



the university of alabama at birmingham

Whither the Mathematics Major? (and Department?) Some Partial Answers at UAB



Impediments

- High School students do not know what mathematicians do (apart from teach mathematics)
- AP calculus takes students out of college mathematics courses that introduce them to the major
- Research departments tend to underemphasize community outreach
- Traditional major is too narrowly “academic”

UAB Mathematics Before 1990



- **Going for us**
 - Internationally known research faculty in mathematics via conferences/papers
 - NSF research grants in mathematics
 - UAB internationally AND LOCALLY known for health sciences research, teaching, and delivery
- **Going against us**
 - Dropping number of mathematics majors
 - No PhD program in mathematics
 - No community recognition of strengths

PhD in Applied Mathematics

- Joint Program with
 - University of Alabama (Tuscaloosa)
 - University of Alabama in Huntsville
 - Common qualifying examination
- First UAB graduate 1993
- Currently, 19 UAB graduates

Mathematics Major – Before and After

Prior to 1993

- Traditional math major
 - Calculus 12 hrs
 - DE, Linear Alg. 6 hrs
 - Sequence 6 hrs
 - Advanced Calc 6 hrs
 - Math Electives 9 hrs
 - Math total 39 hrs
- Minor 18 – 27 hrs

1993 to Present

- Traditional math major
- Fast-Track BS/MS Math Program (1993)
 - NSF support (1995)
- Honors in Mathematics (1996)
- Applied mathematics BS track (2002)
- Mathematics/Education double major (2003)
- MCTP (NSF-2004)
- Middle school track (2006?)

Mathematics Fast-Track Program

Student-oriented features

- Scholarships
- First-year mathematics seminar
- Travel to conferences
- Office space
- Participate in the life of the department

Mathematics Fast-Track Program

Academic advancement

- Advanced seminars
- Mentoring by research faculty
- Research projects
- Posters and talks
- Honors in mathematics
- Graduate courses early
- BS/MS in 4-5 years

Some Fast-Track Alumni

- Post-Doc at Princeton
 - FT MS 1996, PhD UAB 2001
- Post-Doc at Cornell
 - FT MS 1996, PhD UAB 2001
- Marshall Scholar at Oxford
 - FT BS 2002
- Duke MD/PhD program
 - FT MS 2002
- UNC Biostatistics PhD program
 - FT MS 2003

Mathematics and Service Courses

- Urban university
- One-course math requirement
- Consumers of calculus
 - Biology
 - Engineering
 - Physical sciences
 - Health sciences
 - Mathematics

Entering Freshmen

	Fall 2004	Fall 2005
Developmental	528	435
Pre-Calculus	525	567
Finite	83	94
Business Calculus	46	55
Calculus 1	155	178
Calculus 2-3	9	13
Other	4	4
Total	1350	1346

*2005 figures preliminary

Mathematics/Engineering Committee

Motivation

- ABET accreditation (2001)
- Desire for evidence of student learning
- Changing programs for engineers

Common ground

- Problem-solving skills
- Computational skills
- Computer skills

Mathematics and Secondary Education Track

Before 2003

- BS in Education with concentration in mathematics (about 18 math hours)

After 2003

- BS – double major
 - Mathematics (42 hrs)
 - Education (40 hrs)

Result so far: fewer graduates

NEW

Middle School Mathematics Major

UAB

Sharing common ground with elementary teachers

- Pre-calculus and finite mathematics
- Math for elementary and middle school teachers

Deepening School Mathematics

- Integrating mathematics ideas
- Connecting to science
- History of math

Broadening Mathematical Knowledge

- Calculus with applications
- Math Modeling

Electives: choose one of linear algebra, modern algebra, geometry 1-2, other

Mathematics and the Quality Enhancement Plan (QEP)

A Shared Vision for All UAB Graduates

- **Communication**
- **Knowledge**
- **Problem-solving**
- **Ethics and civic responsibility**



Competencies Targeted for Enhancement

- **Writing**
- **Quantitative literacy**
- **Ethics and civic responsibility**

Quantitative Literacy

Every UAB graduate should be adept at

- **Using multiple formats**, including verbal, symbolic, visual and numerical, to present information
- **Interpreting mathematical representations**, such as formulas, graphs, tables and diagrams, in order to draw valid inferences from them
- **Applying** arithmetical, algebraic, geometrical and statistical **methods to solve problems**
- **Evaluating the reasonableness** of proposed answers to mathematical problems, and **exercising caution** in making generalizations

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Quantitative Literacy

UAB graduates should be able to demonstrate awareness of, and strong competency in

- **Discipline QL** refers to students demonstrating the four QL objectives at a level sufficient to solve realistic and authentic problems in their discipline
- **Life QL** refers to students demonstrating the four QL competencies at a level sufficient to solve problems they encounter in their personal and social lives

Mathematics Support for the QEP

- Mathematics Learning Laboratory
 - Mathematics Emporium
 - Strengthening of algorithmic learning
- Inquiry-based learning
 - Problem-solving in context (QL)
 - Concept construction

NEW