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Introduction

The Department of Mathematical Sciences has 30 full time faculty members with expertise in mathematics, mathematics education, developmental mathematics, actuarial science, statistics, data mining and mathematical physics. Our programs prepare students for teaching, business, industry, and research. In addition, we provide students in the Schools of Technology, Business, and Educational and Professional Studies, as well as other departments within the School of Arts and Sciences, with the mathematics and statistics courses needed for success in their fields.

A. Programs

Undergraduates may earn one of the following six degrees:

- Bachelor of Arts in Mathematics
- Bachelor of Arts in Mathematics with specialization in actuarial science
- Bachelor of Arts in Mathematics with specialization in statistics
- Bachelor of Science in mathematics for elementary certification
- Bachelor of Science in mathematics, combined with Biology or Earth Science, for elementary certification
- Bachelor of Science in mathematics for secondary certification.

In addition, we offer eight graduate programs:

- Post-baccalaureate program in mathematics for secondary certification
- Master of Arts in Mathematics
- Master of Arts in Mathematics with specialization in actuarial science
- Master of Arts in Mathematics with specialization in statistics
- Master of Arts in Mathematics with specialization in computer science
- Master of Science in Mathematics for certified elementary teachers
- Master of Science in Mathematics for certified secondary teachers
- Master of Science in Data Mining.

Community of Scholars

The Department of Mathematical Sciences is proud to have received the Community of Scholars award this year in recognition of excellence in our graduate programs.

In the introduction to the portfolio submitted for this award we noted the following:

The diversity of our programs reflects the diversity of our faculty, among whom the disciplines of theoretical and applied mathematics, statistics, actuarial science, and mathematics education are represented. New programs such as the Master of Science in data mining and the proposed sixth year program in mathematics education

leadership indicate that the Department is attentive to new developments in our fields and the needs of the community we serve.

The Department exemplifies the university mission: “Central Connecticut State University is a community of learners dedicated to teaching and to scholarship. We encourage the development and application of knowledge and ideas through research and outreach activities. We prepare students to be thoughtful, responsible and successful citizens.”

Specifically we fulfill the tenets of the School of Graduate Studies:

As a **community of scholars** our weekly colloquium series brings faculty and students together to share the latest findings from our research and engage in the give and take of collaborative problem solving.

Our faculty excels at **scholarly inquiry** as represented by the many articles, books, and lectures documented in this portfolio.

Our **intellectual and personal integrity** is demonstrated by our commitment to serve the community—through service projects such as the State Criminal Justice Statistics program, or commitment to the youth of this region through our hosting of the “math club” and the Connecticut Association for Mathematically Precocious Youth.

We strive for **excellence** not only in our scholarly contributions but in our ongoing improvement of our graduate programs. Recent changes in the research component of the Master of Science program and the addition of a thesis option for the Master of Arts program illustrate that are raising expectations for our students.

Finally, we are recognized for our **leadership** in our respective fields. National recognition for the data mining program and the role our department has played in establishing the Association of Mathematics Teacher Educators in Connecticut are outstanding examples in this regard.

Special thanks to Prof. Robin Kalder, who coordinated the submission of our portfolio to the Community of Scholars Selection Committee.

Programmatic Changes approved in 2006-2007

1. Changes in the Bachelor of Arts program.

We created a new capstone course MATH 450 Proof Seminar. In response to previous efforts to assess students' ability to read, write, and explain mathematical proofs, the department identified the need for an undergraduate capstone course. Independent work will be emphasized; students will be asked to investigate material on their own, and should be ready to discuss everything with the class, culminating with a formal presentation that will serve as

their capstone assessment. This 4 credit course brings the total credits required to 32, leaving 6 credits of electives in the program. The new requirements for the major read as follows.

38 credits in Mathematics and related courses, including MATH 152, 218, 221, 222, 228, 366, 377, and 450. The remaining 6 credits may be selected from MATH 250, 300, 323, 355, 398, 421, 440, 455, 468, 469, 470, 477, 491; STAT 315, 416, 425, 455, 456, 465, 476; ACTL 335, 465, 480, 481, 482. In addition, two laboratory science courses are required. Note: CS 151 is strongly recommended.

2. Changes in the Bachelor of Science (for secondary certification)

- a. In cooperation with the Learning Center we restructured the clinical experience in mathematics education whereby future secondary teachers earn credit for serving as tutors. These field experiences now include completion of a tutor certification program and are contained in three sequential courses.

MATH 211 Clinical Experience in Mathematics Education I 1 Credit

Prerequisite: MATH 152 (C- or higher) Provides prospective teachers of mathematics with an opportunity to gain practical experience in a tutorial setting. Students are trained as tutors for level 1 CRLA (College Reading and Learning Association) certification and are assigned to work a minimum of 3 hours per week in the Learning Center primarily helping students taking MATH 099 and MATH 101.

MATH 311 Clinical Experience in Mathematics Education II 1 Credit

Prerequisite: MATH 211 (C- or higher) Tutors are trained at level 2 (CRLA certification) and assigned to tutor in a middle school or high school setting.

MATH 411 Clinical Experience in Mathematics Education III 1 Credit

Prerequisites: MATH 211 (C- or higher) and MATH 221 (C- or higher). Tutors are assigned to work in the Learning Center and may tutor students in courses up through MATH 152. Students who have not had Level 2 CRLA certification training receive the same training as students taking MATH 311.

- b. We increased the number of credits for MATH 313 Number Systems from an Advanced Viewpoint from 2 to 3 credits. This course was instituted about 10 years ago with the understanding that a secondary mathematics teacher needs to have a solid understanding of the mathematical content and pedagogy for students in grades K-8 in order to deal effectively with students entering high school with gaps in their understanding. Experience has demonstrated that there is enough essential material to be covered that this should be a full three-credit course.
- c. The Committee on the Mathematical Education of Teachers recommends that prospective teachers attain a deep understanding of the subject matter they are to teach.

The addition of MATH 377 (Introduction to Real Analysis) as a required course along with MATH 366 (Abstract Algebra) and MATH 323 (College Geometry) provides future secondary teachers with necessary background in geometry, algebra, and analysis to attain this deep understanding.

The new program requirements for the BS major (for secondary certification) now read

Major in Mathematics, B.S. (Certifiable for secondary teaching)

48 credits in Mathematics as follows: MATH 120, 152, 211, 218, 220, 221, 228, 313, 320, 323, 327, 328, 366, 377; STAT 314; 5 additional credits from MATH 222, 250, 311, 344, 355, 411, 421, 440, 468, 469, 470, 477, 491, STAT 315, 416, 453, 455, 456, 465.

In addition, the student is required to take CHEM 161, 162, 163, and 164 or PHYS 125 and 126 and CS 151 or 213. No minor is required for students with this major. Upon acceptance into the Professional Program in Teacher Education students are required to complete a 30-credit program consisting of SPED 315, EDTE 316, RDG 440, EDF 415, EDSC 425 and MATH 413 (taken concurrently), and EDSC 435 and MATH 426 (taken concurrently).

3. New Liberal Arts mathematics course

We created a new topics course to provide students seeking to fulfill the Skill Area II general education requirement with another option. Specific topics may be of interest to students in certain majors in the arts, humanities, and social sciences who have already fulfilled any specific mathematics or statistics requirements for their major and minor.

MATH 106 Mathematical Topics for Liberal Arts 3 credits

Prerequisite: MATH 101 (C- or higher). Topics in mathematics suitable for students majoring in other disciplines and not covered in other courses. Topics may include: the mathematics of music, mathematics and the arts, game theory, cryptography, and mathematical modeling. May be repeated with different topics for a maximum of six credits.

This course will be offered for the first time in Fall 2007. Professor Eran Makover will teach a section titled "Mathematics in Music," and Professor Jeffrey McGowan will teach a section titled, "Mathematics and the Arts." In Spring 2007 Professor Timothy Craine will teach "Game Theory" as MATH 106 cross listed with PES 210 (Topics in Peace Studies).

Along with the addition of MATH 106, we changed the title of its companion course MATH 105 to Survey of Mathematics for Liberal Arts.

4. Changes in Statistics Courses

Course descriptions and titles were revised for two statistics courses.

STAT 456 Fundamentals of SAS 3 credits

Prerequisite: CS 151 and STAT 201 or 216 or equivalent. Introduction to statistical software. Topics may include creation and manipulation of SAS data sets; and SAS implementation of the following statistical analyses: basic descriptive statistics, hypotheses tests, multiple regression, generalized linear models, discriminant analysis, clustering analysis, factor analysis, logistic analysis and model evaluation. This course is cross-listed with MKT 444.

This course will be team taught with a member of the Marketing Department.

STAT 567 Linear Models and Time Series 3 credits

Prerequisite STAT 416 (C- or higher). Introduction to the methods of least squares. Topics include general linear models, least squares estimators, inference, hypothesis testing, and forecasting with ARIMA models.

The revision of this course is realigned to meet requirements of the Society of Actuaries for work with linear models and time series.

5. Data Mining

On May 16, 2007, the Board of Higher Education approved the revised Master of Science in data mining

An Overview of the MS in Data Mining: 36 Credits
(All courses 3 credits unless otherwise indicated.)

Core Courses

Stat 416 Mathematical Statistics II
Stat 521 Introduction to Data Mining (4 credits)
Stat 522 Data Mining Methods (4 credits)
Stat 523 Applied Data Mining (4 credits)
Stat 525 Web Mining
Stat 526 Data Mining for Genomics and Proteomics
Stat 527 Text Mining
Stat 570 Applied Multivariate Analysis

Thesis Course

Stat 599 Thesis

Elective Courses

Choose any two courses from the following list.

Stat 455 Experimental Design

Stat 529 Current Issues in Data Mining

Stat 551 Applied Stochastic Processes

Stat 567 Linear Models

Stat 575 Mathematical Statistics III

CS 570 Topics in Artificial Intelligence: Machine Learning

CS 580 Topics in Advanced Database: Data Mining

Other appropriate graduate course, with permission of advisor.

On the same date the Board approved a new 18-credit certificate program

Graduate Certificate in Data Mining (18 Credits)

Required Courses

Stat 521 Introduction to Data Mining (4 credits)

Stat 522 Data Mining Methods (4 credits)

Stat 523 Applied Data Mining (4 credits)

Elective Courses

Choose any two courses from the following list.

Stat 525 Web Mining

Stat 526 Data Mining for Genomics and Proteomics

Stat 527 Text Mining

Stat 529 Current Issues in Data Mining

Some other graduate-level data mining or statistics course, with approval of program coordinator.

6. Master of Arts in Teaching

In preparation for the implementation of the Master of Arts in Teaching program in Summer 2008, Professor Maria Mitchell prepared course outlines for the new content pedagogy mathematics courses MAT 529 and MAT 539.

B. Faculty

The Department consists of thirty full time faculty members. The number of part time faculty fluctuates with close to 70 part-timers teaching in the fall semester and between 50 and 60 in the spring. Data on the distribution of full time and part time faculty is displayed in the table below.

Distribution of Full Time and Part Time Faculty

	F'05 FT	F'05 PT	S'06 FT	S'06 PT	F'06 FT	F'06 PT	S'07 FT	S'07 PT
# of faculty*	30	65	30	56	29	71	30	52
# of courses	103	114	102	92	93	118	101	90
# of credits	319	368.5	318	285	307	383.75	317	276.75
credit/faculty	10.6	5.7	10.6	5.1	10.6	5.4	10.6	5.3
%courses taught by	47.5%	52.5%	52.6%	47.4%	44.1%	55.9%	52.9%	47.1%
%credits taught by	46.4%	53.6%	52.7%	47.3%	44.4%	55.6%	53.4%	46.6%

During 2006-07 twenty-eight of the full time positions were occupied by tenured or tenured track faculty. The following table lists these faculty members, their degrees, their ranks and their areas of expertise.

Name	Degree	Rank	Primary Research Interest
Frank Bensics	Ph.D. University of Pennsylvania	Assistant	Actuarial Sciences.
Roger Bilisoly	Ph.D. Ohio State University	Assistant	Text mining, spatial data, science data.
Nelson Castaneda	Ph.D. Indiana University	Associate	Geometric analysis, algebra, graph theory.
Yuanqian Chen	Ph.D. University of Kansas	Full	Partially ordered algebraic systems.
Tim Craine	Ph.D. Wayne State University	Full	Geometry education.
Robert Crouse	Ph.D. University of Rhode Island	Full	Statistical modeling.
Dariusz Dziuda	Ph.D. Technical University of Warsaw	Assistant	Bioinformatics; data mining for genomics and proteomics.
Ivan Gotchev	Ph. D. Sofia University	Full	Topology.
Louise Gould	Ed.D. Columbia University	Associate	Ethno-mathematics, geometry education, group theory, mathematical crafts.
Phil Halloran	Ph.D. University of Connecticut	Full	Psychology of teaching and learning mathematics.
Chun Jin	Ph.D. University of Southwestern Louisiana	Full	Statistics and data mining.

Shelly Jones	Ed.D. Illinois State University	Assistant	Standards-based mathematics; using culture in teaching mathematics.
Robin Kalder	Ed.D. Columbia University	Associate	Reading in mathematics.
Dix Kelly	M.S. Central Connecticut State University and M.A. University of Connecticut	Associate	Pure and applied mathematics.
Dan Larose	Ph.D. University of Connecticut	Full	Data mining.
Fred Latour	Ph.D. Massachusetts Institute of Technology	Assistant	Representation theory, algebra.
Sally Lesik	Ed.D. Harvard University	Assistant	Applied statistical inference.
Eran Makover	Ph.D. Hebrew University	Assistant	Geometry of Reimann surfaces.
Jeff McGowan	Ph.D. CUNY Graduate Center	Full	Reimann surfaces, geometric analysis.
Adele Miller	Ed.D. University of Massachusetts-Lowell	Assistant	Developmental math; mathematical writing.
Dan Miller	Ph.D. University of Connecticut	Full	Statistics.
Maria Mitchell	Ph.D. Capella University	Assistant	Math education and technology.
N. Padma	Ph.D. University of Madras	Full	Differential equations, geometry.
Luis Recoder-Nunez	Ph.D. Wesleyan University	Associate	General topology, topological groups.
Tom Roman	Ph.D. Syracuse University	Full	General relativity, quantum field theory.
Krishna Saha	Ph.D. University of Windsor	Assistant	Statistics.
David Smith	Ph.D. University of Connecticut	Associate	Pure and applied mathematics.
Charles Waiveris	Ph.D. Wesleyan University	Full	Topology, history of mathematics, math education.

Temporary Full Time Positions

Sherry Leone served in a temporary full time position in developmental mathematics in 2005-06 and 2006-07. That position will be filled by a tenure track appointment starting in Fall 2007.

Denise Kelly served in a one semester full time emergency position in Spring 2007. This position was granted to the department in anticipation of the new full time mathematics position (added to accommodate the Engineering program) to be filled by a tenure track appointment starting in Fall 2007.

Pierre Weisgram served in a one semester full time emergency position in Spring 2007 to cover for a full time faculty member on sick leave.

Searches

Two successful searches were conducted in 2006-07.

Drs. Oscar Perdomo (Ph.D., Indiana University) and Marimi Matsushita (Ed.D., Columbia University) will assume positions as assistant professors in Fall 2007.

Promotion and Tenure

Dr. Sally Lesik was promoted to associate professor.

Dr. Luis Recoder-Nunez was awarded tenure.

Creative Activity on the Part of Faculty

a. Publications

Chen Y. "A Note on the Algorists vs. the Abacists : An Ancient Controversy on the Use of Calculators", *Academy for Creative Teaching*, 2006.

Craine T. Review of *Math Made Visual: Creating Images for Understanding Mathematics* by Claudi Alsina and Roger B. Nelson, *Mathematics Teacher*, May 2007.

Kalder, R. *Secondary Mathematics Preparation in the American Northeast* FLATARMÁL: (Iceland's Math Teacher Assn. Magazine)

Gotchev, I. Dense C-embedded subspaces of products, *Scientiae Mathematicae Japonicae*, **64** (2006), No. 3, 509 – 515. (With W. W. Comfort and L. Recoder-Núñez)

Larose, D. *Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage* (with Zdravko Markov), Wiley, 2007.

Larose, D. *Odkrywanie Wiedzy z Danych*, Polish translation of his *Discovering Knowledge in Data*, published in Poland by Wysylkowa.

Lesik, S. (2006). Applying the Regression-Discontinuity Design to Infer Causality with Non-Random Assignment. *The Review of Higher Education*, 30(1), 1-19.

Lesik, S. (2007) Do Remedial English Programs Impact First-Year Success in College? An Illustration of the Regression-Discontinuity Design, *The International Journal of Research and Method in Education*, 30(1), 89-99. (with M.Leake)

Makover, E. An elementary proof that random Fibonacci sequences grow exponentially. *J. Number Theory* 121 (2006), no. 1, 40--44. (with J. McGowan)

McGowan, J. An elementary proof that random Fibonacci sequences grow exponentially. *J. Number Theory* 121 (2006), no. 1, 40--44. (with E. Makover)

McGowan, J. Lens spaces, isospectral on forms but not on functions. *LMS J. Comput. Math.* 9 (2006), 270--286 (with R. Gornet).

Recoder-Núñez , L. Dense C-embedded subspaces of products, *Scientiae Mathematicae Japonicae*, 64 (2006), No. 3, 509 – 515. (With W. W. Comfort and I. Gotchev)

Roman, T. “Some Thoughts on Energy Conditions and Wormholes”, T.A. Roman, in *Proceedings of the Tenth Marcel Grossmann Meeting on General Relativity on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theories*, part C, Rio de Janeiro 2003, 1909-1922. (review article)

Roman, T. with L. Ford and A. Helfer, “Comments on the Allowed Spatial Distributions of Negative Energy. *Proceedings of the Tenth Marcel Grossmann Meeting on General Relativity on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theories*, part C, Rio de Janeiro 2003, 1903-1905.

Saha, K. The generalized linear model and extensions: A review and some biological and environmental applications, with S. R. Paul. *Environmetrics*, 18, 421-443, 2007.

Waiveris, C. Iterated Function Systems in the Classroom, *Mathematics Teacher*, December 2006.

b. Accepted but not yet published

Bilisoly R. Signed book contract with Wiley for the book proposal *Practical Text Mining in Perl*. Manuscript due January, 2008.

Bilisoly R. “Anasquares: Square Anagrams of Squares” was accepted by *The Mathematical Gazette* for publication in 2008. This paper arose from my text mining research.

Castañeda, N. Principal Dirichlet Eigenvalues for Powers of the Laplace Operators on Riemannian Manifolds. *Proceedings of the International Conference in Honor of Jose Escobar* to appear in 2007 (with T. Bagley)

Castañeda, N. Hessians, Warped Products and Eigenvalues. Accepted for publication in *Matemáticas: Enseñanza Universitaria*.

Craine, T., editor, *Understanding Geometry for a Changing World*, 71st yearbook of the National Council of Teachers of Mathematics, to appear in 2009.

Crouse, R. Ridge Regression with Prior Information and Analysis of Variance. *Journal of Applied Statistical Science*, Volume 16, June 2007 (with C. Jin and R.C. Hanumara)

Dziuda, D. Signed a book contract with Wiley Interscience for the book “*Data Mining for Genomics and Proteomics*”.

Gotchev, I. M-embedded subspaces of certain product spaces (With W. W. Comfort and L. Recoder-Núñez) (To appear in *Topology and its Applications*)

Jin, C. “Ridge Regression with Prior Information and the Analysis of Variance”, to appear on the *Journal of Applied Statistical Science*, Vol. 16, 2007 (with R. Crouse and R.C. Hanumara).

Larose, D. *Discovering Statistics*, an introductory statistics textbook, W.H. Freeman publishers, to appear in 2009.

Lesik, S. *Applied Statistical Inference*, Chapman & Hall/ CRC, in preparation.

Saha K. An alternative Wald type test for two linear restrictions with applications to non-linear regression models, with M. King, accepted for publication in the *Journal of Statistical Computation and Simulation (JSCS)*.

Saha K. Open source introduction to statistics with R. *Proceedings of the 19th Annual International Conference on Technology in Collegiate Mathematics*, April 2007.

c. Submitted for Publication

Latour, F. On central extensions of preprojective algebras, with P. Etingof and E. Rains, submitted to the *Journal of Algebra* in summer 2006

Gotchev, I. On a question of Comfort and Negrepointis (With W. W. Comfort and L. Recoder-Núñez)

Makover, E. " The length of closed geodesics on random Riemann Surfaces" resubmitted (on basis of referee comments) to *Journal of Differential Geometry*. (with J. McGowan)

Makover, E. " Regular trees in random regular graphs," submitted to *Journal of Graph Theory*. (with J. McGowan)

McGowan, J. " The length of closed geodesics on random Riemann Surfaces" resubmitted (on basis of referee comments) to *Journal of Differential Geometry*. (with E. Makover)

McGowan, J. " Regular trees in random regular graphs," submitted to *Journal of Graph Theory*. (with E. Makover)

Miller, A. Connecting, Reflecting, and Writing in the Mathematics Classroom to *Journal of Developmental Education*

Mitchell, M. How Constructivist Teaching Using the Internet Promoted Change in Preservice Teachers' Thinking About Teaching Mathematics submitted to *Contemporary Issues in Technology and Teacher Education*

Roman, T. "Energy Density-Flux Correlations in an Unusual Quantum State and in the Vacuum" – with L.H. Ford (Tufts University) to *Physical Review D*.

Roman, T. "Negative Energy in Superposed and Entangled States" – with L.H. Ford (Tufts University)) to *Physical Review D*.

d. Presentations at Professional Meetings and Other Universities

Biliosoly, R. L., Clustering the Short Stories of Edgar Allan Poe: A Text Mining Application. Department of Statistics, University of Connecticut, December 6, 2006, Storrs, Connecticut, and University of Rhode Island, February 16, 2007, Kingston, Rhode Island.

Biliosoly R. Presenting at the Joint Statistical Meetings 2007, the largest statistical conference in North America. Title of presentation: "Clustering the Short Stories of Edgar Allan Poe Using Galois Lattices."

Castañeda, N. Preparing Teachers to Teach High School Geometry. Association of Mathematics Teachers in Connecticut First Annual Conference, New Britain, CT, September, 2006, with Timothy Craine

Castañeda, N. On the hamiltonicity of the hypercube with deleted vertices, 2007 Spring Eastern Section Meeting of the American Mathematical Society, Hoboken, NJ, April 14-15, 2007. (With I. Gotchev)

Castañeda, N. Hessians, Warped Products and Eigenvalues. Western Section Meeting of the American Mathematica Society, Tuscon, AZ, April 22, 2007.

Craine, T. Geometer's Sketchpad in an Urban Classroom. Association of Mathematics Teachers in New England Annual Conference, Killington, VT, October 2006, with David Vania.

Craine, T. Preparing Teachers to Teach High School Geometry. Association of Mathematics Teachers in Connecticut First Annual Conference, New Britain, CT, September, 2006, with Nelson Castaneda.

Dziuda, D. Multivariate method for identification of the informative set of genes, 6th Annual Hawaii International Conference on Statistics, Mathematics and Related Fields, Honolulu, Hawaii, January 2007.

Dziuda, D. Multivariate Biomarkers Discovery Innovation in Life Science & Healthcare Research & Product Development. Bryn Mawr College, Philadelphia, PA, October 2006.

Dziuda, D. Web-Based Microarray Pipeline for Drug Discovery, 11th Annual World Congress on Drug Discovery Technology & Development, Boston, MA, August 2006.

Dziuda, D. Biomarker Discovery ICSA 2006 Applied Statistics Symposium Storrs, CT, June 2006.

Dziuda D. was invited by the organizers of the 5th Conference of International Drug Discovery Science and Technology (IDDST) to give a talk and co-chair the biomarker session at the conference to be held in Shanghai, China, May 28-31, 2007.

Gotchev, I. C-embedded G_δ -dense subsets of products, 2006 International Conference on Topology and its Applications, Aegion, Greece, June 23-26, 2006. (With W.W.Comfort)

Gotchev, I Continuous factorizations and extensions of functions defined on dense subsets of products, International conference “Pioneers of Bulgarian Mathematics”, Sofia University, Sofia, Bulgaria, July 8-10, 2006. (With W.W.Comfort and L. Recoder-Núñez)

Gotchev, I G_δ -dense subsets of products of first-countable spaces are C-embedded, 10th Prague Topological Symposium, Prague, Czech Republic, August 13-19, 2006. (With W.W.Comfort)

Gotchev, I. On a question of W. W. Comfort and S. Negrepontis, 10th Prague Topological Symposium, Prague, Czech Republic, August 13-19, 2006. (With W.W.Comfort and L. Recoder-Núñez)

Gotchev, I. Invited talk at the Topology Seminar at Wesleyan University on our join work with W. W. Comfort “M-embedded G_δ -dense subsets of products”, October 18, 2006.

Gotchev, I. On the hamiltonicity of the hypercube with deleted vertices, 2007 Spring Eastern Section Meeting of the American Mathematical Society, Hoboken, NJ, April 14-15, 2007. (With N. Castañeda)

Gotchev, I. G_δ -dense subsets of products of first-countable spaces, 2006 CSU Faculty Research Conference, WCSU, Danbury, CT, October 14, 2006. (With W.W.Comfort)

Gould, S. L. Presentation at the inaugural Connecticut AMTEC (Association of Mathematics Teacher Educators in Connecticut) Conference held at CCSU – topic was use of email reflections in pre-service elementary teaching courses, September 30, 2007.

Gould, S. L. Presenter with Adele Miller at NEMATYC (New England Mathematics Association for Two Year Colleges) in Fall River MA. Presentation Topic: Timely Reflections \Leftrightarrow Fast Serve Feedback, April 21, 2007.

Halloran, P. *Teach Fraction Problem Solving with Concrete and Pictorial Representations* Workshop at Annual Meeting of the National Council of Teachers of Mathematics in Atlanta, GA, March 2007.

Jones, S. Activities to Connect Probability and Data Analysis to the Middle School Student, Association of Teachers of Mathematics in Connecticut Annual Conference, December 2006.

Kalder, R. Using Algebra Tiles to Make Algebra Concrete, National Council of Teachers of Mathematics Regional Meeting, Chicago, October 2007.

Kalder, R. Using TI-84 *APPS* in the Classroom, Association of Mathematics Teachers in Connecticut Annual Conference, December 2007

Lesik, S. (2006, November). *Do academic integration programs have a causal impact on student retention? A study of a developmental mathematics course using discrete-time survival and regression-discontinuity analysis.* Paper presented at the Northeast Association for Institutional Researcher, Philadelphia, PA and received “Best Paper Award.”

Makover, E. " The length of closed geodesics on random Riemann Surfaces" Topology Seminar at the University of Michigan, Ann Arbor, April 2007.

Miller, A. ICTM3 (Int’l Conf. on Teaching of Mathematics) – Laboratory-Based Learning to Build Conceptual Understanding of Rational Numbers, Istanbul, Turkey, July 2007.

Miller, A. AMTEC (Assoc. of Math Teacher Educators in CT) – *Timely Reflection \Leftrightarrow Fast-Serve Feedback*, September 30, 2007. (with S. L. Gould)

Miller A. NEMATYC (New England Math Assoc. of Two Year Colleges) – *Timely Reflection \Leftrightarrow Fast-Serve Feedback*, April 30, 2007. (with S. L. Gould)

Recoder-Núñez , L. Continuous factorizations and extensions of functions defined on dense subsets of products, International conference “Pioneers of Bulgarian Mathematics”, Sofia University, Sofia, Bulgaria, July 8-10, 2006. (With W.W.Comfort and I. Gotchev)

Recoder-Núñez , L. On a question of W. W. Comfort and S. Negrepointis, 10th Prague Topological Symposium, Prague, Czech Republic, August 13-19, 2006. (With W.W.Comfort and I. Gotchev)

Saha K. *Estimating Dispersion Parameter for Over or Under Dispersed Count Data*. The 16th ICOSA Applied Statistics Symposium, Sheraton Raleigh Hotel, Raleigh, North Carolina, June 3 – 6, 2007.

Saha K. *Rel Test for Testing Two Linear Restrictions in Nonlinear Regression Models*. The 21st New England Statistics Symposium, University of Connecticut, Storrs, Connecticut, April 21, 2007.

Saha K. *Open Source R for Introductory Statistics Courses*. The 21st Annual CSU Academic Computing Conference, Southern Connecticut State University, New Haven, Connecticut, April 14, 2007.

Saha K. *Open Source Introduction to Statistics with R*. The 19th Annual International Conference on Technology in Collegiate Mathematics, Westin Copley Place Hotel, Boston, Massachusetts, February 15-18, 2007.

Saha K. *Testing for Two Linear Restrictions with Applications to Nonlinear Regression Models*. The 2006 CSU University Faculty Research Conference, Western Connecticut State University, Danbury, Connecticut, October 14, 2006.

Saha K. *Semiparametric Estimation for the Dispersion Parameter in the Analysis of Over or Under Dispersed Count Data*. The 23rd International Biometrics Conference, McGill University, Montreal, Quebec, Canada, July 16-21, 2006.

Waiveris C. *Congruence Theorems for Tetrahedra and a Way to Measure Trihedral Angles*, Association of Mathematics Teachers in Connecticut, Annual Conference, December 2006.

e. Department of Mathematical Sciences Colloquium Fall 2006

Date	Speaker	Affiliation	Title
15 Sep 2006	T. Craine	CCSU Faculty	Sufficient conditions for special quadrilaterals: a study in duality and ambiguity
22 Sep 2006	N. Castañeda	CCSU Faculty	New applications of the Hessian - Weitzenbock formula
29 Sep 2006	D. M. Dziuda	CCSU Faculty	Companion website for "Data mining for genomics and proteomics"
6 Oct 2006	I. Gotchev	CCSU Faculty	Concerning a lemma of W. W. Comfort and S. Negrepointis
13 Oct 2006	F. Latour	CCSU Faculty	Factorizations of permutations into transpositions
20 Oct 2006	I. Juhász	Renyi Institute, Budapest, and Rutgers University	Countably compact hyperspaces
27 Oct 2006	L. Recoder-Nuñez	CCSU Faculty	On a question of W. W. Comfort and S. Negrepointis
3 Nov 2006	K. Saha	CCSU Faculty	Testing for two linear restrictions with applications to non-linear regression models
10 Nov 2006	R. Bilisoly	CCSU Faculty	Search engines, formal concepts and clustering: Can a computer group the short stories of Edgar Allan Poe in ways that interest a human?
17 Nov 2006	E. Makover	CCSU Faculty	The many faces of Riemann surfaces
1 Dec 2006	O. Perdomo	Lehigh University	Minimal submanifolds of S^3 invariant under one reflection
8 Dec 2006	Seminar	CCSU Faculty and Students	Sixty-Seventh Annual William Lowell Putnam Mathematical Competition
15 Dec 2006	Seminar	CCSU Faculty and Students	Sixty-Seventh Annual William Lowell Putnam Mathematical Competition
22 Dec 2006	A. Zeqiraj	CCSU Student (MA mathematics)	Limit cycles
22 Dec 2006	B. Konjusha	CCSU Student (MA mathematics)	The Poincare-Bendixon theorem

f. Department of Mathematical Sciences Colloquium Spring 2007

Date	Speaker	Affiliation	Title
2 Feb 2007	N. Castañeda	CCSU Faculty	Spanning paths with prescribed edges and ends in faulty hypercubes
7 Feb 2007	J. Ratzkin	University of Connecticut	Moduli spaces of constant mean curvature surfaces
9 Feb 2007	R. Bilisoly	CCSU Faculty	Some statistical pedagogy for first semester statistics
12 Feb 2007	V. Gochev	Wesleyan University	Compact-open-like topologies on $C(X)$
14 Feb 2007	Z. Huang	University of Michigan	Asymptotics in the Weil-Petersson Geometry of Teichmuller space of Riemann surfaces
23 Feb 2007	O. Perdomo	Lehigh University	New examples of minimal immersed planes in the Euclidean 3 dimensional unit sphere
2 Mar 2007	W. W. Comfort	Wesleyan University	Set Theory: The arithmetic of infinite cardinals
9 Mar 2007	I. Gotchev	CCSU Faculty	C-embedded G_δ -dense subsets of products
16 Mar 2007*	D. M. Dziuda	CCSU Faculty	From multivariate biomarkers to the informative set of genes
30 Mar 2007	F. Latour	CCSU Faculty	Representations of Cherednik algebras
13 Apr 2007	S. Barbee	CCSU Student (MS data mining)	The discovery by Data Mining of rogue equipment in the manufacture of semiconductor devices
20 Apr 2007	E. Sandifer	WCSU	Euler and the tale of the two gammas (Celebration of Leonhard Euler's 300 th birth anniversary)
8 May 2007	S. Ghosh	Indiana U. / Purdue University at Indianapolis	Scalable regularized K-means clustering with probabilistic support for high dimensional data
11 May 2007	K. Alber	CCSU Student (MS data mining)	Identifying Patterns of Potentially Preventable Emergency Department Utilization by American Children

* rescheduled for 27 April due to storm.

g. External Grants

S. Louise Gould participated in the development project that prepared a proposal for the Cromwell/New Britain/ EastConn/ CCSU project. The project was not funded.

I. Gotchev *Computer Science, Mathematics and Physics Scholarship Program at Central Connecticut State University, S-STEM NSF Grant #0630953, 2006–2011, (\$478,302)* (with Stan Kurkovsky, Bradley Kjell, and Nimmi (Parikh) Sharma).

Daniel Larose *Storage-Efficient Data Mining for High-Speed Data Streams, STTR AF03-T011, Phase II, United States Office of Scientific Research, with the University of Connecticut and Sonalysts, Inc., 2004 – 2006, \$750,000.*

Daniel S. Miller was Research Faculty on \$50,000 grant from OPM to study and forecast Connecticut's prison population.

Roman R. National Science Foundation (submitted and in consideration as a finalist).

Recoder-Nunez, L. participates in a grant from the Minority Advancement Program of the Board of Higher Education (under the direction of Prof. Frank Donis) to prepare incoming freshman Latino students to take the mathematics placement examination.

Saha K. IBC Travel Grant of \$1400. *Semiparametric Estimation for the Dispersion Parameter in the Analysis of Over or Under Dispersed Count Data, July 2006.*

g. Travel

In 2006-07, fifteen full time and one part time faculty member used AAUP travel funds to attend conferences:

<u>Faculty Member</u>	<u>Conference</u>	<u>Location</u>
Prof. Nelson Castañeda	AMS Spring Meeting	Hoboken, NJ
	AMS Western Section Mtg.	Tuscon, AZ
Prof. Timothy Craine	11 th Annual AMTE Conf.	Irvine, CA
Prof. Darius Dziuda	6 th Annual Hawaii Intn'l Conference on Statistics	Honolulu, HI
Prof. Ivan Gotchev	10 th Prague Topological Symposium	Prague, Czech Rep.
	22 nd Summer Conference On Topology	Castellon, Spain

Prof. S. Louise Gould	Intn'l Conference of Bridges	San Sebastian, Spain
Prof. Philip Halloran	NCTM Annual Meeting	Atlanta, GA
Prof. Joanne Harper (adjunct)	NCTM Regional Conference and Exposition	Atlantic City, NJ
Prof. Shelly Jones	NCTM Annual Meeting	Atlanta, GA
Prof. Robin Kalder	NCTM Regional Conference and Exposition	Chicago, IL
	2 nd Annual CTLPD Conf.	New York, NY
Prof. Frederic Latour	Joint Mathematics Meeting AMS-MAA	New Orleans, LA
Prof. Eran Makover	Techmuller Theory Conf.	Ann Arbor, MI
Prof. Jeff McGowan	Techmuller Theory Conf.	Ann Arbor, MI
Prof. Adele Miller	3 rd International Conference On Teaching Mathematics	Istanbul, Turkey
Prof. Luis Recoder-Nunez	10 th Prague Topological Symposium	Prague, Czech Rep.
Prof. Krishna Saha	23 rd International Biometric Conference	Montreal, Canada
	19 th Annual ICTCM Conf.	Boston, MA
	ICSAASS Symposium	Raleigh, NC
Prof. Charles Waiveris	Joint Mathematics Meeting AMS-MAA	New Orleans, LA

h. Teaching innovations

Faculty in the department are continually trying new techniques and methods to improve student learning. Here are a few of the innovations faculty noted in their individual annual reports.

Nelson Castañeda introduced Mathematica for the first time in teaching differential equations (MATH 355). He also created handouts with open ended problems for students in Discrete Mathematics (MATH 218) and Higher Geometry (MATH 525).

Louise Gould introduced electronic portfolios in MATH 327, a course for pre-service teachers.

Eran Makover used quizzes on the Blackboard Vista site to assess students on material that covered in class for students in trigonometry (MATH 115) and pre-calculus (MATH 121). This encouraged students to go over the new material each week and not just before exams.

Maria Mitchell developed a letter to go to host teachers supervising students in the methods course, MATH 413, defining expectations for the field experience. In addition she developed a pamphlet for the field experience journal, established requirements for the teaching portfolio, and contributed curriculum materials to the Secondary Education Professor Cohort meetings.

David Smith reports that in MATH 327 he worked with each student to prepare a lesson on a mathematical topic usually taught in the course and had the student teach that topic. Each class period was split between the student-taught lesson and material or activity that he was responsible for.

C. Students

The Department of Mathematics majors break down as such:

Undergraduate majors

BA (mathematics)	35	
BA (mathematics/actuarial science)	29	
BA (mathematics/statistics)	1	
BSED (elementary mathematics)	232	(includes 162 pre-BSED)
BSED (elementary math/biology)	35	(includes 33 pre-BSED)
BSED (elementary math/earth science)	49	(includes 36 pre-BSED)
BSED (early childhood mathematics)	9	
BSED (secondary mathematics)	91	(includes 64 pre-BSED)
Total undergraduate majors	481	

Graduate students

Post-baccalaureate certification	33	(includes 15 conditional admits)
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Masters Degree Programs

MA in Mathematics	19	(includes 9 conditional admits)
MA ACTL specialization	12	(includes 1 conditional admit)
MA STAT specialization	2	
MS secondary mathematics	9	
MS elementary	11	(includes 1 conditional admit)
MS middle level mathematics	8	
MS data mining	55	(includes 25 conditional admits)

Total in masters programs	116	
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Total number of majors	630	
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In addition, 13 undergraduate students have declared a mathematics minor.

Student Achievements

Lucas Roesler received the Departmental Honors Award. He earned a Bachelor of Arts in Mathematics on May 19, 2007.

On February 22, three graduate students were recognized for outstanding academic achievement: Edward DePeau, a candidate for the Master of Science in Mathematics for

certified secondary teachers; Qing Liu, a candidate for the Master of Arts in Mathematics; and Senthil Murugan a candidate for the Master of Science in Data Mining.

Monika J. Wierzbicka was awarded the Tansey Scholarship to pursue the Bachelor of Science in mathematics for secondary certification.

Erik LaBranche and Jerry Sands participated in an after school tutoring program at New Britain High School.

Jarad Demick, Brennan Bell, and Zachary McGuirk participated in the national Putnam Exam competition.

38 students earned certification as peer tutors through the College Learning and Reading Association. On May 10, 2007, they were recognized along with 14 students who had successfully completed student teaching at a reception co-hosted by the Learning Center and the Department of Mathematical Sciences.

As of May 15, 2007, twenty five students majoring in mathematics had applied for the National Science Foundation scholarship program (DUE 0630953). Twelve were awarded scholarships including 5 continuing students, 4 incoming transfer students and 3 incoming first year students. The awardees are:

- Luke Albertson (incoming first year)
- Ramon Chavarro-Casas (continuing)
- Jarad Demick (continuing)
- Towoudjeba Dolou (incoming transfer)
- Joseph Freundlich (incoming transfer)
- Courtney Galotti (incoming first year)
- Michael Lefebvre (continuing)
- Aiqi Liu (continuing)
- Jennifer Morel Trans (incoming transfer)
- Jonathan Vargas (incoming transfer)
- Monika Wierzbicka (continuing)
- Christopher Wilcox (incoming first year)

D. Community Engagement

A number of individual faculty members were involved in community outreach activities.

Tim Craine worked as a consultant with student George Francis and retired high school teacher David Vania on a project to introduce geometric construction software at Hartford Public High School.

Shelly Jones served as a consultant with Manchester Public Schools to provide professional development in mathematics to middle school teachers.

Louise Gould designed and executed two in-service workshops for Middle School and High School teachers in New Britain Schools.

Robin Kalder conducted a workshop of experienced users of graphing calculators under the auspices of the New York Board of Cooperative Educational Services. She also reviewed the mathematics curriculum for grades 6-12 for the Rye Country Day school and conducted a follow up workshop for teachers at the school.

Dan Miller gave an actuarial exam preparation seminar at Cigna for local candidates sitting for Exam C.

Adele Miller Member served as member of the consulting faculty of Charter Oak State College.

Luis Recoder-Nunez is president of the Education Committee of the Hispanic American Cultural Council, which awards scholarships to enable talented Hispanic students to attend college.

In addition, the Department hosted two significant events.

On September 30, 2006, the first annual conference of the Association of Mathematics Teacher Educators in Connecticut (AMTEC) was held at CCSU. Maria Mitchell was the conference chair.

On May 27, 2007, for the second year in a row, CCSU was a site for “CAMPY on Campus”, a program for middle school students sponsored by the Connecticut Association for Mathematically Precocious Youth. Sixty students participated. Workshop presenters from our department included Nelson Castaneda, Tim Craine, Louise Gould, Shelly Jones, and Charles Waiveris. Jeff McGowan coordinated conference registration. See Appendix 1.

E. Other Departmental Initiatives

1. Course Redesign for Elementary and Intermediate Algebra

In March, Department Chair, Timothy Craine, attended a conference on “course redesign” sponsored by the National Center for Academic Transformation, as part of a team of faculty and administrators from the CSU system. Included on the team were mathematics faculty from our sister institutions, Eastern, Southern, and Western Connecticut State Universities.

A focus of discussion at the conference was the large number of students required to take developmental mathematics courses, i.e. MATH 099 (Elementary Algebra) and MATH 101 (Intermediate Algebra). We examined several models including those in which a majority of student work is done on line or in a computer lab, with faculty, teaching assistants, and tutors serving as resources available to students who need help. A major problem with this approach is that the curriculum materials become focused on the development of algebraic skills to the exclusion of concept development and the higher order thinking skills students need in order to become effective problem solvers. Furthermore, mathematics is not effectively learned in isolation; rather students benefit from interaction with teachers and peers. Consequently, the mathematics faculty attending the conference focused on ways we can use software to enhance rather than replace classroom learning.

As an outcome of the conference the participants met with CSU Chancellor David Carter and the four presidents on April 11. At that meeting we presented a list of pros and cons of using software in developmental mathematics courses (MATH 099 and 101). We also reported on the status of elementary and intermediate algebra on the four campuses. In discussing next steps, Professor Craine reported three areas in which our work will focus in the coming year.

- (1) The development of web enhancements for MATH 099 and MATH 101 in conjunction with revision of the textbook. Professors Craine and McGowan have already met with the publisher (Houghton Mifflin) to begin this process. Current programs offered by commercial publishers tend to be exclusively focused on skills. We hope to develop web enhancements that promote problem solving and concept development as well.
- (2) The expansion of options for students. We already have special sections of MATH 099 and 101 for students with special needs and students in the EOP program. The “combo” course, which covers both elementary and intermediate algebra has been successful. A preliminary plan for a self-paced version of MATH 101 has been presented to the department but has not yet been approved. For students who earn a D in MATH 099 or 101 (thus missing the C- prerequisite for the next course in their program), an abbreviated extension course might be an effective alternative to repeating the entire course. This latter suggestion is in line with the Ad Hoc e-Learning Committee’s proposal for “make up” courses.

(3) Collection of more data on predictors of student success, particularly for transfer students who have credit for elementary algebra but struggle in intermediate algebra and may benefit from a short “bridge” course.

Appendix 2 contains two documents presented to the Council of Presidents: the list of developmental software pros and cons as well as the summary of the past ten years of curriculum design at CCSU

2. Entrance Examinations for Courses in the Pre-Calculus/Calculus Sequence

On February 6, Marsha Davis, Chair of the Department of Mathematics and Computer Science at Eastern Connecticut State University, met with the Department. She described their Calculus Assessment Plan. Students in Calculus I, II, and III are required to take an entry exam on their own time within the first two weeks of class. Students who fail the exam are required to work through a tutorial, which puts the burden of review of material from previous courses on the student. The ECSU faculty believe that this has had a beneficial effect on student performance in calculus courses. The examination and review module use the software package Maple T.A.

Upon hearing the report the Department voted to support the request by ECSU that the CSU system support a system-wide site license for Maple and Maple T.A. Subsequently the site license was obtained. We plan to collaborate with our colleagues at Eastern (and at the other two CSU universities) to develop common sets of questions for entrance examinations and tutorials that we can incorporate in our own classes.

It is our hope that a team of faculty from the four universities can work on this project together. To accomplish the task, however, will require some reassigned time.

3. Sixth Year Program in Mathematics Education Leadership

In 2005-06 the Department developed a proposal to offer a Sixth year program in Mathematics Education Leadership. The program and proposed courses were approved by the Curriculum Committee and Faculty Senate. President Miller deferred approving the program until the incoming Provost had a chance to review it. At the request of the Provost, a survey of school superintendents and principals was conducted to determine the need for and interest in the program. The response to the survey was overwhelmingly positive. The full text of the report on the survey by Professor Philip Halloran, is contained in Appendix 3 to this report.

4. Jamaica Program

Plans to offer Master of Science degrees to graduate students in Jamaica were placed on hold pending a thorough review of the University’s relationship with the teachers colleges there and the development of a strategic plan for the University’s role in that country. A committee of faculty and deans from the departments and schools involved in Jamaica, chaired by Associate Vice President Paulette Lemma, developed such a plan and presented it to the

Provost in May 2007. The MS in mathematics is included in that plan. The specific proposal for the masters degrees we could offer is contained in Appendix 4 to this report.

F. Budget

Funds Allocated for Fiscal Year 2007

Discretionary Budget Pool	20,000
OE Budget Pool	26,755

Year to Date as of April 1, 2007 (75% through Fiscal Year)

Source: Banner

Discretionary Budget Pool		14, 024.68
Graduate Assistant	3,858.00	
Student Labor	10,166.68	
OE Budget Pool		18,342.62
Conferences	1,257.20	
Educational Supplies	1,468.29	
Professional Services	664.67	
Dues and Memberships	265.69	
Travel Out of State	328.70	
Office Equipment Repairs	1,078.51	
Other Purchased Services	163.20	
Telecom Recurring Charges	1,863.18	
Telecom Toll Charges	86.42	
Office Supplies	7,791.92	
Contract Office Supplies	332.32	
Data Processing Supplies	101.14	
Other Supplies	94.50	
Postage	122.36	
Lease Copy Machines	2,724.52	

G. Assessment

The Department adopted assessment plans for two majors, the BA in mathematics and the BSED for secondary mathematics teaching. The curriculum maps and assessment measures are indicated on the next two pages. The program changes in both these majors discussed in section A of this report are an outgrowth of and are reflected in the assessment plans.

Bachelor Arts in Mathematics

Learning Outcomes and Curriculum Map

	Learning outcomes	Addressed in these courses * indicates electives			
1.	Understand basic analytic arguments using such common notions as epsilon/delta, infinite sums, and limits	152	221	222	477*
2.	Understand basic algebraic and discrete notions, such as facts about vector spaces and counting arguments.	218	228	250*	
3.	Be able to both follow and recreate analytic proofs, including basic ideas involving abstract metric spaces and differential equations.	377	355*	455*	491*
4.	Be able to follow and recreate algebraic proofs, with a good understanding of groups.	366	468*	469*	
5.	Be able to independently investigate more advanced topics in mathematics and present their results to others in a clear way.	450			

	Learning Outcomes By the time of graduation, a student will be able to: (Please state in measurable terms).	Assessment Measures List at least two for each outcome, one of which should involve direct evidence of learning.	Indicate when and how often the measure(s) for this learning outcome will be implemented.
1.	Understand basic analytic arguments using such common notions as epsilon/delta, infinite sums, and limits	In class exams and problem sets.	Every semester during class.
2.	Understand basic algebraic and discrete notions, such as facts about vector spaces and counting arguments.	In class exams and problem sets.	Every semester during class.
3.	Be able to both follow and recreate analytic proofs, including basic ideas involving abstract metric spaces and differential equations.	In class exams and problem sets.	Every semester during class.
4.	Be able to follow and recreate algebraic proofs, with a good understanding of groups.	In class exams and problem sets.	Every semester during class.
5.	Be able to independently investigate more advanced topics in mathematics and present their results to others in a clear way.	Performance in a capstone class and on a final capstone presentation.	Once during senior year.

Bachelor of Science in Mathematics (for secondary certification)

Learning Outcomes and Curriculum Map

	Learning outcomes	Addressed in these courses			
1.	Understand basic analytic arguments using such common notions as epsilon/delta, infinite sums, and limits and basic algebraic and discrete notions, such as facts about vector spaces and counting arguments.	152	221	218	228
2.	Be able to follow and recreate algebraic and geometric proofs.	218	323	366	377
3.	Apply mathematical principles to the solution of problems, including real world applications	120	220	320	STAT 314
4.	Understand issues concerning the mathematics curriculum for grades 7-12	313	327	328	
5.	Develop skills necessary to become an effective teacher of mathematics	211	413	EDSC 435	426

	Learning Outcomes By the time of graduation, a student will be able to: (Please state in measurable terms).	Assessment Measures List at least two for each outcome, one of which should involve direct evidence of learning.	Indicate when and how often the measure(s) for this learning outcome will be implemented.
1.	Understand basic analytic arguments using such common notions as epsilon/delta, infinite sums, and limits and basic algebraic and discrete notions, such as facts about vector spaces and counting arguments.	In class exams and problem sets.	Every semester during class.
2.	Be able to follow and recreate algebraic and geometric proofs.	In class exams and problem sets.	Every semester during class.
3.	Apply mathematical principles to the solution of problems, including real world applications	In class exams and problem sets.	Every semester during class.
4.	Understand issues concerning the mathematics curriculum for grades 7-12	In class exams and problem sets.	Every semester during class.
5.	Develop skills necessary to become an effective teacher of mathematics	Field Experiences	Mid point assessment in MATH 413 Student Teaching evaluation.

We are taking the following steps to implement these assessment plans.

1. We have begun central collection of final exams for all courses in each main sequence (pure math, math education, and statistics). This will allow us to track the material covered from semester to semester and by instructor. We can then make sure that we are covering the material we wish to cover for all our majors.

2. We will begin this semester to track final grades for all courses in each main sequence. This will allow us to assure that our standards remain constant from semester to semester. It will also help us to identify “problem courses” which need reevaluation and perhaps redesign.
3. We will use the following to monitor student mastery of our core material
 - a. For BA students, a new senior level course, Math 450, which is a seminar type course designed to teach our pure math students how to begin to do proofs independently. This course will be a capstone, integrating material learned in a variety of previous classes and preparing students either for further study in mathematics or for applying their mathematical knowledge in a variety of settings.
 - b. We will continue to assess the BSED students at several stages. Admission to the professional program requires a detailed evaluation of a student’s progress up to the time of admission. A mid program assessment has been given in MATH 413. Finally, during student teaching candidates are under close faculty supervision and must pass the ultimate test of putting what they have learned into practice.

We anticipate that more attention will be given to assessment in the coming year, in particular as we prepare for NEASC and NCATE. Maria Mitchell and Adele Miller attended an NCATE Conference March 29-April 1, 2007 in Washington, DC. They will be coordinating the preparation of our department’s SPA report for NCATE.

H. Plans for 2007-2008

1. Appraisal of our Plans for 2006-07 as contained in the May 2006 Annual Report

Plans from 2006-2007	Appraisal
<p>Department Evaluation Committee</p> <p>In 2006-2007 the DEC plans to undertake a thorough study of the criteria by which candidates for promotion and tenure are judged. In particular, the committee plans to examine our methods for judging teaching performance and to formulate guidelines for assessing scholarship within each of the sub-disciplines in the department. The DEC will report its findings to the department for a thorough discussion and review. Although the need for this review was identified by the DEC early in the 2005-06 academic year, the recent communication from President Miller to the faculty on issues regarding promotion and tenure have given this project added significance.</p>	<p>Progress in this area has been slow, in part because the DEC had a large number of promotion and tenure cases to consider this year, but more significantly because of the ongoing discussion and debate campus wide and in the Senate over Promotion and Tenure Procedures. On May 11 the Faculty Senate gave final approval to the ad hoc committee report, as amended. The task of the DEC and the Department will now be to develop specific guidelines for creative activity (in accordance with provision IIA), establish more effective methods of peer review of teaching (a topic that will be examined University-wide by an ad hoc Senate committee), and establish a mentoring program for tenure track faculty (in accordance with provision II E).</p>
<p>Program Assessment and Capstone for the BA program</p> <p>Establishing clearer outcomes and finding effective methods of assessment has been an ongoing concern, especially for students earning the Bachelor of Arts degree, who are not subject to an external examination as are students earning the Bachelor of Science in Education. As noted above, a first step in this process has been the establishment of the new 300-level course (MATH 377, Introduction to Analysis) and the increase in credits for the other required 300-level course (MATH 366, Introduction to Abstract Algebra). The next step will be consideration of a capstone requirement such as a seminar or portfolio assessment. In Fall 2006 the chair will appoint a committee to study this issue with a mandate to report to the Department in Spring 2007.</p>	<p>This was accomplished with the revision in the BA program, approved by the Curriculum Committee and the Senate, which includes the new capstone course MATH 450 Proof Seminar. (See section A1 above).</p>
<p>Using Technology Effectively in Introductory Courses</p> <p>In Spring 2006 an ad hoc committee on use of web-based technology for quizzes, homework assignments, and practice problems was formed. The impetus was pressure from textbook publishers to adopt commercial software packages along with required textbooks. The committee reached the conclusion that support for introductory courses (up through pre-calculus) can best be provided by our own department on our own web site. That</p>	<p>This will be an ongoing focus in 2007-2008. See discussion of technology in sections E1 and E2 above and Appendix 1.</p>

<p>conclusion was approved by departmental vote in May 2006. Consequently a major goal for 2006-07 will be to create appropriate materials and make them available to students on the web. There will be a request forthcoming for a Graduate Assistant to aid in this effort.</p>	
<p>Further Program Changes On the programmatic front, we foresee the following changes in 2006-07:</p> <ul style="list-style-type: none"> a. Approval of an 18-credit graduate certificate program in Data Mining to complement the existing Masters Degree. This proposal has already been approved by the Department and will be considered by the Curriculum Committee in the fall. b. Final approval for the Sixth Year Program in Mathematics Education Leadership by the CSU System Office and the Department of Higher Education. c. Establishment of a Masters degree program for mathematics teachers in cooperation with Sam Sharpe Teachers College in Jamaica. d. Development of the mathematics component of the new Master of Arts in Teaching program, once the program has been approved by the Department of Higher Education. This will entail combining material currently taught in several different courses into the new content pedagogy courses MAT 529 and MAT 539. 	<p>This was accomplished. See section A5 above.</p> <p>For an update on the status of this program see section E3 above and Appendix 2.</p> <p>For an update on the status of this program see section E4 above and Appendix 3.</p> <p>This was accomplished. See section A6 above.</p>

2. Department Retreat August 28, 2007

An all day retreat for full time members of the Department is planned for Tuesday, August 28. The topics to be discussed will include major issues to be considered and initiatives to be undertaken during the upcoming academic year. These include:

- a. Establishment of a mentoring program for non-tenure track faculty, as indicated in the Appraisal section of the chart above.
- b. Further steps in integrating web resources into courses both at the developmental level and for the pre-calculus/calculus sequence (as indicated in Sections E1 and E2 above)
- c. Data collection for the Assessment plan indicated in Section G above.
- d. A new degree program, Master of Science in Applied Statistics, which has been proposed by several members of the department.
- e. Future structure and leadership for the Department in anticipation of the expiration of Professor Craine's term as chair in 2009.

3. Resources

The Department of Mathematical Sciences is one of the largest in the University. Based on our part time faculty load for Fall 2006 and Spring 2007, part time faculty constitute the FTE equivalent of 27 full time members, giving a department total of 57 FTE. To function effectively we need sufficient resources.

- a. Our request for a second full time office staff position was included in the Dean of Arts and Sciences budget proposal for 2007-08. We hope that this position will be approved shortly.
- b. Reassigned time for Department functions continues to be a concern. Currently we have 12 hours per semester of contractual reassigned time and 9 hours of discretionary reassigned time provided by the Dean of Arts and Sciences. We would benefit from addition reassigned time for
 - (1) assessment (especially in preparation for NCATE); see Section G above.
 - (2) the development of web based entrance exams and tutorials for the pre-calculus/calculus sequence; see Section E2 above.
 - (3) analysis of factors affecting student performance in MATH 101; see Section E1(3) above.

Appendix 1 CAMPY on Campus Central Connecticut State University May 22, 2007

Registration and Refreshments 8:30-9:00 AM	Vance Academic Building Lobby (First Floor)
Welcome and Orientation 9:00-9:15 AM	Room 105
Morning Sessions 9:30-11:45 AM	Description
Creating Fractals Session 1 Mako Haruta University of Hartford Room 102	Create fractals and learn about some of the beautiful and fascinating mathematics behind them in this hands-on workshop. We'll play the Chaos game, explore the Sierpinski triangle and fractal dimension.
The Mathematics behind GPS systems Session 2 John Williams University of Hartford Room 104	A description of the math behind GPS systems and applications. How do the satellites find you and where you are? What can you do with the data once you have it? Students will need calculators but not their own GPS system. Some geometry will be used but nothing too difficult.
Indian Tabla Drumming and Mathematical Patterns Session 3 Steve Lecky Middletown High School Room 103	The fascinating Hemachandra (Fibonacci) sequence can be uncovered by exploring patterns within the tabla style of drumming. Participants will create music for the tabla and explore the Fibonacci pattern in nature and the arts. A second famous mathematical pattern will also be uncovered by delving deeper into our drumming.
Human Graphs Session 4 Shelley Jones CCSU Room 105	Learn statistics and algebra concepts using students as data points.
Creating Fractal Images with Iterated Function Systems (IFS) Session 5 Charles Waiveris CCSU Room 206	Become a fractal artist and hang your painting in a web gallery!! Participants in this workshop will get a brief introduction to fractals and learn how to make simple fractal images using a computer. They will also be able to post their images in a special online gallery.
Lunch 11:45-12:15	Memorial Hall Constitution Room
Afternoon Sessions 12:30-2:45 PM	Description
Explorations with Geometer's Sketchpad Session 6 Jim Paniati Northwestern High School Region 7 Room 206	We will use the computer program Geometer's Sketchpad to look for patterns and make conjectures about geometric properties.
Geometry Explorations Using Google Earth Session 7 Louise Gould and Antonio Zea, CCSU Room 104	Google Earth lets us travel any where in the world from our own home or school. We will explore a number of interesting questions that arise from using this tool.
The Geometry of Molecules Session 8 Leslie and Tim Craine, CCSU Room 105	We'll explore how three-dimensional geometry is used by chemists to analyze the properties of molecules. Hands-on activities will help you understand why symmetry is an important idea in both mathematics and science.
Finite Geometries Session 9 Nelson Castaneda, CCSU Room 103	Can you imagine a "geometry" where there are only a finite number of points? This session will expand your horizons!
Stimulating Simulating: Investigating Probability Problems using the TI-83+/84 Session 10 Jean Burelle University of Hartford Room 102	We will use random integer feature on the TI-83+/84 to simulate the Chinese Population problem, the Birthday Bet problem, the Grasshopper-on-a-Log problem and others.

Appendix 2: Materials Presented to Council of Presidents, April 11, 2007

Pros and Cons of Developmental Mathematics Software

This list was compiled by a group of mathematics faculty from all four CSUs meeting on April 5, 2007, to discuss our experiences with the developmental mathematics courses, elementary and intermediate algebra. Our conclusion is that in redesigning courses to incorporate mathematics course software, we need to consider both the advantages and the limitations of using technology in this way. The most effective use of this software is likely to be in the context of web enhancements to courses in which students meet with the instructor in more traditional lecture/recitation sections.

Pros

1. Computer program is available to students 24/7
2. Course software carefully sequences instruction
3. Course software can be used effectively to reinforce skills
4. Students receive instant feedback on their work.
5. Software can be used to support in-class instruction.
6. Course software is effective when it is correlated with the textbook used in class.
7. Learning with a computer is appealing to many students.
8. Feedback from a computer program is perceived by students as less judgmental than from an instructor or tutor.
9. Use of the computer enhancement may result in more time-on-task for many students.

Cons

1. Infrastructure costs (space, computers, time, and IT support) may lessen the supposed financial benefits of an emporium model.
2. Emphasis on drill and practice fosters rote learning.
3. It is uncertain to what extent conceptual development can be enhanced with software.
4. Current software favors symbol manipulation skills over a functional approach with applications.
5. Students working exclusively on computers miss interaction with teachers and peers that is necessary to clarify misunderstandings.
6. Course software is (generally) not sensitive to different students' learning styles.
7. Students may encounter problems transferring their knowledge from a computer environment to paper-and-pencil.
8. Student "success" with the software may be illusory.

Tim Craine, Central Connecticut State University

Pete Johnson and Christina Gundlach, Eastern Connecticut State University

Alain D'Amour, Southern Connecticut State University

Josie Hamer, Western Connecticut State University

Elementary and Intermediate Algebra* at Central Connecticut State University: Ten Years of Course Redesign

*MATH 099 = Elementary Algebra; MATH 101 = Intermediate Algebra

Academic Year	Accomplishments
1997-98	Pilot common final exams for MATH 099 (open response) Begin common grading sessions (MATH 099) Reestablish MATH 099/101 combination course
1998-99	Adoption of combined elementary-intermediate textbook Professional development workshops (at start of each semester) MATH 101 final becomes open response with common grading sessions
1999-2000	Writing of custom textbook begins
2000-01	Pilot testing of custom textbook Faculty Senate passes change of grading policy for MATH 099 (from S/U to letter grade affecting GPA)
2001-02	Custom textbook adopted for all sections Change in grading policy takes effect Strategic Planning Grant for Supplemental Instruction (with Learning Center) Full time developmental mathematics position filled
2002-03	Instructor-led 4th hour of "lab" in MATH 099 Strategic Planning Grant for tutoring (with Learning Center)
2003-04	Custom textbook is commercially published Continuation of tutoring (with Learning Center) through funding from royalties
2004-05	Second developmental mathematics position approved Board of Trustees proficiency policy adopted.
2005-06	Learning Center begins training of certified tutors Summer incentive program for MATH 099-101
2006-07	SAT scores used for preliminary placement with Accuplacer as back up Clinical experience course in secondary mathematics education major revised

The first year the common final was administered in MATH 099 only 56.4% of students taking the final passed with 60% or better. Since only 73.9% of the students enrolled in the course actually took the final, the effective success rate was 41.7%. From 1998 to 2002, MATH 099 performance showed steady improvement and then leveled off. MATH 101 performance has improved gradually to over the past four years. The most recent figures for Fall 2006 are as follows:

Course	Percent of students enrolled in course who take final exam.	Percent of students taking exam who pass with 60% or better.	Percent of students enrolled in course who pass final with 60% or better.	Percent of students taking exam who score 80% or better.
MATH 099	81.6	75.2	61.3	24.1
MATH 101	82.7	76.9	63.6	29.9

Next steps: (1) Develop web enhancements for MATH 099 and MATH 101 in conjunction with revision of the textbook; (2) Explore concept of course modularization and additional options for students (including a self-paced version of MATH 101); (3) Collect more data on predictors of student success particularly for transfer students who have credit for elementary algebra but struggle in intermediate algebra and may benefit from a short "bridge" course.

Appendix 3: A Survey of Public School Administrators Support for a 6th Year Program in Mathematics Education Leadership

Report by Dr. Philip Halloran, Department of Mathematical Sciences, May 1, 2007

The Department of Mathematical Sciences, in cooperation with the Department of Education Leadership has proposed the creation of a Sixth Year Program in Mathematics Education Leadership. In Fall 2006 members of the Department met with the Provost, Dr. Carl Lovitt to discuss the proposal. At that meeting the Provost asked that the Department conduct a survey to establish the need for such a program.

In the Spring of 2007 a survey was conducted of school districts within close proximity of the University. Fifty school districts were asked to participate in the survey. A list of those to whom the survey was sent appears in Appendix A.

Within each of the 50 school districts sampled, four questionnaires were sent: one to the Superintendent and three to randomly selected principals from at the high school, middle school, and elementary school. The letter and the questionnaire sent to each administrator appear in Appendix B. The results are as follows:

Superintendents responding: 22
 High School Principals: 26
 Middle School Principals: 21
 Elementary School Principals: 9

- Question: [There is a need for individuals with this type of background in Connecticut.](#)
- All respondents

<input type="checkbox"/>	Strongly Agree:	49/78	63%	
<input type="checkbox"/>	Agree:	18/78	23%	86%
<input type="checkbox"/>	Disagree:	0/78		
<input type="checkbox"/>	Strongly Disagree:	9/78	12%	12%
<input type="checkbox"/>	Blank:	2/78		
- Superintendents

<input type="checkbox"/>	Strongly Agree:	18/22	82%	
<input type="checkbox"/>	Agree:	3/22	14%	95%
<input type="checkbox"/>	Disagree:	0/22		
<input type="checkbox"/>	Strongly Disagree:	1/22	4%	4%
- High School Principals:

<input type="checkbox"/>	Strongly Agree:	15/26	58%	
<input type="checkbox"/>	Agree:	6/26	23%	81%
<input type="checkbox"/>	Disagree:	0/26		
<input type="checkbox"/>	Strongly Disagree:	4/26	15%	15%
<input type="checkbox"/>	Blank:	1/26		

○	Middle School Principals:			
□	Strongly Agree:	10/21	48%	
□	Agree:	6/21	29%	76%
□	Disagree:	0/21		
□	Strongly Disagree:	4/21	19%	19%
□	Blank:	1/26		
○	Elementary Principals:			
□	Strongly Agree:	6/9	67%	
□	Agree:	3/9	33%	100%
□	Disagree:	0/9		
□	Strongly Disagree:	0/9		
□	Blank:	0/9		
□				
•	Question:	This Program would effectively prepare teachers for mathematics education leadership in my school district.		
○	All respondents			
□	Strongly Agree:	47/78	60%	
□	Agree:	20/78	26%	86%
□	Disagree:	0/78		
□	Strongly Disagree:	8/78	10%	10%
□	Blank	3/78		
□				
○	Superintendents			
□	Strongly Agree:	18/22	82%	
□	Agree:	3/22	14%	95%
□	Disagree:	0/22		
□	Strongly Disagree:	1/22	5%	5%
○	High School Principals:			
□	Strongly Agree:	15/26	58%	
□	Agree:	6/26	23%	81%
□	Disagree:	0/26		
□	Strongly Disagree:	4/26	15%	15%
□	Blank:	1/26		
○	Middle School Principals:			
□	Strongly Agree:	11/21	52%	
□	Agree:	5/21	24%	76%
□	Disagree:	0/21		
□	Strongly Disagree:	4/21	19%	19%
□	Blank:	1/26		

○	Elementary Principals:			
<input type="checkbox"/>	Strongly Agree:	5/9	56%	
<input type="checkbox"/>	Agree:	3/9	33%	89%
<input type="checkbox"/>	Disagree:	0/9		
<input type="checkbox"/>	Strongly Disagree:	0/9		
<input type="checkbox"/>	Blank:	1/9		
•	Question: CCSU should move forward with this program.			
○	All respondents			
<input type="checkbox"/>	Strongly Agree:	43/78	55%	
<input type="checkbox"/>	Agree:	24/78	31%	86%
<input type="checkbox"/>	Disagree:	0/78		
<input type="checkbox"/>	Strongly Disagree:	8/78	10%	10%
<input type="checkbox"/>	Blank	3/78		
○	Superintendents			
<input type="checkbox"/>	Strongly Agree:	16/22	73%	
<input type="checkbox"/>	Agree:	5/22	23%	95%
<input type="checkbox"/>	Disagree:	0/22		
<input type="checkbox"/>	Strongly Disagree:	1/22	5%	5%
○	High School Principals:			
<input type="checkbox"/>	Strongly Agree:	15/26	58%	
<input type="checkbox"/>	Agree:	8/26	31%	88%
<input type="checkbox"/>	Disagree:	0/26		
<input type="checkbox"/>	Strongly Disagree:	2/26	8%	8%
<input type="checkbox"/>	Blank:	1/26		
○	Middle School Principals:			
<input type="checkbox"/>	Strongly Agree:	8/21	38%	
<input type="checkbox"/>	Agree:	7/21	33%	71%
<input type="checkbox"/>	Disagree:	0/21		
<input type="checkbox"/>	Strongly Disagree:	4/21	19%	19%
<input type="checkbox"/>	Blank:	2/26		
○	Elementary Principals:			
<input type="checkbox"/>	Strongly Agree:	5/9	56%	
<input type="checkbox"/>	Agree:	4/9	44%	100%
<input type="checkbox"/>	Disagree:	0/9		
<input type="checkbox"/>	Strongly Disagree:	0/9		
<input type="checkbox"/>	Blank:	0/9		

In addition to these questions we asked several questions which attempted to determine what kind of curriculum and mathematics leadership exists with the districts at the present time. We have listed the analyzed the answers of the Superintendents since the questions were asked of the *districts*.

- Does your school district presently have a supervisor, coordinator, or director of mathematics?**
 - Eighteen of the 29 districts or 62% answered *yes*.
 - Of these, 8, or 28%, of these districts have K-12 supervisors
 - Three, or 10%, have two supervisors. One supervisor is K-6 the other is 7-12.
 - One has three K-8 supervisors.
 - Two have one 6-12 supervisor.
 - One has one 9-12 supervisor
 - One has one preK-12 supervisor
 - Two did not respond to this question
 - All of the 9 superintendents who responded *no* felt that there was no need for such a position in their district. Incidentally, this correlates perfectly to the Superintendents who felt that there was no need for this kind of position in the State of Connecticut.

- Does your school district have at least one Mathematics Department Chair?**
 - Twenty-five of the 29 Superintendents answered, *yes*.
 - Eleven of the 25, or 44%, whose district has a Mathematics Department Chair, utilize that Department Chair as an evaluator of teachers.
 - The other 14, or 56%, evaluate teachers using the following positions:
 - At the high school; 10, or 71%, use the Principal; 2, or 14%, use a position described as Administration; and 2, or 14%, use a Mathematics Supervisor.
 - At the middle school; 11, or 79%, use the Principal; 2, or 14%, use the Administrator; and 2, or 14%, use the Mathematics Supervisor.
 - At the elementary level; 11 or 79% use the Principal; 2, or 14% use the Administrator; and 2, or 14%, use the Mathematics Supervisor.

- Does your school district have a system-wide position with specific responsibility of general curriculum?**
 - Twenty-five, or 86%, of the districts have a person responsible for general curriculum.
 - Of those 25, 13, or 52%, have someone who is responsible for mathematics curriculum
 - Of the remaining 12, or 48%, the general curriculum coordinator is responsible for the mathematics curriculum. There is no mathematics specialist.

- In the remaining 4 districts who do not have a person responsible for general curriculum, the principal is responsible for the mathematics curriculum within the building.

We also asked the individuals who responded to our survey to add any comments of their own, if they so desired. Nineteen of them did. We have included them here, broken down by job description.

SUPERINTENDENT COMMENTS:

1. We spent a year and a half searching for a person to fill our Mathematics Curriculum Coordinator Position.
2. I'm not sure if data driven decision making and continuous improvement are taught in the Leadership and Supervisor course. If they are not this would be a glaring hole in the preparation sequence.
3. CRITICAL: Math 616 should teach students how to collect and analyze data from assessments. Instructional strategies should be implemented as a result of the analysis. Collecting data and analyzing assessments is critical in each school across Connecticut, especially with the NCLB and AYP mandates. Students need many opportunities!
4. I assume the content would be strongly focused on the CT Math Frameworks? It is important to stress the difference between a math curriculum and the textbook used as a learning tool. Often the text itself is viewed as the curriculum.
5. Why not link this to a PhD program and give these individuals even more opportunity?
6. Thank you for this initiative! We utilize our Math Consultants, mentors, and master mentors to aid teachers with math instruction, but I find K-5 teachers somewhat unprepared to teach complex mathematics concepts, and relatively unsure of themselves regarding mathematics instruction.
7. I think this is a good idea.

ELEMENTARY PRINCIPALS

1. I believe that you need more EDL to get an 092 – teaching math (my favorite subject) and taking math classes will not help you in the role of an educational leader.
2. My main concern is: What if you have an elementary education major who is highly proficient in Math, but DOES NOT HAVE a BS or MS in Mathematics—how many “additional” courses would they be required to take? We need this track @ the Graduate level;. I applaud you on getting this going. By the way—my CCSU graduates are well prepared and I search them out!

MIDDLE SCHOOL PRINCIPALS

1. I think this is a fantastic idea & fully support it. I applaud your efforts to support/specialize/develop math leadership as we have for language arts. Well done.
2. Reach out to the state level to make having a numeracy coach for each district a requirement.
3. I am an interim (.4) math supervisor in the district with a focus on grades 7 & 8. I would be interested in such a program. However, I do not have a Masters in Math, etc. I think you should detail what options people like myself have, or should take (such as needed coursework) in order to get into the program. Thanks.
4. They need more classroom experience. Probably most of these people have secondary backgrounds, which is unfortunate for elementary schools. I would prefer K-6 and 7-12. Secondary people don't have background for elementary and vice versa. Certainly a strong math background is important but being able to relate to curriculum and teachers at different levels is equally or more important.

HIGH SCHOOL PRINCIPALS

1. Like many small to medium sized high schools, we have a Coordinator of Math K-12 who is actually on a teacher contract. She teaches 2 classes and does informal evaluations & walk throughs. We have a K-5 Math 'Specialist' who is also on a teacher contract. (He does not have a classroom of students). Building Administrators still do evaluations of teachers; we are eagerly awaiting the day when assistance can be provided and supported by the BOE. The issue for many districts is the "# of administrators".
2. Although I agree with the program, I am not sure anyone in this district would be interested and I am not sure the district would pay for dept. chairs at a competitive level.
3. Please make sure that we produce teacher students that will teach students and not simply teach the content—the program sounds great.
4. Increase math requirements for elementary ed programs.
5. Increase the number of mathematics credits needed for undergraduate elementary degree candidates to obtain their degree and subsequent certification.
6. Last year when we looked for a supervisory dept chair for our math dept we found that the pool of candidates was extremely small and the few candidates that did exist did not meet our standards.

Appendix A: School Districts Participating in the Survey

Avon Public Schools	Region 8 Public Schools (Andover, Hebron, Marlborough)
Berlin Public Schools	Region 9 Public Schools (Easton, Redding)
Bloomfield Public Schools	Region 10 Public Schools (Burlington, Harwinton)
Bolton Public Schools	Region 13 Public Schools (Durham, Middlefield)
Bristol Public Schools	Region 14 Public Schools (Bethlehem, Woodbury)
Cheshire Public Schools	Region 15 Public Schools (Middlebury, Southbury)
Colchester Public Schools	Region 16 Public Schools (Beacon Falls, Prospect)
East Granby Public Schools	Rocky Hill Public Schools
East Hampton Public Schools	Simsbury Public Schools
East Hartford Public Schools	Somers Public Schools
East Windsor Public Schools	South Windsor Public Schools
Ellington Public Schools	Southington Public Schools
Enfield Public Schools	Suffield Public Schools
Farmington Public Schools	Thomaston Public Schools
Glastonbury Public Schools	Tolland Public Schools
Granby Public Schools	Waterbury Public Schools
Hartford Public Schools	West Hartford Public Schools
Litchfield Public Schools	Wethersfield Public Schools
Manchester Public Schools	Winchester Public Schools
Meriden Public Schools	Windsor Locks Public Schools
Middletown Public Schools	Windsor Public Schools
Naugatuck Public Schools	Wolcott Public Schools
New Britain Public Schools	
Newington Public Schools	
Plainville Public Schools	
Plymouth Public Schools	
Region 6 Public Schools (Goshen, Morris, Warren)	
Region 7 Public Schools (Barkhamsted, Colebrook, New Hartford, Norfolk)	

Surveys were sent to the superintendents of each of these districts. In addition one high school, one middle school, and one elementary school was chosen at random from each districts and principals of those schools were also surveyed.

Appendix B Survey Materials

1. Cover Letter

Dear [Title, Last Name],

The mandates of No Child Left Behind have turned the public's attention to the need to improve student performance in mathematics at all grade levels. The Department of Mathematical Sciences at Central Connecticut State University has strong programs in teacher preparation at the undergraduate level and Masters degree programs for in-service elementary, middle school, and high school teachers. Yet we believe there is more that we should be doing to prepare teachers to assume leadership roles for mathematics instruction. To that end, we have consulted with leaders in mathematics education from around the state in order to develop a proposed program.

Attached is a draft of the program we believe will aid districts in assuring that the mathematics instruction throughout the state is functioning at the highest possible level. This proposed program will lead to a Sixth Year Diploma in Mathematics Education Leadership with either department chair or 092 administrator certification. Before we can proceed with the final design and implementation of this program we would like some sense of the need for such a program through input from principals and superintendents from throughout the state. With that in mind, we are asking you to respond to this brief questionnaire.

Sincerely,

Timothy Craine
Department Chair
Department of Mathematical Sciences

2. Survey Questionnaire

Please complete both sides of this form and return in the enclosed stamped envelope.

[page 1]

3. Does your school district presently have a supervisor, coordinator, or director of mathematics?
YES NO

A. If "yes" what are the grade levels for which this position is responsible? _____

B. If "no" do you think that your district would benefit from such a position?
YES NO

4. Does your school district have at least one Mathematics Department Chair? YES NO
If "yes" does one or more of these individuals act as an evaluator of teachers? YES NO

If "no" who evaluates mathematics instruction:

At the high schools _____

At the middle schools _____

At the elementary schools _____

5. Does your school district have a system-wide position with the specific responsibility of general curriculum? YES NO

A. If "yes" does this person have a subordinate who is responsible for mathematics curriculum?
YES NO

If "yes" what is this person's title. _____

If "no" who is responsible for mathematics curriculum? _____

B. If "no" who is responsible for mathematics curriculum?

[page 2]

4. Please look over our enclosed draft description of a proposed program, and then please rate the following.

a. There is a need for individuals with this type of background in Connecticut.

Strongly Disagree Disagree Agree Strongly Agree

b. This program would effectively prepare teachers for mathematics education leadership in my school district.

Strongly Disagree Disagree Agree Strongly Agree

c. CCSU should move forward with this program.

Strongly Disagree Disagree Agree Strongly Agree

Optional:

Please make any other comments which you feel will help the Department of Mathematical Sciences improve the quality of mathematics instruction in the schools of Connecticut.

3. Overview of Sixth Year Proposal (2 page summary sent with survey)

Sixth Year Program in Mathematics Education Leadership

Background

Literacy and “numeracy” have long been recognized as the two core objectives of K-12 education, and since the passage of the No Child Left Behind Act schools and districts are held accountable for making annual yearly progress in both these critical areas. The key to increasing the capacity of schools to meet this challenge lies in the professional development of classroom teachers under the capable leadership of administrators who are knowledgeable about issues of learning, teaching, curriculum and assessment in these two fields.

For many years, Central Connecticut State University has offered Sixth Year programs in Educational Leadership and in Reading. There has been no comparable program for mathematics education.

In Spring 2006 the Department of Mathematical Sciences, in collaboration with the Department of Educational Leadership, proposed the creation of a Sixth Year Program in Mathematics Education Leadership. The proposal contains eight new courses, seven in the Department of Mathematical Sciences and one in the Department of Educational Leadership. The program would initially be offered to cohorts of ten to twenty students admitted in two-year cycles..

Program Description

Sixth Year Program in Mathematics Education Leadership

1. Core requirements (21 credits)

EDL 655 Leadership and Supervision, 3 credits

MATH 611 Mathematics Curriculum K-8: Theory and Implementation, 3 credits

MATH 612 Mathematics Curriculum 7-14: Theory and Implementation, 3 credits

MATH 613 Research on the Learning of Mathematics, 3 credits

MATH 614 Research on the Teaching of Mathematics, 3 credits

MATH 615 The Cultural Context of Mathematics Education, 3 credits

MATH 616 Assessment in Mathematics Education, 3 credits

2. Additional Requirements

a. Department Chair Certification Track (11 additional credits, 32 total)

(meets requirements for department chairperson under Section 10-145d-579)

b. Intermediate Administrator Certification Track (16 additional credits, 37 total)

To receive certification, students must also pass a performance-based examination administered by the State of Connecticut. The State of Connecticut also requires 50 months of teaching experience prior to licensure and completion of a designated course in Special Education.

Courses

These courses were approved by the Faculty Senate on March 13, 2006.

MATH 611 Mathematics Curriculum K-8: Theory and Implementation

Examination of key questions of what mathematics should be taught in grades K-8. Mathematical foundations of exemplary elementary and middle schools curricula will be studied along with strategies to insure the development of students' deep and connected mathematical understandings.

MATH 612 Mathematics Curriculum 7-14: Theory and Implementation

Examination of key questions of what mathematics high school graduates should know and be able to apply in light of foundations laid in the middle grades and needs of post-secondary education and the work force. Exemplary secondary school curricula will be studied.

MATH 613 Research on the Learning of Mathematics

Exploration of theorists' perspectives on learning. Analysis of researchers' conceptual frameworks and methodology. Issues include learning of algorithms, building conceptual understanding, the use of concrete materials, and the role of group work, reflection, writing, discovery, dialogue, and listening.

MATH 614 Research on the Teaching of Mathematics

Designed to acquaint educators with research on effective mathematics teaching practices. This course will focus on areas of research most useful in advancing classroom practices. All students will develop a research proposal.

MATH 615 The Cultural Context of Mathematics Education

Explores the many aspects of cultural connections with mathematics. Topics may include the history of mathematics, comparative international studies and an introduction to ethnomathematics.

MATH 616 Assessment in Mathematics Education

Use of varied assessments that probe students' mathematical understanding, provide effective feedback, improve questioning techniques, and use results to make instructional decisions will be explored. The entire range of assessments from those designed by the classroom teacher to state mandated assessments will be considered.

MATH 622 Internship in Mathematics Education Leadership

Description: Supervised internship concerning leadership in promoting effective teaching and learning in mathematics. Students initiate and complete an action plan and professional portfolio.

EDL 655 Leadership and Supervision

Course focuses on school leadership standards and educational supervision practices. Students will complete a leadership portfolio which will be presented for admission into the intermediate administrator program.

Appendix 4: Proposed Master Degree Programs for Jamaica

Plans of Study

1. Master of Science in Mathematics for certified secondary teachers, or “Upper Secondary Option”
(33 credits as follows, as per page 43, CCSU Graduate Catalog, 2004-2006)

Educational Foundations (3 credits)
EDF 500 Contemporary Educational Issues

Secondary Mathematics Education (9 credits)
MATH 543 Secondary School Algebra with Technology from an Advanced Viewpoint
MATH 544 Secondary School Geometry with Technology from an Advanced Viewpoint
MATH 547 Reflective Practice in Teaching Mathematics

Mathematics and Statistics Content Courses (12 credits)
MATH 469 Number Theory
MATH 491 Advanced Calculus
STAT 453 Applied Statistical Inference
MATH 525 Higher Geometry

General Education Elective (3 credits)
MATH 540 Curriculum Problems in School Mathematics

Research Requirement (3 credits)
MATH 598 Research in Mathematics Education

Capstone Requirement, Plan E (3 credits)
MATH 590 Special Project in Mathematics

2. Master of Science in Mathematics for certified elementary teachers, or “Lower Secondary Option”
(33 credits as follows, as per pages 42-43, CCSU Graduate Catalog, 2004-2006)

Educational Foundations (3 credits)
EDF 500 Contemporary Educational Issues

Elementary/Middle School Mathematics Education Core (12 credits)
Middle School track:
MATH 536 Teaching Number Concepts in the Middle Grades
MATH 537 Teaching Geometry and Measurement in the Middle Grades
MATH 538 Teaching Probability and Statistics in the Middle Grades
MATH 539 Teaching Algebraic Thinking in the Middle Grades

Mathematics Electives (6 credits)

MATH 504 Special Topic: Problem Solving in School Mathematics

STAT 453 Applied Statistical Inference

General Education Electives (6 credits)

MATH 540 Curriculum Problems in School Mathematics

MATH 547 Reflective Practice in Teaching Mathematics

Research Requirement (3 credits)

MATH 598 Research in Mathematics Education

Capstone Requirement, Plan E (3 credits)

MATH 590 Special Project in Mathematics

3. Master of Science in Reading and Language Arts (Strand in Reading-Mathematics)
(30 credits as follows, as per page 62, CCSU Graduate Catalog, 2004-2006

Reading and Language Arts Courses (12 credits)

RDG 578 Teaching Writing in the Elementary Schools

RDG 585 Reading in the Content Areas

RDG 588 Teaching Children's Literature

RDG 591 Developmental Reading in Primary Grades

Mathematics Course (15 credits)

MATH 506 Teaching Number Concepts in the Elementary Grades

MATH 507 Teaching Geometry and Measurement in the Elementary Grades

MATH 508 Teaching Probability and Statistics in the Elementary Grades

MATH 509 Teaching Algebraic Thinking in the Elementary Grades

MATH 534 Techniques of Diagnosis and Remediation for the Teaching of Mathematics

Research Requirement (3 credits)

RDG 598 Seminar in Reading and Language Arts Research

Capstone Requirement Plan B

Comprehensive Examination

Proposed Schedules

Programs will be offered only when there is sufficient demand for a cohort of thirty students.

(1) Tentative Schedule for Master of Science in Mathematics (Upper Secondary Option)

Summer Year 1 Four weeks on site in Jamaica Early July to Early August	MATH 469 Number Theory
	MATH 543 Secondary School Algebra with Technology from an Advanced Viewpoint
Post Session Year 1 On line course in August (student work submitted by December)	MATH 547 Reflective Practice in Teaching Mathematics (This course will involve assignments that are based upon the teachers' work with students in their own classrooms.)
Winter Year 2 Two weeks on site in Jamaica January (with some assignments continuing)	MATH 544 Secondary School Geometry with Technology from an Advanced Viewpoint
Summer year 2 Four weeks on site in Jamaica Early July to Early August	MATH 491 Advanced Calculus
	EDF 500 Contemporary Educational Issues This course will be modified to include cross-cultural comparisons of education in Jamaica, the United States, and other countries.
Post Session Year 1 On line course in August (student work submitted by December)	MATH 540 Curriculum Problems in School Mathematics This course will involve examination of international studies on curriculum and student achievement in mathematics with particular emphasis on Jamaica and the United States.
Winter Year 3 On line course in January (student work submitted by May)	STAT 453 Applied Statistical Inference This course is a prerequisite for the research methods course (MATH 598).
Summer Year 3 Five weeks at CCSU July and August	MATH 525 Higher Geometry
	MATH 598 Research in Mathematics Education
	MATH 590 Special Project in Mathematics. This course is the capstone of the program. Proposals for the project will be developed in MATH 598. Students will meet with an advisor to plan the project which should be completed by December and presented at a poster session in January held in conjunction with the graduation ceremony.

(2) Tentative Schedule for Master of Science in Mathematics (Lower Secondary Option)

<p>Summer Year 1 Four weeks on site in Jamaica Early July to Early August</p>	<p>MATH 536 Teaching Number Concepts in the Middle Grades</p>
	<p>MATH 537 Teaching Geometry and Measurement in the Middle Grades (linked with MATH 544)</p>
<p>Post Session Year 1 On line course in August (student work submitted by December)</p>	<p>MATH 547 Reflective Practice in Teaching Mathematics (This course will involve assignments that are based upon the teachers' work with students in their own classrooms.)</p>
<p>Winter Year 2 Two weeks on site in Jamaica January (with some assignments continuing)</p>	<p>MATH 539 Teaching Algebraic Thinking in the Middle Grades</p>
<p>Summer year 2 Four weeks on site in Jamaica Early July to Early August</p>	<p>MATH 538 Teaching Probability and Statistics in the Middle Grades</p>
	<p>EDF 500 Contemporary Educational Issues This course will be modified to include cross-cultural comparisons of education in Jamaica, the United States, and other countries.</p>
<p>Post Session Year 1 On line course in August (student work submitted by December)</p>	<p>MATH 540 Curriculum Problems in School Mathematics This course will involve examination of international studies on curriculum and student achievement in mathematics with particular emphasis on Jamaica and the United States.</p>
<p>Winter Year 3 On line course in January (student work submitted by May)</p>	<p>STAT 453 Applied Statistical Inference This course is a prerequisite for the research methods course (MATH 598).</p>
<p>Summer Year 3 Five weeks at CCSU July and August Post Session Year 3</p>	<p>MATH 504 Special Topic: Problem Solving in School Mathematics</p>
	<p>MATH 598 Research in Mathematics Education</p>
	<p>MATH 590 Special Project in Mathematics. This course is the capstone of the program. Proposals for the project will be developed in MATH 598. Students will meet with an advisor to plan the project which should be completed by December and presented at a poster session in January held in conjunction with the graduation ceremony.</p>

(3) Tentative Schedule for Master of Science in Reading and Language Arts, Strand in Reading-Mathematics

Summer Year 1 Four weeks on site in Jamaica Early July to Early August	MATH 536 Teaching Number Concepts in the Middle Grades
	RDG 578 Teaching Writing in the Elementary Schools
Post Session Year 1 On line course in August (student work submitted by December)	MATH 534 Techniques of Diagnosis and Remediation for the Teaching of Mathematics
Winter Year 2 Two weeks on site in Jamaica January (with some assignments continuing)	MATH 507 Teaching Geometry and Measurement in the Elementary Grades
Summer year 2 Four weeks on site in Jamaica Early July to Early August	MATH 508 Teaching Probability and Statistics in the Elementary Grades
	RDG 591 Developmental Reading in Primary Grades
Post Session Year 1 On line course in August (student work submitted by December)	RDG 585 Reading in the Content Areas
Winter Year 3 On line course in January (student work submitted by May)	RDG 588 Teaching Children's Literature
Summer Year 3 Five weeks at CCSU July and August	MATH 509 Teaching Algebraic Thinking in the Elementary Grades
	RDG 598 Seminar in Reading and Language Arts Research
	Comprehensive Examination