

**Five-Year Program Plan
2005-2010
Department of Mathematics and Science Education**

A. Statement of Vision and Goals

1. Vision:

The Department of Mathematics and Science Education is committed to the advancement of the mathematics education and science education disciplines through exemplary leadership, research, instruction, service, and other scholarly activities. Many core activities of the department combine research, teaching, and service, and all activities are fundamentally supported by scholarship. The department holds a fundamental commitment to racial, ethnic, cultural, linguistic, geographic, and experiential diversity in its students, faculty, and staff and the ideas, opinions, and contributions they bring to our disciplines. This diversity is a significant strength of our department, and it significantly contributes to all aspects of our work. The department also holds a fundamental commitment to literacy, including mathematics, science, technology, and environmental literacy. These commitments guide the department in all of its activities including, but not limited to, those described below.

2. Goals

Provide exemplary leadership at the local, state, national, and international level by

- Developing, implementing, and continuously improving research-based teacher education programs for the range of individuals seeking to enter the profession or to enhance their professional knowledge.
- Maintaining and intensifying our cutting edge research programs and increasing the impact of our research.
- Strengthening our doctoral programs in order to prepare the next generation of mathematics and science educators.

3. External Factors

- There is a critical shortage of highly qualified Ph.D.'s being produced by the major university centers of mathematics and science education in the United States.
- There is a critical shortage of highly qualified mathematics and science teachers at all levels in Georgia and the nation.
- There is a high attrition rate among mathematics and science teachers with fewer than five years of experience.

- A significant number of mathematics and science teachers are teaching out of the field in which their teaching certificate was granted and/or are teaching without updated content and pedagogical knowledge.
- Alternative routes to certification are becoming increasingly available outside of university settings.
- Teachers can advance in the field with a graduate degree in any field, not necessarily the field in which they are teaching.
- There is increased accountability on both teachers (e.g., No Child Left Behind) and teacher educators (e.g., Board of Regents Principles for the Preparation of Educators).
- The demographics of the K-12 student population in Georgia and the nation are rapidly changing.
- Student achievement in science and mathematics is below expectations at the local, state, and national level.
- Many school systems are moving to extended year calendars that shorten summer breaks when teachers are available to attend graduate classes and participate in intensive professional development activities.
- Federal funding for research in education has wavered in recent years. Federal priorities for funding often do not match the research goals of the professional mathematics education and science education communities. (For example, the calls for “scientifically-based research” do not always dovetail with our methodologies and the issues we believe are important to investigate.)

4. Program Priorities

In order to bring our vision to reality, accomplish our goals, and respond to the external factors identified above, we have specified the following program priorities:

- Initial and advanced certification for elementary, middle, and secondary school teachers of mathematics and science in undergraduate and graduate programs
- Research on teaching, learning, curriculum, and teacher education in mathematics and science education
- Doctoral education
- Improving mathematical and scientific literacy through leadership in state, national, and international arenas

B. Institutional-level Performance Measures¹

The methods described below will be used to annually measure demand, quality, productivity, and impact.

Note: Our emphasis is on quality in the students we produce, in the teaching and research of the faculty, and in the service we provide at the State and National levels. Because quality is not as easily quantifiable as quantity, we urge caution in the interpretation of quantitative measures of quality over time. In many situations it is not legitimate to assume that larger numbers represent improvements and smaller numbers represent backsliding. For example, we currently have several large, externally funded grants. When those grants are finished, we will show a drop in external funding. This measure should not be interpreted as a stagnation or regression in our work. Similarly, with regard to measures such as numbers of doctoral students graduating and numbers of publications, there are reasonable hills and valleys in these kinds of data that are explained by factors having nothing to do with the quality of our doctoral program or the productivity of our faculty.

1. Demand

Demand for more and better-qualified mathematics and science teachers is reported annually by the Georgia Department of Education and the US Department of Education. Internally, we will also track data on intended majors in our programs at the undergraduate level and applications at the graduate level.

Demand for highly qualified recent Ph.D. graduates is indicated by the number of positions advertised by colleges and universities annually.

An indicator of demand for research in mathematics and science education is funding allocated by the National Science Foundation, private foundations, and US Department of Education. We will track data released by these agencies annually to determine who and what kinds of programs are receiving funding.

2. Quality

The following key outcomes identified in our existing undergraduate assessment plans will be monitored annually:

- Number of content courses in program of study and grades earned
- Grades in professional education courses
- Student performance on Praxis II (as available)
- Student responses to multicultural exit survey (EMAT)/student work on cultural essays (ESCI)
- Initial employment data (as available)

¹ No programs at the Gwinnett University Center are included in this report.

- Responses to selected items from exit surveys (e.g., COE exit survey)
- Responses to selected items from mentor teacher surveys
- Interviews with a strategic sample of graduates and school personnel

The following key outcomes identified in our existing graduate program assessment plans will be monitored annually:

- Student performance on end-of-degree assessments, such as comprehensive examinations, portfolios, theses, and dissertations
- Presentations at state, national, and international professional meetings by graduates and current students
- Publications by graduates and current students
- Number of content courses in allied fields in program of study and grades earned
- Number of professional mathematics or science education courses in program of study and grades earned
- Student performance on Praxis II (where applicable)
- Initial employment data

Additional indicators of quality include

- Awards and honors (e.g., Presidential Awardees, Teacher of the Year, etc.)
- Graduates who achieve National Board certification
- Leadership positions assumed by graduates
- Career trajectories of graduates (e.g., time to promotion)

3. Productivity

a. Faculty

i. Teaching

- Maintaining high-quality programs
- Revision of programs and courses
- Creation of new programs and courses
- Increase credit hour production at the undergraduate level
- Increase credit hour production at the graduate level
- Awards and honors
- Course evaluations

ii. Research

- Programmatic lines of inquiry by individual faculty members and groups of faculty members
- Quantity and quality of publications
- Grant funding (number of grants and dollar amounts)
- Awards and honors

iii. Service

- Quantity and quality of services provided to constituents
- Leadership in professional organizations and on special commissions
- Awards and honors
- Grant funding (where applicable)

b. Students

- Based on past enrollments and available field placements, we project the following numbers of graduates per year per program:

Mathematics Education

- B.S. Ed.: 25
- B.S. Ed. Mathematics Education/B.S. Mathematics Dual Major: 5
- M. Ed./M.A. Mathematics Education: 20
- Certification only (undergraduate and graduate): 5
- Ed. S.: 6
- Ph. D.: 4

Science Education

- B.S. Ed.: 17
- B.S. Ed. Science Education/B.S. Biology Dual Major: 4
- M. Ed./M.A.: 15
- Certification only (undergraduate and graduate): 10
- Ed. S.: 4
- Ph. D./Ed. D.: 4

We anticipate a graduation rate of 90%+ for each program. We work hard to ensure that every student who is accepted into the program and who makes satisfactory progress will graduate. We counsel students who struggle with some aspect of the program to consider whether this is the appropriate degree for them. However, there are always students who change majors, change institutions, or have life experiences that preclude their finishing the program. Thus, we do not see graduation rate as a meaningful measure for our programs. Similarly, we do not consider time to completion of degree a meaningful measure for our programs, particularly at the graduate level. Our priority is for students to take the time they need to master the content, skills, and processes that are required for the degree rather than working toward an arbitrary timeline.

c. Benefits to Community, State, Region, National, Global Community

Our work has both tangible and intangible benefits for a variety of communities. These benefits are either very global (such as increasing the quality of teachers in our nation's schools) or very specific (such as helping to provide on-site doctoral education in a developing country). We will compile a list of these benefits annually, but it is not possible to state them in advance due to the multitude of ways that our faculty and students engage with various communities.

4. Impact

The impact on the University's three strategic goals will be measured and monitored as follows:

a. Building the New Learning Environment

- Cutting edge use of technology for learning and, where appropriate, for instructional delivery and assessment
- Quantity and quality of field experiences completed by our students
- Development of new delivery models to meet the needs of students
- Recruitment of faculty members who can enhance and monitor the building of new learning environments

b. Research Investments

- Funding of endowed chair in Mathematics Education
- Recruitment of faculty members who can enhance strategic lines of research, including research on the building of new learning environments.
- Establish departmental advisory board to provide annual assessments of quality and productivity and to provide advice on future directions.

c. Competing in a Global Economy

- Student and faculty participation in international exchanges (not limited to formal study abroad programs)
- Visiting scholars and students from other countries
- Partnerships and projects with colleagues in other countries
- International students enrolled in our programs
- Faculty service to international organizations and commissions
- Research, teaching, and service activities in international contexts

d. Enhancing Diversity

- Use of diverse field placements for field experiences and student teaching
- Course activities and objectives designed to prepare teachers to bring all learners to high levels of achievement
- Results of multicultural exit survey
- Diversity of students and faculty in the department
- Research, teaching, and service activities in diverse cultural contexts

C. Individually-selected Benchmarks

We have identified goals as described above. The following are objectives for each goal and unique benchmarks that we will regularly monitor to assess progress towards those objectives.

Resources that are needed to achieve each objective are listed. Note that in the 2005—06 year we have a deficit of five science educators. Thus, rebuilding the science education faculty is part of our resource needs.

Goal #1:

Develop, implement, and continuously improve research-based teacher education programs for the range of individuals seeking to enter the profession or to enhance their professional knowledge.

Objectives:

- Refine the content preparation of prospective secondary mathematics teachers.
- Retain highly qualified mentor teachers.
- Expand alternative delivery models for graduate teacher education (e.g., partnering with school districts to deliver on-site degree programs, cohorts, and use of technology to reach underserved areas of the state). Conduct research and dissemination efforts on these programs.

Key Benchmarks:

- Course/program development in secondary mathematics education
- Retention of mentor teachers over time
- Articulation and dissemination of model teacher education program models at the graduate level

	Content	Retention of Mentor Teachers	Model Programs
2005-06	Baseline data (via NCATE and Graduate Assessment report); set benchmarks	Baseline data on retention rates	Finalize plans for Keystone Newton Co. (EMAT), continuation of Gwinnett program (ESCI)
2006-07	Begin conversations with the Mathematics Department about the content and delivery of courses such as MATH 3100 and 4000.	Increase 5%; maintain when 75% reached	Implement
			Investigate building on-campus model programs for mathematics and science teaching specialists at the elementary and middle school levels.
2007-08	Examine EMAT 3500, 4680, 4500 courses and EMAT 4000 shadow seminars for content duplication and omission. Revise course syllabi as	Increase 5%; maintain when 75% reached	Document

	Content	Retention of Mentor Teachers	Model Programs
	necessary. Work with the Mathematics Department to implement necessary changes in MATH courses.		
			Hire faculty to develop blueprints for on-campus mathematics and science teaching specialists at the elementary and middle school levels.
2008-09	If EMAT 4000 shadow seminars are to continue, establish permanent course numbers and seek approval through the curriculum approval process.	Increase 5%; maintain when 75% reached	Disseminate
			Hire faculty needed to operate the new programs.
2009-10		Increase 5%; maintain when 75% reached	Admit the first cohort of students.
			Plan for next cohort

Resources Needed:

- With increases in the numbers of students seeking initial certification at the masters level, we are having to offer more split-level courses to accommodate both undergraduate and graduate students. Thus, doctoral students cannot teach these courses, so we need more faculty lines.
- Funding is needed to compensate mentor teachers for their role in our programs.
- The *development* of any new initiatives will require additional faculty lines (and associated resources, such as space). *Implementation* of such initiatives will require additional lines beyond those needed for their development.

	Faculty	GTAs	Mentors
2005-06	Deficit of 5 tenure-track ESCI faculty members	Deficit of 9 GTAs in EMAT, 5 in ESCI	n/a
2006-07	Add 1 tenure-track ESCI faculty member (search	Reduce deficit to 5 GTAs in EMAT, 2 in ESCI	Pay mentor teachers \$250 for student teaching

	Faculty	GTAs	Mentors
	in progress); replace any personnel lost due to retirement or attrition		semester
2007-08	Add 2 tenure-track ESCI faculty members; replace any personnel lost due to retirement or attrition	No deficit	Pay mentor teachers \$100 for pre-student teaching field experiences
2008-09	Add 2 tenure-track ESCI faculty members and 1 tenure-track EMAT faculty member; replace any personnel lost due to retirement or attrition	Maintain	Maintain
2009-10 and beyond	Add 2 tenure-track ESCI faculty member and 1 tenure-track EMAT faculty member; replace any personnel lost due to retirement or attrition At this point we will still be short 2 ESCI faculty members and 1 EMAT faculty member from our goal of 15 of each.	Maintain	Maintain

Goal #2:

Maintain and intensify our cutting edge research programs and increase the impact of our research.

Objectives:

- Increase the scholarly productivity of faculty members.
- Increase the impact of our research on our professions (e.g., teaching, learning, curriculum development, professional development).

Key Benchmarks:

- Dissemination of key research findings via published papers and conference presentations
- Use of research in mathematics teaching, in curriculum development, in teacher education, in professional development for teachers, and in other arenas as appropriate

Note: The objective of increasing scholarly productivity among the faculty has many dimensions and it is not adequately measured by simply counting published papers and conference presentations. One focus in increasing the scholarly productivity of the faculty concerns the courses we offer at both the undergraduate and graduate levels. We regard this kind of

scholarship as *scholarship of teaching* and believe that it is at the heart of our educational programs. It is primarily realized in the daily conduct of courses. The development of new courses and programs of study are also included in this kind of scholarship. Simply put, *scholarship of teaching* does not necessarily lend itself to conventional measures of performance.

Another focus in increasing the scholarly productivity of the faculty concerns the research of the faculty. We regard this kind of scholarship as *scholarship of research*. Although we consider writing papers and presenting at conferences a conventional measure of this kind of scholarship, requiring such measures can be inappropriate. Examples are junior faculty who are just starting their research programs, faculty who are establishing new lines of research, and faculty who are reestablishing old lines of research after a hiatus as an administrator. Concentrating on initiating and/or conducting research takes time and concentrated effort, and the performance measures are quite different than published papers.

We have cited the use of our scholarly activity in both teaching and research as a way to measure the impact of our scholarly activity. Although use of our scholarly work is an indicator of its impact, our impact has traditionally transcended such use. Essentially, a major impact of our scholarly work has been its influence on the thinking of our colleagues both nationally and internationally.

	Productivity	Impact
2005-06	Assess the kinds of scholarly activity of the faculty.	Establish ways in which our scholarly work has had an impact on the fields of mathematics and science education.
2006-07	Establish baselines for a scholarship of teaching and a scholarship of research. Establish baselines for establishing writing and/or publication programs within and across each type of scholarship.	Begin to develop strategies for increasing the impact of our scholarly work.
2007-08	Initiate writing and/or publication programs including grant proposals when appropriate.	Continue to develop strategies for increasing the impact of our scholarly work and make those strategies an integral part of the infrastructure being developed and honed.
2008-09	Revise the baselines for a scholarship of teaching and a scholarship of research and intensify the writing and/or publication programs.	Begin to implement the strategies.

	Productivity	Impact
2009-10	Have a consensual scholarship of teaching and a scholarship of research in place and begin to explore their reciprocal influences.	Make the implementation of the strategies an integral part of the progressive and evolving infrastructure.

Resources Needed:

- Reach a critical mass of 15 tenure-track science educators and 15 tenure-track mathematics educators in order to sustain rigorous scholarly inquiry and our educational programs at all levels. Steadily recruit the highest quality scholars to our programs to allow for expansion of our work.
- Secure adequate research space for faculty, graduate students, visiting scholars, post-doctoral associates, equipment, and data.

	Faculty	Space
2005-06	Deficit of 5 tenure-track ESCI faculty members	Deficit of 1000 sq. ft. of space
2006-07	Add 1 tenure-track ESCI faculty member (search in progress); replace any personnel lost due to retirement or attrition	Reduce deficit to 500 sq. ft. of space
2007-08	Add 2 tenure-track ESCI faculty members; replace any personnel lost due to retirement or attrition	Reduce deficit to 250 sq. ft. of space
2008-09	Add 2 tenure-track ESCI faculty members and 1 tenure-track EMAT faculty member; replace any personnel lost due to retirement or attrition	Secure an additional 1000 sq. ft. of space to house digital video and audio editing/storage suite for all departmental research projects.
2009-10 and beyond	Add 2 tenure-track ESCI faculty member and 1 tenure-track EMAT faculty member; replace any personnel lost due to retirement or attrition At this point we will still be short 2 ESCI faculty members and 1 EMAT faculty member from our goal of 15 of each.	Maintain

Goal #3:

Strengthen our doctoral programs in order to prepare the next generation of mathematics and science educators.

Objectives:

- Ensure that our students are prepared to address new research emphases in the field (both topics and methods).
- Increase the quality of students being recruited for our doctoral programs (e.g., prior degrees, diversity—both global and domestic; prior professional experience).

Key Benchmarks:

- Develop a new course about data collection and analysis in the area of teachers' and students' cognitions.
- Scholarly productivity of students and recent graduates
- Quality of students being recruited as measured by GRE scores, previous institutions attended (e.g., students from EMAT/ESCI peer and aspirational institutions), percent of students from diverse backgrounds

	Course	Productivity of students	Quality of recruits
2005-06	n/a	Begin to systematically track these data, establish baseline data and goal	Establish baseline and goals
2006-07	Design course	Increase by 2% per year until goal reached	Increase two of three criteria (GRE scores, previous institutions attended, diversity) by 2%
2007-08	Pilot course	Increase by 2% per year until goal reached	Increase two of three criteria (GRE scores, previous institutions attended, diversity) by 2%
2008-09	Course approval process	Increase by 2% per year until goal reached	Increase two of three criteria (GRE scores, previous institutions attended, diversity) by 2%
2009-10	First official offering of course	Increase by 2% per year until goal reached	Increase two of three criteria (GRE scores, previous institutions attended, diversity) by

			2%
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Resources Needed:

- Funds are needed for additional assistantships. State support for assistantships has been cut in recent years, and recruitment of doctoral students is very competitive and depends on the availability of attractive assistantships.
- Funds are needed to support graduate student research (e.g., travel for data collection, transcribing, equipment, travel to present research at conferences).
- Space is needed to support graduate student research.
- Funds are needed to support international graduate students because they are excluded from many university and federal funding sources.
- The development of the course is contingent upon receipt of a National Science Foundation grant that was submitted in July 2005.

	Assistantships	Student Research	Space	International support
2005-06	Unable to fund 5 qualified doctoral students	Establish baseline	Deficit of 1250 sq. ft. of work space for students	Deficit of support for 6 international students
2006-07		Fully fund professional travel for 80% of graduate students presenting at conferences	Achieve 50 sq. ft. of work space per student (equipped with computer, telephone)	Reduce the deficit of support to international students by 50%
2007-08	Fund 100% of qualified doctoral students	Fully fund professional travel for 90% of graduate students presenting at conferences	Maintain	Support for 100% of international students accepted into the program without their own support
2008-09	Maintain	Fully fund professional travel for 100% of graduate students presenting at conferences	Maintain	Maintain
2009-10	Maintain	Maintain	Maintain	Maintain