections between mathematics and other disciplines - As with learning outcome 2, this learning outcome pertains to the solution of word problems. Well-defined word problems will be used to assess this learning outcome.

Student Learning Outcome 4: Use technology, where appropriate, to support mathematical reasoning and problem solving - Use of technology, where appropriate, to support mathematical reasoning or problem solving means that the mathematically informed student is able to use technology to enhance the exploration of complex mathematical arguments or to solve computationally complex problems. This does not mean that the student will be allowed to substitute proficiency in technology for basic knowledge of mathematics or arithmetic. Assessment of this learning outcome will be consistent with MA 110 and MA 112 course objectives. Since MA 110 tends to be more computationally oriented than MA 112, this learning outcome will be addressed using well-defined exam problems. Since MA 112 tends to be more method oriented, the use of significant technology is not considered part of the course objectives.

Student Learning Outcome 5: Apply mathematical and/or basic statistical reasoning to analyze data and graphs - Individual student performance on several test items will be used to assess this learning outcome.

Since the department is currently involved in various stages of implementation of plans for the assessment of student learning outcomes in these three program areas, we have no recent improvements that are based on the assessment of student learning outcomes. Our current thoughts about how the department may utilize student learning outcomes are presented below.

Computer Science Major Program

The assessment of student learning outcomes is designed to provide a basis for suggesting reasonable directions of change, if warranted. After careful consideration of departmental findings pertaining to a specific learning outcome assessment together with other relevant data points as indicated above, the Computer Science Major Committee may well elect to recommend modifications in the computer science program if subsequent improvement appears to be a likely result.

Assessment of learning outcome 1 and 10 will provide information on the overall integrity of the computer science major. If, for example, high computer science GPAs are concordant with high performances on the MFT, then our perceptions of the overall integrity of the computer science program will tend to be reinforced. If, however, it turns out that high computer science GPAs are not consistent with high performance on the MFT, then measures may be needed to strengthen academic standards and/or to provide stronger incentives for achievement on this exam.

Assessment of learning outcomes 2, 3 and 9 will also provide information on the overall integrity of the computer science major. Students' performance on the assessment activities for each of these outcomes should closely correlate with student CS GPA's. If this is not the case, then additional measures may be needed to strengthen academic standards and/or to provide stronger incentives for achievement on these assessment activities.

Assessment of learning outcome 4 addresses a priority item in the development of a competent computer science major. Results from the assessment of students' ability to work jointly with other students on a team project could lead to an emphasis on team projects at an earlier point in the curriculum.

Assessment of learning outcomes 5, 7, and 8 may indicate a deficiency in the inclusion of these issues in our CS curriculum and could indicate a need for inclusion of these topics in a specific course or the development of a separate course to address these topics.

Learning outcome 6 will measure both the oral and written communication skills of students. Assessment of this outcome may indicate that earlier and continued emphasis through-out the CS curriculum on these skills may be necessary.

Assessment of learning outcome 11 also addresses a priority item in the development of a competent computer science major. Results from the assessment of students' ability to apply design and development principles in the construction of software systems could lead to an emphasis on these principles in earlier courses in the curriculum.

Mathematics Major Program

As indicated above, the assessment of student learning outcomes is designed to provide a basis for suggesting reasonable directions of change, if warranted. After careful consideration of departmental findings pertaining to a specific learning outcome assessment together with other relevant data points as indicated above, the Mathematics Major Committee may well elect to recommend modifications in the mathematics major program if subsequent improvement appears to be a likely result.

The assessment of learning outcome 1 will provide information on the overall integrity of the mathematics major. If, for example, high mathematics GPAs are concordant with high performances on the MFT, then our perceptions of the overall integrity of the mathematics program will tend to be reinforced. If, however, it turns out that mathematics GPAs are not concordant with MFT scores, then a more careful study of the integrity of the program is warranted.

Assessment of learning outcome 2 will provide useful information on how well our majors are able to communicate mathematical ideas. Efforts to improve student performance in this area may well lead to an emphasis on communicating mathematical ideas at an earlier point in the curriculum.

Learning outcome 3 addresses a priority item in the development of a competent mathematics major. The ability to think analytically and use logical arguments to produce mathematically rigorous proofs is essential for continued study of mathematics. Investigation of this learning outcome could lead to a stronger emphasis on teaching students to develop their own mathematically rigorous proofs.

Learning outcome 4 will measure both the retention of mathematical skills and the ability of the student to transfer these skills to various application formats. Real improvement in this area may be difficult to achieve, but nevertheless, it needs to be addressed.

General Education Mathematics Component Program

As indicated above, the assessment of student learning outcomes is designed to provide a basis for suggesting reasonable directions of change, if warranted. Since both MA 110 and MA 112 curricula are standardized in the State of Alabama, it follows that possible modification in these general studies courses may need to be directed toward course delivery rather than course content. After careful consideration of departmental findings pertaining to a specific learning outcome assessment together with other relevant data points as indicated above, the MA 110 Committee or the MA 112 Committee may well elect to recommend modifications in this portion of the General Education Mathematics Component Program if subsequent improvement appears to be a likely result.

The assessment of learning outcome 1 will provide information on the overall effectiveness of these two courses. If, for example, students tend to assess well regarding this learning outcome, then mastery of fundamental course concepts is indicated; otherwise, measures may be needed to strengthen academic standards and/or to provide stronger incentives for achievement. Over time, the assessment of this learning outcome may lead to extensive comparisons with peer institutions regarding course delivery and assessment.

Assessment of learning outcome 2 will provide useful information on how well our students handle word problems. Typically, many students at this level tend to dismiss word problems. Efforts to improve student performance in this area may lead to trying different emphases to enhance student application of mathematics in the solution of real-life problems.

Learning outcome 3 and learning outcome 2 are somewhat related. Relating word problems to other disciplines represented in our classes may well bring improvement in these student learning outcomes.

Learning outcome 4 will measure the ability of the student to use technology to extend the power of mathematics to more complex problems. Assessment of this learning outcome will need to be carefully designed so that technology is a tool of mathematical problem solving rather than a substitute for it. Real improvement in this area may be difficult to achieve since many students have already learned how to substitute use of technology for conceptual understanding of mathematics.

Learning Outcome 5 is already an integral part of the MA 110/MA 112 curriculum. The assessment of this learning outcome may lead to improvements in course emphasis on the interpretation of data and graphs.

Major Field Assessment Test Results

Mathematics and computer science majors typically take their major field assessment exam during their final semester at UNA. The distribution of examinees for each of the past five years is displayed in the following table.

Distribution of MFT Examinees by Major and Year

Major	2004	2005	2006	2007	2008	Total
CS	5	3	8	4	8	28
Math	17	7	7	8	12	51

Note that the above table provides approximate information on the number of graduates each program has produced over the last five years.

Computer Science Major Program

The five-year distribution of Computer Science MFT Exam scores for our majors is displayed in the following table. It is interesting to note that the median score for this distribution is slightly above the median of the norm population. It is also important to note that the one-standard deviation interval about the mean of the norm population ranges from 133.1 to 165.3. Thus, 25 out of 28 scores (89.3%) fall within one standard deviation of the mean of the norm population. Based on the limited percentile information available to us, the 175 score ranks above the 90th percentile of the norm population while the 132 score ranks between the 10th and 15th percentile. These considerations indicate that our computer science seniors compare favorably with other students in the norm population.

Distribution of MFT Computer Science Exam Scores for 2004 through 2008*

Score	Frequency	Cum %	Score	Frequency	Cum %
132	1	3.57	151	1	57.14
133	1	7.14	152	3	67.86
137	1	10.71	154	1	71.43
138	1	14.29	156	1	75.00
140	1	17.86	157	1	78.57
141	3	28.57	159	2	85.71
143	1	32.14	162	2	92.86
146	3	42.86	164	1	96.43
148	1	46.43	175	1	100.00
149	2	53.57			

* Norm Population Information: Mean = 149.2, Median = 148, Standard Deviation = 16.1, Number of Examinees= 3928, Number of participating institutions = 178, Norm

population data is based on data gathered from seniors after January of 2006 to present (the CS exam was changed in February of 2006).

An additional analysis of the 2008 computer science MFT data was undertaken to relate MFT scores and CS gpa's. Associated gpa data was available for 7 of the 8 CS majors who took the MFT in 2008. These data yielded a Pearson Product-Moment Correlation Coefficient value of .44027 (n = 7, p-value = .3229). The data is shown in the following table.

2008 Distribution of MFT Score / gpa Data for CS Majors

MFT	CS GPA
132	**2.02**
141	**2.31**
146	**2.33**
146	**2.61**
152	**2.17**
159	**2.12**
159	**2.91**

Mathematics Major Program

The five-year distribution of Mathematics MFT Exam scores for our majors is displayed in the following table. Careful comparison with the distribution of the norm population suggests that the distribution of scores for our students is considerably lower. For example, 64% of our students had scores below the median of the norm population. On the other hand, 29 out of the 50 scores (58%) fell within a one-standard deviation interval (138.0 to 173.8) about the norm population mean, and 48 out of the 50 scores (96%) fell within a two-standard deviation interval (120.1 to 191.7) about the norm population mean. Our limited norm population percentile information indicates that the 187 score ranks above the 85th percentile, the 169 score is approximately the 75th percentile, and the 120 score lies below the 5th percentile. These considerations indicate that our mathematics majors are not performing as well as the norm population.

Distribution of MFT Mathematics Exam Scores for 2004 through 2008*

Score	Frequency	Cum %	Score	Frequency	Cum %
120	2	4.0	149	2	64.0
125	2	8.0	152	10	84.0
128	3	14.0	155	2	88.0
131	2	18.0	158	2	92.0
134	5	28.0	161	1	94.0
137	6	40.0	164	1	96.0
140	6	52.0	169	1	98.0
143	2	56.0	187	1	100.0
146	2	60.0			

* Norm Population Information: Mean = 155.9, Median = 152, Standard Deviation = 17.9, Number of Examinees= 6290, Number of participating institutions = 260, Norm population data is based on data gathered from seniors after January of 2004 to present.

Proper interpretation of the above findings is critical insofar as the assessment of our mathematics major program is concerned. A realistic evaluation of these findings may well include consideration of several questions such as: Why are the computer science majors outperforming the mathematics majors? Are mathematics majors taking the MFT Exam seriously? Are our students performing about as well as can be expected? Is our program deficient in some respect? Do we need to include a "Prep for the Exam" course in our curriculum?

Computer science majors are probably outperforming mathematics majors because the CS program seems to be more adept than the mathematics program at retaining better students and "weeding out" poorer students. It seems abundantly clear that the future in computer science belongs to those majors who are becoming adept in computer science, while the future in mathematics belongs both to those students who are adept in mathematics and to those who may be less adept but manage to complete enough mathematics course work to qualify for a position teaching secondary mathematics (70-80% of our mathematics majors are certified to teach at the secondary level). Consequently, without any special effort to "weed out" poorer students, the computer science program may tend to be self-pruning while the mathematics program is more likely to retain less prepared majors.

One goal of departmental assessment of student learning outcomes is to measure readily accessible knowledge in one's discipline. Therefore, the proposition that poor performance is due to lack of serious endeavor on the exam may lack credibility if the object is to measure readily accessible mathematics knowledge. Since some of our majors do go on to successful graduate study in mathematics or a mathematics-related area, it seems reasonable to conclude, especially in the light of our continuing improvement program, that our mathematics curriculum is not deficient. Therefore, it may be prudent to conclude that our students are performing about as well as can be expected. This conclusion is further supported by the following facts: 1) many of our mathematics majors are community college transfers who struggle to complete the major because they come to us under-prepared in mathematics and 2) this university is not recruiting its fair share of the students who are better prepared for undertaking the mathematics major. Consequently, our population of mathematics majors may well be lacking a substantial proportion of the higher achieving majors who attend schools with more selective admissions policies. It is especially noteworthy that 2.80 was the highest cumulative GPA among our graduating seniors for the spring of 2009.

An additional analysis of the 2008 mathematics MFT data was undertaken to relate MFT scores and mathematics gpa's. Associated gpa data was available for the 12 mathematics majors who took the MFT in 2008. These data yielded a Pearson Product-Moment Correlation Coefficient value of -.07384 (n = 12, p-value = .8196). The data is shown in the following table.

2008 Distribution of MFT Score / gpa Data for Mathematics Majors

MFT	MATH GPA	MFT	MATH GPA
131	2.78	140	2.30
134	2.14	140	2.69
134	4.00	149	2.61
137	2.42	152	2.33
137	2.77	152	2.90
140	1.71	152	2.92

The student with a gpa of 4.00 was a nontraditional transfer student who took 12 hours of mathematics at UNA. The bulk of her coursework was taken elsewhere more than 15 years ago. Since she did not have to refresh everything that she had previously learned in order to complete the mathematics major, her low MFT score could be an accurate reflection of her readily accessible mathematics knowledge. In any event, a re-analysis of the above data with her data point excluded yielded a sample correlation coefficient value of 0.27035 (n = 11, p-value = .4214). It is also noteworthy that the 1.71 gpa was earned by a transfer student who took MA 125 and MA 126 at a community college (his grade in each of these courses was a B).

- **Provide a brief analysis of the grade distribution patterns of courses and delineate an action plan for improvement where appropriate.**

Computer Science Major Program

Five year grade distribution patterns for the computer science major are displayed in the following table. Grade distributions seem reasonably consistent across time especially with regard to the percentages of grades of C or higher. The failure/withdrawal rate for CS majors was 27.9% for the five year period from 2004 through 2008.

Five Year Grade distributions – Computer Science Major

	2004		2005		2006		2007		2008	
Grade	n	%	n	%	n	%	n	%	n	%
A	36	21.1	46	22.8	44	20.2	40	18.6	32	16.8
B	46	26.9	48	23.8	38	17.4	47	21.9	41	21.5
C	22	12.9	31	15.3	39	17.9	45	20.9	49	25.7
D	15	8.8	22	10.9	30	13.8	21	9.8	27	14.1
F	27	15.8	25	12.4	24	11.0	31	14.4	16	8.4
Other	25	14.6	30	14.9	43	19.7	31	14.4	26	13.6
Total	171		202		218		215		191	

Mathematics Major Program

Five year grade distribution patterns for the mathematics major are displayed in the following table. Grade distributions seem reasonably consistent across time especially with regard to the percentages of grades of C or higher. The failure/withdrawal rate in mathematics courses normally taken by mathematics majors was 31.1% during the five year period from 2004 through 2008.

Five Year Grade distributions – Mathematics Major

	2004		2005		2006		2007		2008	
Grade	n	%	n	%	n	%	n	%	n	%
A	84	19.4	77	20.4	78	20.4	70	19.5	60	15.0
B	106	24.4	85	22.5	99	25.8	86	24.0	67	16.7
C	74	17.1	53	14.0	71	18.5	61	17.0	82	20.4
D	42	9.7	34	9.0	30	7.8	37	10.3	50	12.5
F	37	8.5	28	7.4	21	5.5	22	6.1	50	12.5
Other	90	20.8	101	26.7	84	21.9	83	23.1	92	22.9
Total	433		378		383		359		401	

General Education Mathematics Component Program

Five year grade distribution patterns for MA 110 and MA 112 are displayed in the following table. Since MA 110 and MA 112 are terminal mathematics courses for many of our students, it is of interest to note the percentages of passing grades that were awarded across the five year period. The percentages of passing grades were: 2004 – 68.9%, 2005 – 74.1%; 2006 – 74.7%; 2007 – 71.8%; 2008 – 70.6%. Thus, percentages of passing grades have been reasonably consistent across time. The overall withdrawal/failure rate was 28.0% for the five year period from 2004 through 2008.

Five Year Grade distributions – General Education Mathematics (MA 110 and MA 112)

	2004		2005		2006		2007		2008	
Grade	n	%	n	%	n	%	n	%	n	%
A	220	19.7	230	20.8	267	22.3	237	18.8	231	17.6
B	201	18.0	237	21.4	242	20.2	254	20.2	250	19.1
C	216	19.3	242	21.9	246	20.5	271	21.5	277	21.1
D	134	12.0	111	10.0	140	11.7	143	11.3	167	12.7
F	94	8.4	70	6.3	81	6.8	110	8.7	154	11.7
Other	254	22.7	217	19.6	222	18.5	245	19.4	232	17.7
Total	1119		1107		1198		1260		1311	

Pre-General Studies Mathematics Program (MA 099)

MA 099, Beginning Algebra, is a required for students with ACT math scores of 15 or less. The department has found that students at this level are very much at risk insofar as their potential for success in mathematics is concerned. During the five year period from 2004 through 2008, 50.1% of the students enrolled in MA 099 earned a passing grade. The department has also found that students who complete MA 099 satisfactorily continue to be very much at risk in MA 100 or MA 105 and beyond. It is our experience that students who are determined to succeed at the level of MA 112 or below usually will achieve satisfactorily while those who are not committed to demonstrating mastery of mathematics at this level usually will not.

Five Year Grade distributions – Pre-General Studies Mathematics (MA 099)

	2004		2005		2006		2007		2008	
Grade	N	%	n	%	n	%	n	%	n	%
S	81	45.8	105	57.7	81	47.6	129	51.2	115	48.3
U	88	49.7	72	39.5	83	48.8	113	44.8	111	46.6
Other	8	4.5	5	2.7	6	3.5	10	4.0	12	5.0
Total	177		182		170		252		238	

MA 100, Intermediate Algebra, or MA 105, Mathematics for Liberal Arts, is a required course for students with ACT math scores between 16 and 21, inclusive. The topics covered in these courses are normally covered in the eighth and/or ninth grades in public school. Nevertheless, university students with ACT math scores at this level are very much at risk insofar as their potential for success in mathematics is concerned. During the five year period from 2004 through 2008, 47.4% of the students enrolled in MA 100 or MA 105 received a grade of C or higher while 41.4% either failed or withdrew.

Mathematics faculty members are very much aware that there are several factors that may lead to poor student performance at the MA 100/MA 105 level. First, many students at this level have no idea that they are under-prepared in mathematics. Their high school transcripts may show outstanding grades for courses ranging up to and including calculus; yet, the ACT math score indicates that their credentials in mathematics courses misrepresents actual achievement. Consequently, they may assume that the material in MA 100/105 is far below their level of mathematics achievement and tend to dismiss the course by failing to attend class and to do the assigned homework. Second, many of these students have not made the transition to a university academic environment, and they expect to be treated like high school students. The end result is that these students can get so far behind that catching up is out of the question. Third, it may well be that failure/withdrawal in MA 100 or MA 105 is highly concordant with student attrition among new freshmen. If so, a substantive early intervention by the university, for orientation purposes, may be necessary to reduce early attrition among these students. Again, it is our experience that students who are determined to succeed at the level of MA 112 or below usually will achieve satisfactorily while those who are not committed to demonstrating competence in mathematics at this level usually will not. Perhaps, early intervention could provide sufficient motivation to improve the success rates of students at the MA 100/MA 105 level.

Five year Grade Distributions - Pre-General Studies Mathematics (MA 100 and MA 105)

	2004		2005		2006		2007		2008	
Grade	N	%	n	%	n	%	n	%	n	%
A	122	12.3	124	12.1	135	11.7	168	14.6	160	13.9
B	152	15.4	128	12.5	172	14.9	184	16.0	181	15.8
C	181	18.3	203	19.8	236	20.5	232	20.2	213	18.6
D	118	11.9	106	10.3	114	9.9	127	11.1	144	12.6
F	187	18.9	169	16.5	158	13.7	164	14.3	198	17.3
Other	230	23.2	296	28.8	338	29.3	272	23.7	251	21.9
Total	990		1026		1153		1147		1147	

General Studies Computer Science program

Five year grade distribution patterns for the general studies computer science students are displayed in the following table. These grade distributions seem reasonably consistent across time especially with regard to the percentages of grades of C or higher. The failure/withdrawal rate in these courses was 27.7% for the five year period from 2004 through 2008.

Five year Grade Distributions - Computer Science (CS 110 and CS 120)

	2004		2005		2006		2007		2008	
Grade	N	%	n	%	n	%	n	%	n	%
A	90	24.4	63	18.7	64	16.8	53	17.8	68	21.9
B	96	26.0	94	27.9	100	26.3	75	25.3	85	27.3
C	55	14.9	66	19.6	73	19.2	53	17.8	57	18.3
D	25	6.8	24	7.1	34	8.9	34	11.4	24	7.7
F	35	9.5	28	8.3	31	8.2	37	12.5	41	13.2
Other	68	18.4	62	18.4	78	20.5	45	15.2	36	11.6
Total	369		337		380		297		311	

Post-General Studies Mathematics Service Component Program

For each of the last five years, the department has offered offers 12 sections of MA 147, Elementary Statistics, 5 sections of MA 113, Pre-Calculus Trigonometry, 4 sections of MA 121, Calculus for Business and Life Sciences I, 4 sections of MA 306, Mathematics for the Elementary Teacher, and 1 section each of MA 122, Calculus for Business and Life Sciences II, MA 181H, Freshman Honors Seminar, and MA 425, Methods and Materials for Teaching Secondary Mathematics. Given the broad range of topics represented by these post-general studies mathematics courses, it is of interest to note that grade distributions seem reasonably consistent across time with a failure/withdrawal rate of 23.3% for the five year period from 2004 through 2008.

Five year Grade Distributions - Post-General Studies Mathematics Service Courses (MA 113, MA 121, MA 122, MA 147, MA 181H, MA 306, MA 425)

	2004		2005		2006		2007		2008	
Grade	n	%	n	%	n	%	n	%	n	%
A	132	22.0	145	23.2	166	24.6	157	23.7	166	24.1
B	143	23.8	150	24.0	158	23.4	168	25.4	175	25.4
C	115	19.1	118	18.9	136	20.1	133	20.1	137	19.9
D	74	12.3	56	9.0	53	7.8	56	8.5	57	8.3
F	24	4.0	33	5.3	41	6.1	32	4.8	53	7.7
Other	113	18.8	122	19.6	122	18.0	116	17.5	102	14.8
Total	601		624		676		662		690	

Graduate Education Mathematics Service Component

Typically, our graduate education mathematics offering each year consists of one graduate course per semester and summer session for secondary education graduate students and one course during the spring semester and summer session for elementary education graduate students. During the summer of 2008, an additional mathematics course for secondary teachers, MA 617, Symbolic Logic, was offered for the first time even though the course has been listed in the graduate catalog for many years.

Five year Grade Distributions - Graduate Education Mathematics Service Courses

	2004		2005		2006		2007		2008	
Grade	n	%	n	%	n	%	n	%	n	%
A	61	69.3	53	67.9	35	72.9	54	76.0	50	70.4
B	22	25.0	21	26.9	5	10.4	16	22.5	14	19.7
C	2	2.3							2	2.8
D									1	1.4
F	1	1.1							4	4.6
Other	2	2.3	4	5.1	8	16.7	1	1.4	71	
Total	88		78		48		71			

10. Program Recommendations

From a practical standpoint, this five year program review is, in effect, a departmental self-study. This undertaking has helped to clarify the broad scope of this department's activities and to bring into clearer focus many of the issues that this department will need to address over the next several years. Whether or not any of these issues have risen to the level where specific workable recommendations are within reach is a matter that remains for the faculty members to decide. Since program ownership by department faculty is necessarily an integral part of departmental shared governance, it would not be prudent to advance recommendations for change at this juncture. It may be helpful, however, to reemphasize several issues already discussed in this report.

1. Computer Science Major Program - Should the Department of Mathematics and Computer Science pursue ABET accreditation in computer science? The departmental Annual Action Plan for this year includes a goal that pertains to assessing the feasibility of pursuing ABET accreditation in computer science. If this assessment is favorable, then the department will request permission to seek ABET accreditation in computer science.
2. Mathematics Major Program – Is MA 112 a credible prerequisite for MA 125, Calculus I? Most students (about 85%) who enroll in MA 112 are not calculus bound. Consequently, MA 112 has gradually evolved into a course that does not fulfill the role that its name implies. Furthermore, revitalizing the course to benefit a relatively small number of students would probably turn out to be counter-productive. From an articulation viewpoint, MA 112 will have to continue to serve, at least on paper, as a prerequisite for MA 125. Thorough study of this issue will involve the consideration of several possible solutions. For example, should we offer an accelerated MA 112/MA 113 pair whereby students would take both courses sequentially in a single semester and the MA 112 section would have appropriate content for MA 125 preparation? Since MA 113 students are usually calculus bound, this section of MA 112 could be upgraded to serve as a suitable prerequisite for MA 125. Or, should the department reinstitute MA 151, the 5-hour course in college algebra and trigonometry that was used as a prerequisite for calculus prior to the advent of articulation? Or, is there another viable option? A recommendation may be forthcoming in this area after faculty members have addressed this issue.
3. Mathematics Major Program - The department is aware of programs where capable students play an integral role in the instruction of students in general studies courses. Whether or not it is feasible to create and implement a program, perhaps a practicum or internship, where mathematics majors who are also pursuing secondary certification would serve as teaching assistants/tutors in our general studies and pre-general studies mathematics classes has not been determined. A recommendation may be forthcoming if faculty members find that this form of program delivery would be mutually beneficial for all parties involved.
4. Mathematics Major Program – The department will continue to look for ways to minimize the negative effects of substantial under-preparation in mathematics for our majors who are community college transfers. Earlier in this self-study it was pointed out that "Students with transfer credit in Calculus I, II, and III (and perhaps Applied Differential Equations I) are usually so far behind compared to our own students that completing a major in mathematics is extremely difficult. In addition, many of these students plan to pursue secondary certification to teach mathematics. Consequently, many of the community college transfer students who complete our mathematics program have minimally acceptable GPA's in the mathematics major, but they find employment as mathematics teachers in the public schools." While the outlook for finding a suitable remedy for this situation is not favorable, we will continue to examine the issue.
5. General Education Mathematics Component Service Program - The department will continue to look for ways to improve student success in our pre-general

studies and lower-level general studies mathematics courses. If another form of course delivery appears promising, then we may wish to include it as another option in our program. Retention of seriously at-risk students is also a concern. If lack of academic maturity is a major cause of student attrition in general studies or pre-general studies mathematics, then advising at-risk students to begin their university studies is probably a major mistake. Therefore, it may be academically prudent to advise the most at-risk mathematics students to delay their enrollment in a mathematics course until their second or third semester at UNA.

6. Responsible Use of the CAAP Exam – The CAAP Exam in Mathematics is primarily designed to measure achievement in algebra through the level of MA 112, Pre-Calculus Algebra. This means that students who choose the MA 105/MA 110 general studies route are considerably disadvantaged on the CAAP Exam. Students who have not gotten beyond pre-general studies mathematics don't fare well on the exam, and transfer students who have transfer credit in one general studies mathematics course (MA 110 or MA 112) also tend to perform poorly on the exam. Not surprisingly, previous statistical analyses of CAAP exam data conducted by this department have revealed that the only groups of students who do well on the CAAP are those who have taken MA 112 only or those who have taken MA 112 plus additional mathematics courses beyond the level of MA 112 at UNA. If the CAAP Exam in Mathematics is to serve as a valid measure of student achievement in the UNA general studies mathematics program, then interpretation of CAAP data should necessarily be limited to those students who have earned credit in MA 112 at UNA.
7. Student Placement in Mathematics – Student placement in general studies or pre-general mathematics at UNA is based primarily on the student's ACT math score. The department has found that high school transcripts are quite unreliable as indicators of actual student achievement in secondary mathematics. While the ACT math score works reasonably well in most cases, we recognize that there are cases where the ACT math score can lead to a lower placement level than the student deserves. For example, many students take the exam before their senior year in secondary school, and they may take one or more substantive mathematics courses afterwards. Also, some students may, for whatever reason, choose to dismiss the ACT. Should UNA offer entering freshmen the option of taking another placement exam, such as the ACCUPLACER Exam, especially for those cases where the student is convinced that his or her mathematics placement based on the ACT is too low?
8. A General Concern – The following issue was raised earlier in this report. Before the creation of the state mandated general studies mathematics program, UNA students had two lower level options for satisfying the 3-semester hour general studies mathematics requirement. At that time, the UNA general study requirement in mathematics was also satisfied by MA 100, Intermediate Algebra, and MA 105, Mathematics for Liberal Arts, (MA 115 at that time). Thus, severely under-prepared students in mathematics could choose a major that required little or no mathematics background and take a mathematics course that was easier (and more practical) for them. In addition, students who needed MA 112 or a higher level mathematics course took it as a requirement for their majors.

Today, many of our mathematically at-risk students seem overwhelmed by mathematics requirements that seem insurmountable. The consequence for many of these students is poor attendance, low performance and high attrition in their mathematics classes. Would it be possible to return to a lower level UNA general studies mathematics requirement that would apply only for UNA graduates? Perhaps the time has arrived for a rational reexamination of what should constitute an appropriate lower level general studies mathematics requirement.

9. Another General Concern - Mathematics faculty members are very much aware that many of our mathematically at-risk students have no clue that they are at-risk. They don't know that they are mathematically under-prepared, and they don't understand that the university academic environment will demand considerably more effort from them in order to achieve an acceptable measure of academic success. Consequently, they may assume that the material in MA 100/105 is far below their level of mathematics achievement and tend to dismiss the course by failing to attend class and to do the assigned homework. Thus, high attrition in these classes is common, and oftentimes, these students will have disconnected from MA 100/MA 105 before two weeks of classes have elapsed. Is it likely that a substantive early intervention by the university, perhaps a very purposeful extended orientation period, would help to reduce early attrition among these students?
10. A Third General Concern – What could be done to keep the Department of Mathematics and Computer Science from having to serve as the de facto gatekeeper for graduation from UNA? Every semester, this department will have some students enrolled in a general studies or pre-general studies mathematics course who are close to graduation, but they have not satisfied their general studies mathematics requirements. Typically, these students are at-risk insofar as their mathematics preparation is concerned. Some of these students have deliberately delayed taking any mathematics, perhaps planning to request a waiver of the mathematics requirement especially since all other degree requirements would have been satisfied. These students are simply trying to take advantage of the university, and the department has a valid de facto gatekeeper role in this situation. We also have students who have made six or seven serious attempts to pass MA 100 before achieving success followed by several serious attempts in MA 112. When a student is deemed by the department of his/her major to be worthy of pursuing a bachelor's degree, and the student has clearly made a good faith effort over an extended period of time to satisfy the general studies mathematics requirement, then perhaps further progress toward the degree should be halted pending a resolution of the mathematics requirement. This resolution should include consultation between the Dean of the College of Arts and Sciences, the Chair of the Department of Mathematics and Computer Science, and the Chair of department of the student's major.
11. Physical facilities – The aging physical facilities of the Mathematics Building are an ongoing problem. During the cooling season, a number of classrooms as well as faculty offices suffer from excessively high temperatures. In addition, during heating season some classrooms and faculty offices are either extremely hot or extremely cold. Clearly, neither faculty nor students can function very well when

temperatures in their classrooms become too extreme. In fact, during January and February of 2009, there were several occasions when faculty members found it necessary to cancel classes because of extreme cold in the classrooms. Serious problems also exist with the aging plumbing system which serves the restrooms in this building. These kinds of problems with our physical facilities help to create a negative perception on the part of both students and faculty that should be addressed promptly.

- **Identify recommendations for improvement of the program.**

With the exception of Issue 11, whether or not any of the program issues mentioned above has risen to the level where specific workable recommendations should be forthcoming is a matter for the faculty members of this department to determine.

a) Recommendations for changes, which are within the control of the program, including curricular changes if appropriate

b) Recommendations for changes that require action at the Dean, Provost, or higher levels