

STRIVING FOR EXCELLENCE
A Program Review & Strategic Plan
for the
Department of Mathematics & Statistics
Youngstown State University

Contents

1	Executive Summary	2
2	Introduction	4
I	PROGRAM REVIEW from 2000-2005	5
3	Introduction	5
4	General Department Information	5
5	Specific Department Information	10
II	STRATEGIC PLAN through 2010-2015	24
6	Opening Remarks	25
7	Needs Assessment	26
8	Goals and Strategies to Address Needs	31
9	Relation to Higher Learning Commission	42
III	APPENDICES	44

1 Executive Summary

One of the Department's greatest strengths is the diverse variety of activities and accomplishments that complement and supplement the University mission and goals. The collaboration with the Biology department and our ventures into distance learning clearly demonstrate the commitment of the Department of Mathematics and Statistics to remaining current in new directions in curriculum and technology. We are active in statewide efforts to improve teacher education in mathematics. We continually host activities such as Mathfest and AMC challenges that involve local schools. The review indicates an extensive list of activities that demonstrate outreach and engagement with the community and beyond.

The Program Review shows that the Department of Mathematics and Statistics has had a substantial increase in credit hour production. Further documented in the review, the faculty of the Department of Mathematics and Statistics are extremely active and productive in scholarship, teaching innovations, and service to the department, the university, the community, and the discipline. We are proud to have had this opportunity to showcase our many achievements and accomplishments.

The subsequent Strategic Plan identifies critical needs of the department and sets goals designed to address the needs together with strategies and metrics of success. The Plan also includes a correspondence between departmental goals and accreditation criteria devised by the Higher Learning Commission.

In its needs assessment, the department projects enrollment needs and future composition of its student body. The Strategic Plan identifies needs in all areas of the Department of Mathematics and Statistics, and emphasizes needs in Mathematics Education, the Center for Undergraduate Research in Mathematics, the Graduate Program, the Collaborative Ph.D. Program, interdisciplinary programs, Actuarial Science, developmental and service courses, distance learning, the Mathematics Assistance Center, and statistical tutoring and consulting. The following are priorities:

- Program development in the areas of the collaborative Ph.D., mathematics education, interdisciplinary studies, and distance learning,
- More release time for faculty so that they can continue their substantive efforts,
- An additional student lab utilizing laptop computers,
- Increased funding and additional space for graduate assistants,
- Two additional full-time faculty and additional secretarial support, and
- Additional dedicated classrooms for programs including Mathematics Education.

The major goals set by the department in the Strategic Plan to address its needs are:

GOAL 1: Provide a highly effective and supportive environment for teaching, learning, and scholarly pursuits

GOAL 2: Recruit and retain a diverse and highly qualified permanent faculty and staff of sufficient size to meet programmatic needs

GOAL 3: Recruit, retain and graduate a diverse undergraduate and graduate student body of high ability

GOAL 4: Improve the department infrastructure and facilities to support the teaching, research, and service missions of the Department

GOAL 5: Foster and strengthen mutually beneficial ties with external constituencies

GOAL 6: Establish more exchange opportunities for students and faculty

The department has outlined subgoals and strategies to achieve its major goals and has devised a set of associated metrics to measure and document its success.

Finally, the department has explicitly addressed the following four Key Elements of the Strategic Plan as they relate to the accreditation criteria of the Higher Learning Commission: academic programs, engagement and student experience, partnerships and community involvement, and diversity in all its manifestations.

The Department of Mathematics and Statistics strives for excellence in every aspect of its operation. The Program Review and Strategic Plan both show evidence of the department's commitment to excellence from 2000-2005, and provide a pathway for continued success through 2010-2015.

2 Introduction

Impetus for the Departmental Review and Plan

The Program Review and Strategic Plan were designed to serve several objectives, as outlined in the *Academic Program Review and Planning Guidelines*:

- To provide an initial overview of the state of the department within Academic Affairs to assist in the strategic planning process for the division, and to assist in a possible reallocation/realignment of available resources,
- To assist in preparation for the upcoming self-study and site visit required for continuing accreditation by the Higher Learning Commission (HLC),
- To assist the department in a comprehensive review and subsequent on-going review and improved planning process, and
- To accomplish the above objectives without creating substantial additional paperwork for the department.

Program Review and Strategic Planning Committee

The members of the committee were **Anita Burris**, **G. Jay Kerns (Chair)**, **Roy Mimna**, and **George Yates**. The initial committee was divided into the *Program Review* subcommittee - served by Anita Burris and Roy Mimna, and the *Strategic Plan* subcommittee - served by Jay Kerns and George Yates. The interim Department Chair, **John Buoni**, served in an advisory capacity throughout the Program Review and Strategic Planning process.

Process for Development of the Document

Information for the Program Review was obtained from four primary sources: 1) program reviews from previous years, 2) departmental annual reports, 3) faculty curriculum vitas, and 4) compiled data supplied to the committee by the YSU Office of Institutional Research. Information for the Strategic Plan was obtained from points identified in the Program Review, data from the Office of Institutional Research, and from faculty consultation.

An open departmental meeting was held on November 21, 2006, during which members of the faculty discussed drafts of the Program Review and Strategic Plan that had been distributed the previous week. Comments and suggestions from the meeting were implemented in the final draft of the document.

Part I

PROGRAM REVIEW from 2000-2005

3 Introduction

This initial document presents a review of the Department of Mathematics & Statistics for the years 2000 through 2005. Over this time period, yearly reports have been generated which address many of the issues in the Academic Program Review and Planning Guidelines. Throughout this document we will reference portions of these previous reports, which have been attached in the form of Appendices. We will follow the Academic Program Review and Planning Guidelines as closely as possible, and present this document in the style of responding to each of the items in turn (although it should be recognized that there is natural overlap between many of these items). This document is a summary of highlights of previous annual reports, with additional details included in the Appendices. For this reason, we will keep our responses to the individual items of this review brief.

As stated in our Mission and Goals Statement below, and as will be shown in the following document summarizing our many and varied activities and accomplishments, the Department of Mathematics & Statistics at Youngstown State University is committed to the highest standards of excellence in teaching, research and scholarship, and service. We are pleased to have this opportunity to review our many activities and accomplishments in these areas over the last five years.

4 General Department Information

MISSION STATEMENT

- *The Department of Mathematics and Statistics is committed to the highest standards of excellence in teaching, research and scholarship, and service.*
- *We strive to enhance students' abilities both to reason mathematically and to communicate mathematical ideas effectively, as well as to instill in students a desire to continue their involvement in mathematics.*
- *We strive to extend mathematical knowledge, to support quality undergraduate and graduate programs, and to disseminate the diversity, coherence, and accomplishments in the discipline.*

- *We strive to provide scholarly expertise, to cooperate with colleagues from other disciplines for the good of the university and its service area, and to advance the discipline in the councils of the university.*

VISION STATEMENT

The Department of Mathematics and Statistics will build scholarship in mathematics and exhibit leadership in the teaching and learning of mathematics. We will maintain broad strength in mathematics and strengthen multidisciplinary collaborations that provide the foundations of scientific principles and prepare students for a technological society. We will provide our students with a quality educational experience in mathematics that is responsive to the needs of all students while recognizing student achievement in mathematics and enthusiasm for creative thinking.

CORE VALUES

- The Department believes strongly in the individual worth of every student, and continues to provide a high quality education in mathematics and statistics within the environment of a small, student-centered academic unit.
- The Department values the expertise of its faculty and endeavors to extend mathematical and statistical knowledge and to avail these skills to benefit our students, the university, and the community.
- We respect others and value diversity of opinion, freedom of expression, and other ethnic and cultural backgrounds.
- We value a broad education of foundational knowledge in mathematics and statistics emphasizing multidisciplinary connections, with curricula enrichment through research and experiential learning.
- We value the creation of mathematical and statistical ideas which are original, rigorous, elegant, meaningful, contextualized, coherent, and instructive for the discipline.

Departmental Governance Document: See the Appendices.

Brief Overview of the Department

At the undergraduate level, the Department of Mathematics and Statistics offers the Bachelor of Science in Mathematics, the Bachelor of Arts in Mathematics, and the Bachelor of Science in Education. In the Bachelor of Science in Mathematics programs, students have a choice of four tracks: the Traditional Mathematics Major Track, the Statistics Track, the Applied Mathematics Track, and the Quantitative Business Track. A mathematics student in the Bachelor of Science in Education program takes the same core courses and many of the same other courses as a Traditional Mathematics Major Track student. All other courses for a student in this program are designed to meet Ohio Department of Education and NCATE (National Council for Accreditation of Teacher Education) guidelines.

At the graduate level, the Department offers a Master of Science in Mathematics. Masters students have the options of choosing pre-doctoral studies, applied mathematics, computer science, secondary mathematics, or statistics. The Department has a ten-year history of facilitating cooperative programs at the doctoral level: the Spring 1997 visit of the Vice-Chancellor of Rhodes University (South Africa) put in place a cooperative program in which Prof. R. Mimna received his Ph.D. on 5 April 2002; in 2003 this cooperative effort was extended to University of Cape Town; and currently, the Department is implementing a cooperative Ph.D. program with Kent State University, based on a Memorandum of Understanding passed by both the Department and the Department of Mathematics at Kent State, in which certain Kent doctoral students would write their dissertation under the supervision of departmental faculty in topology.

How the department fits into the University's overall mission

In addition to its degree programs, the Department of Mathematics and Statistics supports the mission and program of Youngstown State University by providing a wide range of service courses and general education courses. This includes an extensive program for the teaching of the differential and integral calculus, as well as applied calculus, mathematics courses for future educators, and various survey courses.

In 2003 the Department initiated collaboration with the YSU Department of Biological Sciences. This resulted in two Summer Undergraduate Research Experiences in mathematics and biology during 2004 and 2005. During this period, students from the Department of Mathematics and Statistics and the Department of Biological Sciences worked together on joint projects. In this connection, a Supplementary Grant in the amount of \$100,000.00 from the National Science Foundation, No. DUE0337558, was obtained for the period 2003-2005.

In 2004 the department co-sponsored a Summer Undergraduate Research Experience (SURE) in which eight students engaged in intensive summer research projects at the boundaries between mathematics and biology. The projects lasted eight weeks and were jointly

advised by math and biology faculty. This venture was coordinated and directed by George Yates.

Andy Chang developed and taught a distance education course in Biostatistics for the Master of Public Health Program. Annette Burden has taken the lead in developing and implementing online course sections for Math 1501, Math 2623, Math 2673, Math 3705, Math 3720, Math 3785/3760, and Math 3751. Some of these courses were developed for Empire State (SUNY), Salem International University, and DeVry University. These universities do not have the faculty and resources to offer such courses on site. This venture into distance learning may have implications for future cooperative programs at the Master's level.

Andy Chang presented three workshops on using Technology in Teaching to YSU staff and faculty.

Jay Kerns, Andy Chang, and Gary Stanek regularly provide statistical consulting services to faculty of other departments at YSU as well as to local businesses and media as requested.

Coordinating with the Center for International Studies and Programs, Roy Mimna worked on the creation of a Distinguished Professor Program to provide for application by academic departments to bring scholars from other countries to YSU for a semester.

The department, along with the local chapter of the Mathematical Association of America, sponsors an annual Calculus competition open to all YSU students. Our students regularly attend the summer meeting of the MAA and present award winning papers at Pi Mu Epsilon's Mathfest. Further details of these events are given below.

In 2000, the department raised approximately \$2000 in a telephone pledge effort. This money was used to purchase furniture for a Mathematics Resource and Study Center. The center was opened Fall 2001 and since then has been extremely popular with our mathematics majors.

In 2001, the J. Douglas Faires Endowment fund was created. This \$50,000.00 endowment supports outreach activities, provides support for undergraduate students to travel and present research projects and results at conferences and other such events, underwrites student awards and competitions, and provides support for a faculty position in the department with a reduced teaching load.

The Mathematics Assistance Center (MAC) continues to assist YSU students in the strengthening of the fundamental mathematics skills which are necessary for success in the study of mathematics and to provide resource materials for independent study. The MAC provides tutoring in courses ranging from Algebra through selected topics in Calculus II. Students taking Calculus III or Differential Equations may also find solutions manuals and computer assistance for these courses. The MAC offers workshops (usually for Math 2623) as needed. Statistics are available at any time on the MAC attendance; instructor printouts are distributed twice each semester. The MAC is frequently used and is highly appreciated by the students who use it. In the 2005-06 academic year, the MAC logged over 6,780 sessions.

More information on this vital resource is provided in the Appendices.

The Role of the department with respect to outreach and engagement with the community

The department, along with our active Pi Mu Epsilon chapter, sponsors many community activities such as annual Homecoming tailgate parties, book sales, bake sales, and the annual Spring Formal Dinner Dance. We also host an annual PME Regional Conference / Student Paper Meeting which students and faculty from dozens of colleges and universities from Ohio, Pennsylvania, and West Virginia regularly attend. This conference provides students the opportunity to give presentations, discuss math with their peers, and hear about other students' experiences with REU's (Research Experiences for Undergraduates). In recent years, NSF Grants have provided the department the opportunity to offer students free registration to this important conference.

Since 2003, the Department of Mathematics and Statistics has held an annual MathFest for area high school students. The event is held in Kilcawley Center and comprises an entire day of activities. About three hundred high school students from northeastern Ohio and western Pennsylvania have participated each year. Events include Workshops, Mixed Team Competition, a Mathbowl, and a Challenge of Champions Test. Prior to the day of MathFest, students participate in an Essay Contest and a Statistics Poster Contest. Numerous prizes and awards, donated by area businesses, are presented. The high school teachers also attend and participate. Workshops have included topics such as mathematical puzzles, game theory, mathematics and baseball, voting theory, and mathematical biology, to name but a few.

Andy Chang served as the course director of Biostatistics in Public Health for the Consortium of Eastern Ohio Universities Master of Public Health (MPH) program. This program involved MPH programs from 6 universities in eastern Ohio: Akron, Cleveland State, Kent State, NEOUCOM, Ohio State, and YSU.

Anita Burris served as Co-leader of the 2005 NEOCEX Math Project. The NEOCEX (North East Ohio Center of Excellence) project is a collaborative effort with YSU, Kent State University, Akron University, and Cleveland State University to improve the quality of mathematics and science teacher education. David Pollack and Howard Pullman (Department of Teacher Education) led the YSU math team consisting of YSU faculty and local elementary and middle school teachers. The team developed several lesson plans to be used in courses at YSU for future educators. These lesson plans will be submitted to the Ohio Resource Center (ORC) for possible publication and dissemination.

Nate Ritchey has served as Consultant Evaluator for the North Central Association of Colleges and Schools and as a Mathematics Program Evaluator for universities in Pennsylvania, Oklahoma, and Minnesota.

Lori Carlson is a school board member on the board of education of Lowellville Local School District.

David Pollack (regularly) and Anita Burris (occasionally) provide consulting and in-service workshops to local elementary, junior, and senior high school teachers and math specialists.

Annette Burden gave presentations to area high school guidance counselors and to YSU Tech Prep program representatives on developmental math.

Angela Spalsbury served as Program Coordinator for Ohio Project NExT (New Experiences in Teaching) a mentoring program for new mathematics faculty in Ohio.

Many of the faculty in the Department of Mathematics and Statistics serve as judges at local science fairs and mathematics competitions including 24 Challenge competitions coordinated over the years by Nate Ritchey, a Statistics poster competition hosted by G. Andy Chang and G. Jay Kerns, and AMC competitions directed by J. Douglas Faires. Over the years many members of the faculty have spent several Saturdays working with local junior and high school students and teachers to prepare students for the AMC examinations and the American High School Competition in Mathematical Modeling. Several faculty members have given presentations at local middle schools and high schools to introduce students to research in mathematics and to initiate recruitment efforts. See individual faculty vitas for further information regarding these and other outreach activities.

5 Specific Department Information

Number of Majors: Traditional undergraduate mathematics majors are those students in the Colleges of Arts and Sciences, Engineering, or Business who choose mathematics as their primary or secondary major. In addition to these traditional majors, the Department of Mathematics and Statistics has a number of undergraduate majors who elect to major in mathematics in the Department of Education. These latter undergraduate students, who are majoring in Integrated Mathematics Education for teaching grades 7 to 12, take the same courses as a major in mathematics. It should also be noted that, upon entering the university, those students who indicate that they intend to major in mathematics are also listed in Table 1 under the category of “Mathematics-Pre Education.” This designation was first implemented in 2001.

Although the data show a slight decrease in major enrollment from 2004 to 2005, the other years indicate a significant increase in the number of student majors. Our graduate program has nearly doubled in size since the late 1990’s. The diversity of graduate student

Table 1: **Official Fall 14th day Head-count Enrollment**

Program	2000	2001	2002	2003	2004	2005
Mathematics Majors	47	57	49	46	47	33
Integrated Mathematics Education	27	37	45	51	39	29
Mathematics Pre-Education		7	17	21	21	18
Graduate students in Mathematics	13	17	18	30	29	23

backgrounds has also increased. In recent years, we have had graduate students from the following world areas: Cameroon, Ghana, Nigeria, Nepal, India, China, Jamaica, Bahamas, and Palestine. A large number of our students come from Ohio, Pennsylvania, and other U.S. states.

Student retention and average time to degree: The percentages of undergraduate students returning in the same major (mathematics) are as follows:

2000-01	2001-02	2002-03	2003-04	2004-05
100%	50.00%	75%	100%	40.0%

The percentages of undergraduate students returning in the same major (integrated math education) are as follows:

2000-01	2001-02	2002-03	2003-04	2004-05
66.7%	75.0%	33.3%	50.0%	75.0%

Student recruitment and retention is a priority of the department. Current students provide input on the programs via the recently developed assessment tools. Every graduating student completes an exit interview. Alumni input is regularly solicited through faculty contact and newsletter surveys. The effectiveness of the programs and their attractiveness to students is an ongoing item on the agenda of the departmental mathematics major committee.

The average time to completion of degree measured in years for undergraduate mathematics majors and integrated mathematics education majors is shown in Table 2.

Table 2: **Average Time to Completion of Undergraduate Degree**

Degree Program		2001-02	2002-03	2003-04	2004-05	2005-06
Mathematics	New	5.24	5.05	5.85	5.66	4.36
	Transfer	3.33	3.22	3.83		3.00
Int. Math. Educ.	New	4.49	3.66	7.58	5.12	4.83
	Transfer		2.83	3.00	1.66	4.22

Credit Hour Generation: In Spring Term, 2002, the Department generated 11,182 credit hours, which was 14.117 percent of the total of 79,206 hours generated by the College of Arts and Sciences, and 8.026 percent of the university total. In Spring Term, 2006, the Department generated 12,666 credit hours, which was 15.911 percent of the total of 79,605 hours by the College of Arts and Sciences, and 8.741 percent of the total for Youngstown State University. Based upon these data, the Department has had a 13.271 percent increase in credit hour production from Spring 2002 to Spring 2006.

In Fall Term, 2001, the Department had the highest production of credit hours of any department in the university with 14,487 hours. That is a full-time equivalent (FTE) of 966 students.

In Fall Term, 2006, the Department has a preliminary credit-hour production of 15,444. This total is made up of 3,717 hours in General Studies One, 6166 hours in General Studies Two, 5,346 hours in Baccalaureate One, and 215 hours in Masters One. The above-listed credit hour production of 15,444 includes only subsidy-eligible credit hours. In addition to subsidy-eligible credit hours, there are 1,254 non-subsidy-eligible credit hours for Fall Term, 2006.

Staff Resources and Number of Faculty: The Department of Mathematics and Statistics has a full-time teaching staff of twenty-three, comprised of four females and nineteen males. Ethnic diversity of the faculty is not great; one faculty member is from Taiwan, two are African-American, and the others are of mostly European ancestry. Twenty-two members of the full-time staff hold a doctorate degree and one holds a master's degree. Eight hold the rank of professor, five hold the rank of associate professor, and ten hold the rank of assistant professor. Sixteen of the faculty members have tenure and six are tenure-track. One member of the faculty is cross-listed in the Department of Teacher Education. One member of the full-time faculty is currently serving as Associate Provost.

In addition to the full-time faculty, the Department has thirty-nine part-time instructors and eighteen graduate students who teach classes. Finally, the Department also receives teaching services from retired faculty who are on Extended Teaching Service. An examination

of the data indicates that the Department of Mathematics and Statistics has more “full-time-equivalent” part-time faculty than full-time faculty.

The clerical staff is comprised of one full-time secretary (secretary 2) and one part-time secretary (secretary 1). For a department of our size and production, 1.5 secretarial positions is inadequate.

Department of Mathematics & Statistics

Accreditation: Youngstown State University is accredited by the Higher Learning Commission. In support of accreditation efforts, Nate Ritchey is a member of the Steering Committee & the Criterion 3 Committee - Student Learning / Effective Teaching. Angela Spalsbury is a member of the Criterion 5 Committee - Engagement and Service.

In addition to Youngstown State University being accredited by the Commission on Institutions of Higher Education of the North Central Association of Colleges and Schools, Youngstown State University’s teacher education and advanced programs are accredited by the Ohio Department of Education (ODE) and the National Council for Accreditation of Teacher Education (NCATE). Anita Burris (the Mathematics Department faculty member who is cross-appointed in the Department of Teacher Education) is a Standards Committee Member for NCATE Standard II (Assessment system and unit evaluation).

External Recognition: In 2000, Joe Altinger and Andy Chang were mentioned in Prism (a magazine devoted to engineering education) for their work on the effects that cold medicine have on test skills in mathematics. In 2001, Nate Ritchey received the “Spirit in Education Award” from the Suntex Corporation in recognition of his efforts to coordinate the 24 Challenge. In 2003, Annette Burden and David Pollack both received the NOCHE Award for Excellence in Teaching. Annette Burden also received the Ohio Magazine Award for Excellence in Teaching. G. Andy Chang received a Faculty Award in 2005 from the Consortium Eastern Ohio Universities Master of Public Health Outstanding MPH. See individual faculty vitas for further details regarding these and other forms of external recognition.

Research Productivity: The faculty of the Department of Mathematics and Statistics is very active and productive in research. See faculty vitas for individual data. The totals of reported activities are given in Table 3.

In April, 2001, and also in April, 2006, the department hosted a Symposium on Topology and Abstract Analysis. Scholars in attendance for the 2006 symposium included professors

Table 3: DMS Research Productivity Totals

	2000-01	2001-02	2002-03	2003-04	2004-05
Refereed Journal Articles	12	6	4	9	31
Books		4	2	1	
Monographs		1			
Book Chapters	4	1	2	7	
Manuals & Ancillaries	1	1	3	2	1
Presentations	11	8	16	22	27
Teaching Awards	3		2	4	2

from the University of Pittsburgh, Slippery Rock University, South Carolina University, and the Slovak Academy of Sciences. Some of the speakers at this conference were world recognized mathematicians. Both conferences were huge successes.

Development of new programs In the late 90's the Ohio Department of Education implemented a change from grades 1 - 8 certification to teacher licensure in either Early Childhood (Grades Pre-K - 3) or Middle Childhood (Grades 4 - 9). The department of Mathematics and Statistics developed a 2-course sequence - Mathematics for Early Childhood Teachers, and 6 new courses (in a 7 course sequence) designed especially for future Middle Childhood Teachers of Mathematics. These programs have steadily grown in enrollment. During the 2004 - 2005 academic year, more than 40 sections of these new courses for future educators were offered. This can be compared to 23 sections of mathematics courses for future educators offered during the 1999-2000 academic year. YSU was one of the first universities in Ohio to develop new course sequences to address the changes in certification. The new mathematics programs have been studied and modeled by other universities in Ohio as well as universities in other states.

During this review period, a sequence of courses for Calculus Honors Laboratory requested by the School of Engineering was developed. Development of new courses in Partial Differential Equations, Mathematical Biology, Mathematical Modeling, Actuarial Science, and Data Mining is also underway. Some of these changes and developments are described below:

- The Statistics committee modified the existing Statistics track of the Mathematics Major to include courses in Actuarial Science.

- We have added a course STAT 5802, Theory of Interest. We have modified the existing course STAT 5848 to include Time Series analysis.
- The three courses STAT 5817, STAT 5848, and STAT 6940 were approved by the Validation of Educational Experience (VEE) committee of the Society of Actuaries (SOA) as qualifying for VEE credit.
- The course STAT 5800, Mathematical Foundations of Actuarial Science, was developed.

New Program Delivery Methods In 2001, the department was awarded a fully funded \$70,000 computer grant from the Cluster Ohio Program to set up a 32 processor parallel computer. The department received approval to replace the computers in Cushwa 1062. The old computers were used to construct a developmental Mathematics Learning Laboratory in Cushwa 3085. The department also purchased two SMART boards with projection units and laptop computers that are being utilized on a regular basis.

As previously mentioned, several online distance learning courses have been developed and implemented in this review period. The mathematics department computer lab, Cushwa 1062, is used daily by students working on mathematical projects and assignments. This lab can also be reserved by faculty for classes. This option is so popular with the faculty that reservations must be made well in advance and faculty are continually negotiating with one another to obtain the dates they want to take their students into the lab. In this review period, many faculty members have significantly increased the use of technology in their courses and assignments. Annette Burden also established a synchronous tutoring network via the NetTutor, tutoring students at home at night via the internet.

A. Faculty

Scholarly activities and productivity These activities are documented above.

Professional development activities: During this review period, 1 faculty member received reimbursement for advanced studies, 2 were granted faculty improvement leaves, 4 were granted sabbatical leaves, 8 were granted research professorships, and 4 received reasigned time. This support allowed the faculty involved to take advanced courses related to their areas of concentration, to write textbooks, textbook chapters, and revised editions of textbooks, and to conduct research locally and abroad, independently and in conjunction with a number of highly respected mathematicians.

Teaching effectiveness: During this review period, faculty in the department received 12 distinguished professorship awards (6 in teaching, 1 in research, 4 in university service, and 1 in public service). Other awards include 2 Watson Merit Awards, an Award for Department Chair Leadership, 2 Provost Awards of Merit, and a Student Service Award.

Innovations in teaching: The mathematics department continues to obtain materials and manipulatives for use in courses for future teachers (as well as other courses). These manipulatives are stored in a cabinet in the department office and are accessible to all faculty members who wish to use them in their courses.

In 2003 the department introduced Math 6905, teaching practicum for GAs, as part of the GA orientation. This practicum ensures that GAs receive faculty support and guidance at they venture into teaching (many teaching for the first time) developmental algebra courses for the department. This also ensures that the students in these courses receive the top quality instruction that they deserve.

Use of IDL and other new teaching techniques: New distance learning courses and the increase in the use of technology in math major courses and courses for future teachers is discussed above. Developmental mathematics courses such as Math 1501 have had a computer component since 2002. In 2002 the COMPASS placement exam was implemented. We are currently in the process of analyzing statistical data obtained from this exam, course placements, and success or failure of students in these courses.

Service to the profession: Nearly all of the faculty members are active in refereeing and reviewing articles, textbooks, and software related to their areas of concentration. Over the five-year review period, hundreds of reviews and reports have been generated. See individual faculty vitas for details.

Service to the University: Both Doug Faires and Nate Ritchey have been recognized for their substantial, ongoing contributions to the University Honors Program. Several faculty members have served on important university committees such as accreditation committees, the Technology sub-committee, and various other university committees. See individual faculty vitas for details.

Service to the community: Community outreach activities are described above.

B. Curriculum

Curriculum review processes in place: The Department has developed a program of assessment of the core courses for the major in mathematics, as well as the general education program. The following Learning Outcomes are used to assess core courses, using various standard tools such as student surveys and instructor evaluations:

Learning Outcome 1: Students will develop and demonstrate the ability to reason mathematically by constructing mathematical proofs and recognizing and analyzing accurate numerical data in all core courses. Students will learn that truth in mathematics is verified by careful argument, and will demonstrate the ability to make conjectures and form hypotheses, test the accuracy of their work, and effectively solve problems.

Learning Outcome 2: Students will learn to identify fundamental concepts of mathematics as applied to science and other areas of mathematics, and learn to interconnect the roles of pure and applied mathematics.

Learning Outcome 3: Students will demonstrate that they can communicate mathematical ideas effectively by completing a senior capstone project involving an investigative mathematical project and presenting their findings and results in both a written format and as an oral presentation to faculty and other students.

The following Learning Outcomes are used to assess the general education program, in particular, Mathematics 2623 and Mathematics 2625:

Learning Outcome 1: The student will learn how mathematical modeling is used to solve a variety of real-life problems, including the use of arithmetical, algebraic, geometric, and statistical methods via formulas, graphs, tables, schematics, and other means, representing mathematical information symbolically, visually, numerically, and verbally.

Learning Outcome 2: The student will learn how to estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results.

Learning Outcome 3: The student will learn to process and present both quantitative and qualitative information, using technology when appropriate, and will learn that mathematical and statistical methods have limits.

Learning Outcome 4: The student will learn how mathematics and critical mathematical reasoning fits into the larger tapestry of knowledge available to him/her in today's society.

Learning Outcome 5: The student will learn to use mathematical concepts in both applied and abstract contexts.

Learning Outcome 6: The student will learn how collaboration with other students can be used to accomplish all the other learning objectives listed above.

Program success metrics: During this five-year review period, nearly 50 mathematics students have traveled to MAA's Mathfest, held annually in various locations. For at least two of these years YSU had more students presenting papers and projects than any other university attending the conferences. At this conference, eight student talk awards are given annually. In the five-year review period, YSU students have won 3, 2, 3, 2, and 3 of these 8 annual awards. No other university in attendance can claim such continued student success.

YSU mathematics majors regularly compete in the Putnam exam. Each year students from nearly 500 different colleges and universities from the U.S. and Canada participate in this exam. This exam is so challenging that each year nearly 2000 participants receive no points on it at all. During this review period, YSU students have placed in the top 28%, 26%, 16%, 21%, and 12%.

During this five-year review period, YSU mathematics majors have competed annually in the COMAP Interdisciplinary Contest in Modeling. These students have received 1 Outstanding, 6 Meritorious, 11 Honorable Mention, and 11 Successful Participant awards. In the year of the Outstanding award, there were 638 teams representing 325 institutions from 11 countries around the world. This designation is given to only the top 1 - 2% of the participating teams. The designation Meritorious is usually given to only the top 10 - 15 % of the participating teams.

Praxis II exams: 112 out of 114 YSU students who have taken the Middle School Mathematics Content Praxis II exam have passed this exam. Nearly all of these students passed the exam on their first attempt. This nearly 100% passage rate on this national exam can be compared to a reported national passage rate of 86% (www.ode.state.oh.us, 2005). However, the success rate for the High School Mathematics Content Praxis II exam is not as high as that for the Middle School program. The passage rate of YSU Mathematics Education students taking the High School Content Praxis II exam is 50% when multiple attempts are counted. This is slightly worse than the reported national passage rate on this exam of 54%. When multiple attempts are not counted, 87% of our students eventually pass this exam. 42% of the students who take this exam do not pass it on their first attempt. The department (specifically the math major committee) is currently looking into what can be done to improve these results. No student is allowed to enroll in student teaching until they have passed Praxis II exams in both their content area and in Principles of Learning and Teaching.

Program currency: Our ventures into distance learning, the successful advent of the middle school / early childhood program, and recently approved changes to math major tracks provide evidence that the program is constantly redefining itself in the context of contemporary changes and technology. Although courses and programs are continually re-assessed, consideration of any major revisions should be delayed until a new chair is elected in 2007. Also, the proposed implementation of a community college and/or the proposed college restructuring will have significant impact on plans for future revisions.

Graduate programs: The graduate program, our cooperative Ph.D. with Rhodes and Cape Town Universities, and our efforts to enter into a cooperative Ph.D. with Kent State University are all described above.

Comparison to other programs / departments: Data from the Ohio Department of Education (www.ode.state.oh.us, 2005) indicate that in 2003 - 2004, YSU had 17 out of 17 students in the Middle School Mathematics Education program who passed the Praxis II content exam. This can be compared to 18 out of 18 students in the University of Akron program, 26 out of 30 students in the Cleveland State University program, and 18 out of 18 students in the Kent State University program. Comparing these numbers of students to the total number of education majors at each university, we obtain the following results: Akron 0.45%, Cleveland 0.89%, Kent 1.04%, and Youngstown 1.21%. This demonstrates the popularity out of all education majors of the YSU middle school mathematics program compared to similar programs at other universities.

Web-based reviews of the general student population such as www.studentsreview.com indicate that, for an education, YSU rates an A-, while other universities such as Cleveland State, Kent State, and Akron University, rate respectively as C+, B+, and B-. It is interesting to note that these same students rate the social life of Youngstown as a C+ while rating the social life aspect of Cleveland, Kent, and Akron as C, B+, and B- respectively.

C. Students

Input data: This information is described in a previous section.

Developmental needs: Our two developmental Algebra courses, Math 1500 and Math 1501 play a fundamental role at YSU. This is underscored by the fact that roughly one out of every two freshmen entering YSU takes at least one developmental course in mathematics. Three-fourths of the students taking developmental algebra take only Math 1501. The other fourth of the students take both Math 1500 and 1501.

Tracking studies undertaken by R. G. Goldthwait (Department of Mathematics and Statistics) and R. L. Geltz (Institutional Research) suggest that over 60% of the students, who register in Math 1501, complete that course successfully. Over 35% of the students, who first register in Math 1500, complete the two course algebra sequence successfully.

It is of primary interest to know how many students, who have successfully completed Math 1501, succeed in their mathematics requirement at YSU. The answer depends to some extent on each student's major area of study. Looking at those developmental students who take the GER mathematics course Math 2623 (the majority of developmental math students), tracking results suggest that these students are succeeding in Math 2623 at close to a 90% rate. The success rate of developmental students in the business math sequence and the math sequences for other quantitative disciplines is roughly 40 - 50%.

Job placement rates: While complete information on job placement of alumni is unavailable, the department has had considerable informal contact with alumni who regularly keep us up to date on their status. For information on these math program graduates and their current positions see the attached annual reports.

Alumni input: The Department of Mathematics and Statistics keeps in touch with alumni through a newsletter. Alumni regularly fill out surveys that inform us of their current positions and ventures. Exit interviews also provide the department with valuable input into the programs.

Contests and competitions: Information on Mathfest participation and awards, Putnam exam participation, and COMAP results is given above. These results provide evidence that YSU mathematics majors excel in such ventures.

D. Resources

Our increased credit hour production and low full-time faculty to student ratio indicate a need for more faculty members. Specifically, items detailed above in this report reveal a need for more faculty trained in Statistics, Actuarial Science, Mathematics Education, as well as areas related to the proposed new cooperative Ph.D. The diverse nature and extensive activities of our faculty show a need for more release time. Many of our faculty members serve in time-consuming positions, for example course coordinator for courses involving several sections, without the benefit of release time or other compensation.

The current secretarial staff is overloaded. Additional secretarial positions are a priority.

Some of our current computer labs are not ADA compliant. We have a need for more computer labs and updates of the current labs. With the increase in use of technology in our courses, there is a need for more technologically advanced classrooms and resources.

GA stipends are not competitive with neighboring universities. More space for GAs and more GA resources such as computer access, hardware, and software are necessary.

E. Need for the program

Level of student interest and demand: The increase in number of student majors and the significant activities and achievements of our students (conference presentations, COMAP, Putnam) indicate a high level of student interest and demand for the program.

Enrollment trends: Increased student enrollment and retention is a priority of the department. See the strategic plan for details on these efforts.

Relation to institutional goals and Centennial Plan: The variety of activities and accomplishments detailed above demonstrates the commitment of the Department of Mathematics and Statistics to promoting excellence in teaching, learning, service, and research (Issue 2). We already provide a range of services necessary for a student-centered University (Issue 5). We have demonstrated our commitment to technology and community partnerships (Issues 7 & 8). Our commitment to other goals and the centennial plan are addressed further in our strategic plan.

Fiscal and academic relationships between graduate and undergraduate programs: The department offers a variety of 5800 level courses taken by both graduate and undergraduate students. The swing inventory contains a key overlap; each course in the program helps the other to run due to the number of both graduate and undergraduate students available to take the courses. These courses provide opportunities for advanced undergraduate students that they otherwise would not have.

Graduate assistantships also provide an economical means to staff a significant number of our developmental courses. Graduate assistants attend a teaching workshop prior to the start of every Fall semester. During the semester they receive mentoring from a faculty mentor and attend a teaching practicum. This ensures that the students in our developmental courses taught by graduate students receive the quality education that they deserve.

Cooperative program development: The existing cooperative Ph.D. with Rhodes and Cape Town Universities and the proposed cooperative Ph.D. with Kent State University are described above.

Employment opportunities, graduation rates, and alumni input These items are covered in previous sections of this report.

F. Productivity and Innovation

Adequacy of Resources: See Section D above.

Grants: In 2000 - 2001, the department was awarded a fully funded \$70,000 computer grant from the Cluster Ohio Program to set up a 32 processor parallel computer.

In 2001 - 2002, the department received a \$210,000 NSF CCLI grant to revamp the developmental mathematics courses. Also awarded was a \$50,000 grant for developmental mathematics in Tech Prep.

In 2002 - 2003, Douglas Faires was the PI on a national NSF grant for \$250,000 to support undergraduate conferences in mathematics. Also, the mathematics department received an NSF grant for 80,000 to fund a Science and Engineering Alliance, an Ohio Board of Regents grant for \$50,000 to fund teacher education efforts, an \$84,000 Pacer grant to establish the Center for Advanced Numerics, Complexity, and Networking (CANCAN), and a \$397,500 NSF grant entitled Technology Leaders Scholarship Program.

In 2003 - 2004, a \$40,000 grant for undergraduate mathematics conferences and a \$100,000 grant for Undergraduate Biology and Mathematics were obtained.

In 2004 - 2005, a \$3000 grant for manipulatives to be used in teacher education courses, and a \$48,000 grant (NEOCEX) to help facilitate the statewide improvement in teacher education courses in mathematics and science were obtained.

Collaborations: Our ventures with Mathfest and the PME conference demonstrate collaborations with local schools and universities. The NEOCEX project demonstrates a collaborative effort with Kent, Akron, and Cleveland to improve teacher education in math and science. The Department of Mathematics and Statistics has also received a variety of grants and support from various corporate and community groups. These activities are all described in previous sections of this report.

Contributions to the economic development of the community: The collaborations described above are examples of contributions to the economic development of the community. Our ventures with distance learning and outreach and engagement with the community are also described above.

Collaborations with other departments / institutions and articulation agreements: Collaborations with YSU departments such as Biology, Physics, and Teacher Education are described in previous sections. Collaborations and articulation agreements with Rhodes, Cape Town, and Kent are also described above.

G. Outcomes Assessment

The core courses for the undergraduate mathematics major are Calculus 1, 2, 3, Discrete Mathematics, Linear Algebra and Matrix Theory, Abstract Algebra 1, Real Analysis 1, Probability and Statistics, CSIS Programming and Problem Solving, and the Senior Undergraduate Research Project. The Learning Outcomes for the core courses, which are listed above in the paragraphs on Curriculum, provide specific cognitive skill outcomes to enhance students' abilities to reason mathematically and to communicate their ideas in a lucid and correct way, in accordance with the mission statement of the Department of Mathematics and Statistics. In each academic year the faculty has the opportunity to receive and review the results of assessment of all learning outcomes at a department meeting. The objective is to identify deficiencies and to find ways to correct them. This feedback loop has led to the installation of additional projection equipment in Cushwa Hall. It has also led to the initiation of new course offerings in the department.

For a number of years, a departmental final examination has been given to all students completing Calculus 1. The examination gives all instructors a window on what students are actually learning. Students in all core courses are frequently tested in an objective manner. Most instructors use regular quizzes and a minimum of three midterms, as well as a final examination. In addition, some instructors assign graded homework problems. As a result, instructors quickly become aware of deficiencies as they occur.

Criterion 3 Considerations

(a) The department's goals for student learning outcomes are clearly stated above for each educational program and make effective assessment possible. Assessment in accordance with the department's learning outcomes for core courses and for general education has been an on-going project for many years. During the past two academic years, assessment of core courses and the general education program have been restructured to conform to the methods, concepts, and format of the College and the University.

(b) The 12 distinguished professorship awards (6 in teaching, 1 in research, 4 in university service, and 1 in public service) that faculty in the Department of Mathematics and Statistics have received in this five year period as well as the huge variety of activities and

accomplishments detailed in this report clearly indicate that the organization values and supports effective teaching.

(c) One strong indicator that the organization creates effective learning environments is the 13 best-student-talk awards received by students presenting research at MAA's Mathfest over the five year period. Another evidence of effective learning environments is that 112 out of 114 YSU students that have taken the Middle School Mathematics Content Praxis II exam have passed this exam.

(d) The department's faculty has had relatively little release time. At present, an inordinate number of classes are taught by part-time faculty and by graduate assistants. A number of additional courses are in various stages of planning and development and the demands on staff will continue to grow. Therefore, while the department's learning resources do support student learning and effective teaching, these resources are currently stretched to the maximum.

Critical Issue 2 of YSU's Centennial Strategic Plan

Our list of distinguished professorships (see above) and our vast list of student successes (see above and see the appendices of this report) provide evidence that the Department of Mathematics and Statistics promotes excellence in all areas of teaching, learning, service, and research and prepares students to undertake civic and leadership responsibilities.

Preparing for the Future

Increases in the department responsibilities and workload (as documented elsewhere in this report) and the impending cooperative Ph.D. program with Kent State University make the hiring of new, top-quality faculty and the realization of necessary support and resources a main concern in preparing for the future. It is imperative that the department continue to receive support from the administration as we face the challenges of creating and maintaining a viable Ph.D. program and face other challenges of the future.

Part II

STRATEGIC PLAN through 2010-2015

6 Opening Remarks

Mathematics is a rigorous and axiomatic discipline whose language and concepts underlie science, engineering, technology, and much of the social sciences. The ideas of mathematics frequently precede applications and enable important developments in other fields. Mathematical ideas permeate chemistry, computer science, economics, engineering and physics, and will continue their expansion into biology, business, pedagogy, and the social sciences. Likewise, applications have driven new developments in both pure and applied mathematics.

The Department of Mathematics and Statistics (DMS) is committed to both strengthening core areas of mathematics and statistics and increasing collaboration with other disciplines to address the evolving usefulness of mathematics in those fields.

This strategic plan describes how the DMS intends to strengthen and expand its programs at the University and beyond. Throughout we will strive for excellence in research, education, service, mentoring and community outreach.

MISSION STATEMENT

- *The Department of Mathematics and Statistics is committed to the highest standards of excellence in teaching, research and scholarship, and service.*
- *We strive to enhance students' abilities both to reason mathematically and to communicate mathematical ideas effectively, as well as to instill in students a desire to continue their involvement in mathematics.*
- *We strive to extend mathematical knowledge, to support quality undergraduate and graduate programs, and to disseminate the diversity, coherence, and accomplishments in the discipline.*
- *We strive to provide scholarly expertise, to cooperate with colleagues from other disciplines for the good of the university and its service area, and to advance the discipline in the councils of the university.*

VISION STATEMENT

The Department of Mathematics and Statistics will build scholarship in mathematics and exhibit leadership in the teaching and learning of mathematics. We will maintain broad strength in mathematics and strengthen multidisciplinary collaborations that provide the foundations of scientific principles and prepare students for a technological society. We will provide our students with a quality educational experience in mathematics that is responsive to the needs of all students while recognizing student achievement in mathematics and enthusiasm for creative thinking.

CORE VALUES

- The Department believes strongly in the individual worth of every student, and continues to provide a high quality education in mathematics and statistics within the environment of a small, student-centered academic unit.
- The Department values the expertise of its faculty and endeavors to extend mathematical and statistical knowledge and to avail these skills to benefit our students, the university, and the community.
- We respect others and value diversity of opinion, freedom of expression, and other ethnic and cultural backgrounds.
- We value a broad education of foundational knowledge in mathematics and statistics emphasizing multidisciplinary connections, with curricula enrichment through research and experiential learning.
- We value the creation of mathematical and statistical ideas which are original, rigorous, elegant, meaningful, contextualized, coherent, and instructive for the discipline.

7 Needs Assessment

An essential component of an effective Strategic Plan is an objective assessment of the expected needs of the Department, to ensure that the necessary resources are available when they are required.

Enrollment Needs Student enrollment at YSU is on the rise. With increasing enrollment at the university, the DMS expects a concomitant increase of enrollment in service courses and an associated increase in the number of mathematics and statistics majors. The DMS will need additional faculty to teach additional classes.

While the Program Review shows increased enrollment in Mathematics Education courses, currently this enrollment is declining due to job saturation in the area. While we expect a decrease in the number of Mathematics Educations courses offered in 2010, with large numbers of retirements expected in local area public schools in the coming years, we expect a corresponding increase by the year 2015.

Further, the recent ease of restrictions on international travel will result in an increase in students from foreign countries, so we expect increased enrollment in our graduate program. We project an undergraduate math major headcount of 110 in 2010 and a headcount of 120 in 2015. We project a graduate headcount of 30 graduate assistants (GAs) and 2 cooperative Ph.D. students in 2010 and 30 graduate assistants (GAs) and 5 cooperative Ph.D. students in 2015. Departmental subsidy-eligible credit hours are expected to reach 16,210 by 2010 and 17,167 by 2015. If classroom space needs are met in this time period, we expect credit hour production to increase beyond these estimates.

Future Composition of DMS student body We expect a uniform increase in enrollment in mathematics courses. We expect that ease of restrictions on international travel will result in an increase in students from foreign countries, with an associated increase in graduate students.

With the formation of a new STEM college, we expect increased collaborative activity and programs relating Mathematics to Science, Technology, and Engineering. We thus expect the future DMS student body will reflect a higher proportion of students in applied fields of mathematics.

Expected Program Needs The DMS has rapidly changing needs in the programs it offers and anticipates many evolving requirements. The following programs are target areas, listed in no particular order.

- *Mathematics Education.* The DMS needs a Master's Program for Secondary Mathematics educators. The department also needs development of Mathematics courses at the graduate level that support existing Master's programs in the Department of Education. Finally, the DMS needs similar program and course offerings for Middle school teachers.
- *Center for Undergraduate Research in Mathematics.* The DMS is developing a Center for Undergraduate Research in Mathematics with endowment funds donated primarily

by alumni and faculty. This Center will focus on maintaining and expanding the experiential learning and nationally prominent research activities of our undergraduates in mathematics. The Center needs 1) administrative assistance and work space, 2) a study lounge and classroom for student activities, 3) books, journals, and other mathematical resource materials and, 4) computers and scientific software.

- *Graduate Program.* After a rally in 2000-03, Graduate enrollment has waned from 30 students in 2003 to 23 students in 2005. To make our graduate program more competitive, the DMS needs 1) appropriate recruitment funds for better advertisement of the graduate program and support for visiting candidates, and 2) increased GA stipends at the level of surrounding institutions to entice high quality students to pursue graduate study at YSU. At the same time, the current GAs lack the office space necessary to advise their students and must share only two reserved desktop computers, many of which being outdated with limited computing power; more office space and computing resources are in dire need.
- *Cooperative Ph.D. Programs.* The DMS has a ten year history of facilitating Ph.D. programs with overseas institutions and has nearly completed the establishment of a cooperative Ph.D. program with Kent State University in which certain Kent doctoral students would write their dissertations under the supervision of YSU DMS faculty in topology. We plan to expand the degree options available under this agreement to include other areas of pure and applied mathematics. The intense research requirements associated with doctoral study will entail increased release time for advising faculty, and the DMS will need additional resources to compensate for the decrease in existing faculty instruction. The entering Ph.D. students will need office space and desktop computers to best advise their students and conduct their researches. Additionally, the students will need funding for travel to scientific meetings.
- *Interdisciplinary Programs.* The DMS has recently collaborated with the Department of Biological Sciences in establishing a minor in Biomathematics and developing two new interdisciplinary courses that are cross-listed in Mathematics and Biology. Further course developments are needed and the involved faculty members need increased teaching credit for these interdisciplinary and team taught courses. Other interdisciplinary activities are likely to emerge from the creation of the STEM College within which relationships can be forged between DMS and other STEM departments. As these interdisciplinary programs expand, we anticipate the need for as many as three additional full time faculty members in applied mathematics within the DMS.
- *Actuarial Science.* The Society of Causalty Actuarial Society (CAS) has approved three VEE (Validation of Education Experience) courses in the DMS. A large proportion of

our graduate students go on to pursue careers in the Actuarial Science sector. Although we have developed both an Actuarial track in the Mathematics major and a minor course of study in Actuarial Science, and despite the growing demand, the DMS lacks a sufficient number of qualified instructors to teach these courses.

- *Developmental and Service Courses.* Data from the Program Review show a steady increase of approximately 96 subsidy-eligible credit hours per year produced in the number of developmental and service courses offered by the DMS. Simultaneous budget difficulties have resulted in a net decrease in the number of graduate assistantships (GAs) supported by the DMS, which are used to help cover these courses. This has placed a burden on the existing DMS faculty; consequently, to meet this rising demand the DMS needs more GAs, instructors, and full-time faculty to teach these courses.
- *Distance Learning.* The increase of inexpensive internet availability will have a significant effect on the Distance Learning program of the DMS. At this time, the courses are overloaded and are placing a burden on the faculty charged to supervise these courses. We need 1) computer and classroom facilities with sufficient capability for distance learning, 2) regular software updates, 3) more faculty involvement, 4) support for graduate course development, and 5) faculty training in the implementation of the latest Distance Learning software and 6) addition of new faculty with appropriate skills.
- *Mathematics Assistance Center (MAC).* The MAC gives significant service to the DMS by providing additional study aids and tutoring students in developmental courses. In addition, the MAC hosts office hours for Part-time employees, especially for MATH 2623. In the 2005-06 academic year, the MAC logged over 6,780 sessions. As of the twelfth week of the 2006-07 academic year, the MAC has logged 2,867 sessions. The MAC coordinator has requested 1) additional undergraduate student employees, 2) additional computers and software updates for usage statistics and tracking, 3) increased budget for student salaries and computer maintenance, and 4) use of faculty in the MAC including workshops, office hours, and tutoring.
- *Statistical Consulting and Tutoring.* Increased enrollment in introductory statistics courses has resulted in greater need for statistics tutoring yet there is not a reliable system by which students may receive tutoring for these courses. Further, numerous faculty members from across campus and individuals from private businesses in the region require statistical consultation ranging from experimental design through data processing and analysis. The Statistics group is investigating the formation of a statistical consulting center to address these growing needs.

Future Partnerships with Local Industry and Communities Building on the work of Dr. Allen Hunter from the Department of Chemistry, the DMS is forming connections with the STARBURSTT program to build ties with local industry in the Cybertechnology arena. This program will result in internship opportunities for students and summer employment opportunities for faculty. The DMS expects increasing involvement in this program, and the DMS will need improved academic advisement procedures to help students participating in internships; in addition, the DMS will need to compensate for the decreased number of faculty available for Summer instruction.

Another component of pending partnerships includes the establishment of Summer Enrichment camps for local middle and high schools and students in the surrounding communities.

Investment of Future Resources A top priority of the DMS concerns improvement of computing facilities for students. Consequently, the DMS plans to invest a large amount of future resources to achieve that goal. Due to space limitations, we need to have a wireless system on a mobile cart that can be transported between classrooms.

Another financial need is present with respect to rising prices associated with library resources, including scientific journal subscriptions. The DMS plans to invest future resources to expand our existing library collection and increase the number of journals available to faculty and students conducting research. Related to this is the need for a student library.

Most of the DMS upper-division courses implement technology in some capacity. However, visual projectors are present in few DMS classrooms. This results in class scheduling problems and competition over limited resources. The DMS needs to invest future resources in the installation of projectors in all its remaining classrooms, together with the mathematical and office software necessary for effective classroom instruction.

Full-time technical and computer support personnel are required for the DMS.

New office space and facilities are needed.

Effect of Potential Community College Initiative It is clear from the Program Review that a significant portion of the services that the DMS provides are associated with developmental/service courses. If a community college is formed in the Mahoning Valley, we anticipate the need for close coordination of services to assure adequate coverage of material and to guarantee transferability of community college courses. Depending on the nature of the initiative, the DMS will need the addition of two or more full-time faculty at the Assistant Professor or Instructor level.

8 Goals and Strategies to Address Needs

The DMS has determined six (6) major goals, each with associated subgoals, to address the anticipated needs of the Department in the coming years. Strategies to achieve these goals have been devised and are listed below.

To measure our progress we have developed a set of Metrics that will provide evidence of our successes, and simultaneously serve to identify potential areas in need of improvement.

GOAL 1 Provide a highly effective and supportive environment for teaching, learning, and scholarly pursuits

A high quality teaching, learning, and scholarly environment in mathematics nurtures the intellectual development of students and faculty. It promotes a community of scholars built on dialogue, driven by intellectual curiosity and mathematical inquiry in applications, and guided by university principles for the pursuit of knowledge.

SUBGOAL 1a. Enhance undergraduate programs in the department

Strategies:

1. Actively encourage and increase student participation in undergraduate research and independent projects
2. Enhance faculty development in the use of new technologies in their teaching
3. Improve faculty advising and mentoring of students with specific attention to career planning and placement
4. Involve promising undergraduates in authentic research experiences at the forthcoming Center for Undergraduate Research
5. Review existing Honors courses and develop additional Honors courses.
6. Develop new innovative undergraduate programs or new concentrations within existing programs that would fill an important niche in the State and address future workforce needs
7. New program initiatives; develop a Minor in Biomathematics and a new track in Mathematical Biology; develop a Minor in Actuarial Science and a new track in Actuarial Science

8. Strengthen secondary education major programs in the department by pro-active recruitment of teaching majors and by insuring that department curriculum is aligned with the national science and mathematics standards

Metrics:

- Number of REU grants
- Proportion of graduating seniors who have had an undergraduate research experience
- Number of student-authored presentations at Pi Mu Epsilon meetings
- Participation in COMAP and the participation in the Putnam problem solving contest
- Number of Web-based and distance courses offered by DMS
- Number of course innovations that involve the use of computer technology
- Number of faculty attending conferences each year that focus on the use of technology in the classroom
- Number of curriculum related grants
- Student advising satisfaction questionnaire and exit interviews
- Number of YSU students graduating as secondary education majors
- Enrollment in Honors courses and number of students graduating with Honors.

SUBGOAL 1b. Enhance the overall teaching effectiveness in the department

Strategies:

1. Provide serious support for meaningful assessment of teaching and learning
2. Reduce the reliance on Limited Service (LS) faculty
3. Provide support (in money as well as in LS matters) for professional development and the formulation of new strategies for teaching and for new/revised curricular offerings
4. Host Annual conference on Beginning Algebra and Developmental Courses with expanded programs for teacher training
5. Develop new General Education Requirement (GER) approved courses

6. Continually monitor, assess, and reform (when necessary) the Mathematics portion of the General Education Courses to ensure high quality and effectiveness
7. Increase the success rate of students who enrolled in MATH 1500 and complete MATH 1501 from 35% to 50% by 2010, and to 65% by 2015

Metrics:

- Departmental exams in Calculus and Algebra 1
- Percentage of semester hours taught by LS faculty
- Number of seminars and colloquia on the scholarship of teaching and learning in mathematics
- Number of team taught and cross-discipline courses developed and taught
- Results of Periodic reviews of Math 2623 and 2625

SUBGOAL 1c. Enhance graduate studies in the department

Strategies:

1. Develop new cooperative graduate programs
2. Increase recognition of graduate students (e.g., Best Thesis Award, travel/research grants)
3. Continue to foster an intellectual community that includes graduate students
4. Expand graduate course offerings including, but not limited to, Graduate Foundations of Geometry and Graduate History of Mathematics
5. Develop assessment techniques to measure quality of graduate programs

Metrics:

- Degree of success in receiving approvals for new cooperative graduate programs
- New awards, dollars provided annually for travel/research
- Number of graduate students in seminars

SUBGOAL 1d. Enhance research and scholarship among the DMS faculty

Strategies:

1. Create a Department Distinguished Lecture Series
2. Promote more grant writing and collaborative research among YSU faculty across departmental lines
3. Develop community-based research projects involving multiple departments
4. Encourage the use of sabbaticals to expand the research, teaching, and service base of the Department
5. Provide a special one-time-only teaching load reduction in a given semester to support a faculty member with grant writing

GOAL 2. Recruit and retain a diverse and highly qualified permanent faculty and staff of sufficient size to meet programmatic needs

The quality of a department is no better than the quality of its faculty and staff. If the department is to maintain an intellectually challenging environment supporting and appreciating a diversity of people and ideas, and an environment in which teaching and learning, and scholarship can flourish, the department must have a highly qualified and diverse faculty and staff of sufficient size.

Metrics:

- For each core focus area: number of faculty and students involved, publications, presentations, and external funding
- Graduation rates and placement for each core area
- Assessment of external review committee

SUBGOAL 2a. Ensure that faculty and staff salaries remain competitive with those at peer institutions

Strategies:

1. Evaluate departmental faculty, staff, and material resources to assure the best allocation of resources

2. Provide documentation on the role of YSU in the health and economy of the State. Use strategically selected success stories in which our programs have made a big difference
3. The Chairperson should be aware of the need for equity adjustments to address salary compression problems when appropriate

Metrics:

- Compensation levels compared with other institutions
- Teaching load compared with other similar institutions
- Retention of faculty compared with peer institutions
- Level of external funding
- National rankings

SUBGOAL 2b. Provide adequate resources for faculty and staff development

Strategies:

1. Establish an effective mentoring program to help new faculty in writing grants
2. Encourage interdisciplinary projects that enable faculty to share resources
3. Increase departmental operating budgets to support the work of the faculty and their students, giving particular emphasis to the start-up needs of junior faculty and the ongoing research needs of tenured faculty
4. Encourage, support, and reward faculty development for new instructional delivery systems and new teaching and learning approaches
5. Ensure that department staff have opportunities to attend workshops and conferences that will advance their professional development
6. Form collaborative efforts with other institutions

SUBGOAL 2c. Decrease dependence on part-time faculty while increasing number of full service faculty over time

Strategies:

1. Review departmental course offerings and streamline where possible
2. Recruit the best possible candidates for future DMS positions
3. Replace pending full-service faculty retirements

GOAL 3. Recruit, retain and graduate a diverse undergraduate and graduate student body of high ability

If the department is to maintain and enhance its academic reputation where students can be intellectually challenged as members of a teaching and learning community, it is important that the department improve the quality of its student body while also supporting diversity and accessibility.

SUBGOAL 3a. Improve the overall quality of the undergraduate student body as measured by average ACT/SAT scores, high school GPA and class rank

Strategies:

1. Increase programs bringing local area teachers to YSU facilities
2. Establish a list of faculty/staff willing to visit local schools (with a YSU student) to give presentations and establish a fund for these presentations
3. Continue the Department's MathFest program for area high schools
4. Secure more scholarship funds through department fund raising efforts
5. Establish articulation agreements with various community departments
6. Use our best students as YSU ambassadors to high schools

Metrics:

- Number of advanced undergraduate courses and their enrollments
- Involvement in PME, Problem Solving Seminar, Topology Seminar, Analysis Seminar, Departmental Colloquium, Biomathematics Seminar, and other activities
- Number and dollar amount of scholarships awarded

- Number of Senior projects, time to degree, job placement
- Participation in student organizations

SUBGOAL 3b. Increase enrollment and improve the overall quality of the graduate student body as measured by GRE and TOEFL scores and undergraduate GPA

Strategies:

1. Encourage the DMS to develop more effective recruitment techniques to attract greater numbers of high quality applicants
2. Establish a more attractive aid package for graduate students by a) raising the GA stipend to \$15,500 plus general fees, with a \$1,500 Summer stipend, and b) implementing cost-of-living adjustments to the GA stipend in future DMS budgets
3. Increase the full-time graduate student enrollment to the level of thirty (30) GAs and two (2) cooperative Ph.D. students by 2010, and thirty (30) GAs and five (5) cooperative Ph.D. students by 2015
4. Provide funds for the advertisement of the DMS graduate program and for supporting the invitation of promising candidates to campus during February and March
5. Encourage, when appropriate, the inclusion of graduate student support in proposals for external funding
6. Revise future DMS budgets to include items for a) cooperative Ph.D. stipends, b) cost-of-living adjustments to both GA and Ph.D. stipends, and c) funds for travel to scientific meetings by Ph.D. students

Metrics:

- Number of advanced graduate courses and enrollments in them
- Involvement in the research seminars
- Number of students supported on assistantships and traineeships
- GA workload compared with peer institutions
- Success rate on Comprehensive exams, time to degree, job placement
- Participation in student organizations

- Number and dollar amount of scholarships awarded

SUBGOAL 3c. Enhance the diversity of the student body in the department both in terms of gender and ethnic background

Strategies:

1. Increase diversity in the faculty and staff
2. Provide mentoring and other types of support for the well being of minority students

Metrics:

- Number of faculty of diverse ethnicity and underrepresented minorities and male-to-female faculty ratio
- Involvement of minority students in research seminars

GOAL 4. Improve the department infrastructure and facilities to support the teaching, research, and service missions of the Department

To sustain a high quality teaching and learning and scholarly environment, it is essential to have a quality departmental infrastructure that is maintained and upgraded on a continuing basis. Sufficient building space/facilities/utilities, modern computer equipment and instrumentation, “smart” classrooms, computer labs, an adequate library collection, and an adequate technical support staff and budget are all critical to providing that infrastructure for a department of science and mathematics.

SUBGOAL 4a. Acquire enough building space for the department that will enable it to successfully carry out its teaching and research missions

Strategies:

1. Establish a comprehensive summary of currently available physical facilities and how they are used. Review and make reallocations, where appropriate
2. Double the existing office space reserved for graduate students, and provide offices for cooperative Ph.D. students equipped with desktop computers with sufficient computing power

3. Acquire increased desktop computer availability for all Master's students installed with the latest scientific software that is available during all YSU operating hours for graduate research
4. Ensure that all external funding proposals include adequate consideration of and clear identification of physical space needs
5. Summarize, prioritize, and communicate future department lab needs and specialized room expansion needs to central administration
6. Develop a long-range space plan for the department that addresses projected needs by the year 2015 and work with central administration in the implementation of this plan

Metrics:

- Number of square footage occupied by DMS
- Proportion of space occupied by computing facilities

SUBGOAL 4b. Fully incorporate computers and other instructional technology in all appropriate aspects of the department's teaching programs

Strategies:

1. Establish wireless networking for students
2. Continue to have a computer replacement policy that allows for the best equipment to be available to students. YSU should plan to equip all classrooms on campus so that no matter where you are assigned to teach, you have access to the computer and reasonable demonstration equipment and software
3. By the year 2010, convert at least fifty percent of assigned classrooms in the department to "smart classrooms" with multimedia capabilities to permit the use of new delivery systems that encourage active teaching and learning, and critical thinking. By the year 2015, convert all remaining classrooms
4. Seek external funding, especially from private sources, for the acquisition of computers and other instructional technology

Metrics:

- Number of smart classrooms

- Number of courses with a significant computing component
- Number of students using WebCT

SUBGOAL 4c. Preserve and enhance the library collections in the sciences and in mathematics

Strategies:

1. Retain all memberships in digital libraries and consortia that allow for sharing
2. Better utilize the on-line library collection
3. Encourage faculty to donate from their private collections
4. Encourage departments, in cooperation with the Library, to periodically review and assess current collections in their disciplines and work to rectify any crucial unfulfilled needs

Metrics:

- Number of journal subscriptions
- Number of books purchased each year, and the core areas addressed

GOAL 5. Foster and strengthen mutually beneficial ties with external constituencies

As an academic unit of a public university, the department has an obligation to contribute to the prosperity and quality of life in Ohio through outreach and partnerships. There are various constituencies (alumni, business and industry, school systems, community departments, government agencies, and community groups) that can be encouraged to appreciate and support the programs and services of the department through mutually beneficial ties with the department.

SUBGOAL 5a. Strengthen the relationships between the department and its alumni

Strategies:

1. Continue with departmental interactive websites for communicating and promoting contact with alumni

2. Work with the Division of Institutional Advancement to develop a comprehensive database of YSU Mathematics alumni information
3. Develop a coordinated network of alumni and friends to provide advice and support for the goals of the department
4. In coordination with the Division of Institutional Development, secure major gifts and donations to the department from corporate sponsors, foundations, prominent alumni, and friends of the department

SUBGOAL 5b. Establish and coordinate partnerships with educational, governmental, and professional organizations

Strategies:

1. Select seminar speakers that will support potential partnerships
2. Foster collaboration with Empire State University on the distance learning program
3. Increase the number of educational partnerships and collaborative projects with school systems that will contribute to the improvement of K-12 science and mathematics education in Ohio and beyond
4. Actively pursue research collaborations and partnerships with other institutions of higher education in Ohio and beyond
5. Establish collaborative relationships with government agencies and laboratories as well as professional organizations
6. Establish science education and teacher development outreach efforts that utilize strengths of the Youngstown faculty, students, and programs

GOAL 6. Establish more exchange opportunities for students and faculty

Strategies:

1. Establish exchange programs for completing undergraduate research overseas
2. Increase faculty participation in international exchanges
3. Promote participation in new foreign exchange programs sponsored through external agencies such as DAAD (German Academic Exchange Service)

4. Establish a YSU Visiting Scholar Program with University funding

Metrics:

- Number of students in exchange programs
- Number of faculty participating in international exchanges
- Number of Visiting Scholars
- Dollar amount of funding received by University for Visiting Scholars

9 Relation to Higher Learning Commission

Although the strategic plan will aid the DMS to effectively prepare for future needs, it also addresses the elements defined by the Higher Learning Commission (HLC).

Academic Programs The academic program is the bridge connecting students and faculty and is a critical element addressed by the strategic plan. The goals addressing improvement of Academic Programs are GOAL 1, GOAL 2, GOAL 4, GOAL 5, and GOAL 6. The DMS strives in GOAL 1 to improve the academic environment for both the undergraduate program (1a) and graduate studies (1c) through the development of new programs and course offerings. We desire to maintain the high diversity and qualification level of our full-time faculty through recruitment efforts (GOAL 2), while reducing dependence on part-time faculty (2c) and providing adequate resources for faculty and staff development (2b). Further, our academic programs will be enhanced with improved department infrastructure and facilities (GOAL 4), including the incorporation of computers and other instructional technology in all aspects of the department's teaching programs (4b), as well as expanded library collections (4c). Our programs will improve with strengthened beneficial ties to external constituencies (GOAL 5), especially with respect to partnerships with educational, governmental, and professional organizations (5b). Lastly, more exchange opportunities for students and faculty (GOAL 6) will promote collaborative efforts and enrich the existing DMS programs.

Engagement and Student Experience The DMS strives to improve the engagement of our students, and is constantly searching for ways in which students can be more involved in their own education. The development of student academic ownership will directly improve student experience and will indirectly serve to develop creative thinking, leadership, and give

students the confidence to pursue careers in mathematics or related fields. An important element of the Strategic Plan addresses the student engagement and overall student experience in the DMS program.

Academic pursuits are most efficiently conducted in an effective and supportive environment (GOAL 1). Formation of the Center for Undergraduate Research in Mathematics is expected to provide a forum for undergraduate engagement, and the cooperative agreement with Kent State University for advanced degrees should provide a forum for graduate student engagement. Further, the improvement of department infrastructure and facilities (GOAL 2) will make the students' tasks easier as they pursue their degree, and additional computing facilities will give students cutting edge tools to aid their investigations. Lastly, exchange opportunities (GOAL 6) will both enhance student ownership of their studies as they elect to take advantage of these programs.

Diversity in all its manifestations Exchange opportunities (GOAL 6) will allow students and faculty to experience other cultures and ethnicities, resulting in a deeper appreciation of diversity and its relevance to local academic life. There is a significant amount of diversity exhibited in local businesses and the larger Youngstown community, and fostering beneficial ties with local industry (GOAL 5) will provide students with the opportunity to interact with individuals of diverse backgrounds and abilities.

Partnerships and Community Involvement The DMS is engaged in numerous initiatives targeted to develop partnerships with local businesses and educational programs, and GOAL 5 is specifically designed to address this initiative. Some of the activities in which the DMS is involved are YSU-MathFest, hosting the AMC competition testing, and programs for teacher development. In addition, additional exchange opportunities addressed in GOAL 6 will provide additional partnerships with businesses in the community.