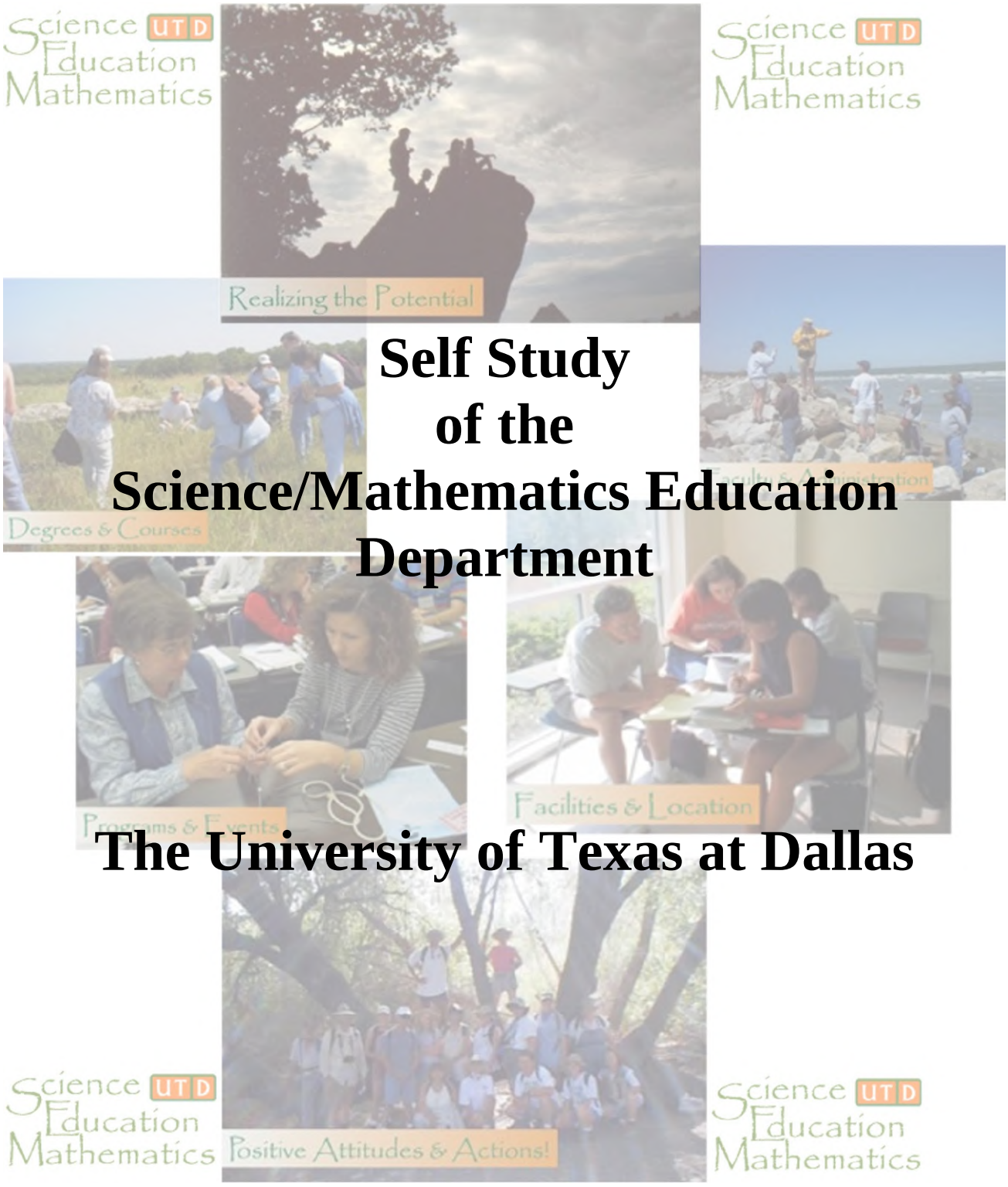

Self Study of the Science/Mathematics Education Department

The University of Texas at Dallas

Prepared by the Faculty of the Science/Mathematics Education Department

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TABLE OF CONTENTS

I. EXECUTIVE SUMMARY 4

A. Mission and Vision 4

B. Current State of the Department 4

C. Academic Focus 5

D. Research Focus 6

E. Strategic plan for new programs, personnel, research, grants, and challenges 6

II. SCIENCE/MATHEMATICS EDUCATION DEPARTMENT HISTORY 10

A. Growth of the Department 11

C. Evolution of Course Work 11

III. GOALS 13

A. Mission 13

B. Vision 13

C. Goals 13

D. Outcomes supported by evaluation processes 14

E. Strategic Plan 15

IV. ADMINISTRATION, PERSONNEL AND BUDGETS 23

A. Faculty 23

B. Support Staff 24

C. Budgets 25

V. SERVICE COURSES 28

A. Alignment with departmental mission/vision/ goals 28

B. Proposed growth of undergraduate offerings 28

C. Evaluation of programs and courses 29

VI. GRADUATE COURSE OFFERINGS 30

A. Fit with the Department of Science/Mathematics Education Mission/Vision/Goals 32

B. Proposed growth of course offerings 32

C. New degree programs 34

D. Evaluation of programs and courses 35

VII. OUTREACH 38

A. Fit with Department Mission/Vision/Goals 38

B. Proposed Areas of Growth 41

VIII. TEACHING 43

A. Faculty Participation 43

B. Staff Participation 45

C. Student evaluations *46*
D. Programmatic evaluations *46*

IX. GRANTS AND CONTRACTS **48**
A. Fit With Departmental Mission/Vision/Goals *48*
B. Proposed Areas for Growth *51*
C. Impediments to Funding Opportunities *51*

X. RESEARCH **53**
A. Fit with Department Mission, Vision, and Goals *53*
B. Faculty Publications, Presentations, and Honors *54*
C. Proposed Areas for Growth *54*

XI. SPACE **61**
A. Fit with Mission/Vision/Goals *61*
B. Offices *61*
C. Research Laboratories *61*
D. Teaching Laboratories *62*
E. Proposed areas for growth *62*

XII. PROGRAM EVALUATION **64**
A. Student evaluations *65*
B. Programmatic evaluations *65*
C. Goals and evaluation measures *66*
D. Other measures *67*

APPENDIX A – PERSONNEL FOR SPRING 2006 ..... **69**

APPENDIX B – CURRICULUM VITAE OF FACULTY **70**

I. EXECUTIVE SUMMARY

The Science/Mathematics Education Department is in the process of transformation. We have experienced significant growth since the last self-study, more than doubling our faculty (primarily in Science Education), substantially increasing our external funding to more than $500,000/year, developing an online strand of the Masters of Arts in Teaching Science Education (MAT-SE), and attracting and retaining record numbers of students into our Masters of Arts in Teaching Program. Our faculty, which consists primarily of untenured junior members, is dedicated, innovative, and stretched to capacity, as are our facilities. Only with the support of the School of Natural Sciences and Mathematics and the University we can continue on our upward path of unprecedented growth and achieving ever-increasing national recognition.

A. Mission and Vision

The mission of the Science/Mathematics Education Department is to have a positive and lasting impact on the quality of science and mathematics education and assist educators of science, mathematics in meeting the challenges of today's dynamic educational landscape in north Texas and beyond. Our mission is accomplished through high-quality content-rich professional education for teachers and educational administrators, innovative research and leadership in teaching and learning**,** educational outreach, and partnerships within UT Dallas and with the broader educational community.

The long term vision of the Science/Mathematics Education Department is to be and to produce leaders in science and mathematics education at institutional, local, state, national and international levels by highlighting national science, technology, engineering, and mathematics (STEM) education reform initiatives in order to support the development of best practices and provide opportunities for participation in cutting-edge research to current and future STEM education professionals.

B. Current State of the Department

All though the department has experienced recent substantial growth, we remain small when compared to the other discipline departments within the School of Natural Sciences and Mathematics (NSM). We are essentially two independent programs: Science Education and Mathematics Education, further amplifying the impact of our small size on the courses offered and the workload of faculty.

At this time the department is composed of:

- 3 regular science faculty (2 discipline specialists, 1 science education researcher)
- 2 mathematics faculty (2 discipline specialists)
- 1 associated administrative faculty member (non-teaching)
- 1 half-time senior lecturer (science pedagogy specialist)
- 1 reduced-service faculty member (science education researcher)
- 1 quarter-time lecturer (educational research specialist)
- 1 administrative assistant

- 1 half-time secretary
- 2 graduate teaching assistants
- 1 undergraduate assistant
- weak connections with each NSM discipline department and with Teacher Development through affiliate faculty

The department budget reflects the strained fiscal environment of state funding for higher education, and is further impacted by the funding crisis in local school districts that traditionally support our student population. State funding provided by the university is insufficient to serve our growing student population. Much of the equipment and supplies necessary to teach our courses and meet our department mission and goals are furnished through grants. External funding, which has been aggressively sought by the faculty, has brought both renewed vigor to the Science Education program and new challenges to the managing faculty and staff.

Our facilities have greatly improved since the last self-study. We now have sufficient office space for current faculty, teaching assistants, and staff, and a dedicated teaching facility. Improvements in laboratory space and space for educational equipment and materials are currently planned. However, like most departments within the School of Natural Sciences and Mathematics we are very close to capacity for space for faculty and staff, and beyond capacity for teaching facilities. Many of our facility needs are dictated by the same external funding agencies that have supported our recent growth in student population. Continued growth will require substantial investment by the State and University.

C. Academic Focus

The Science/Mathematics Education Department is currently a masters-only graduate program designed for classroom pre-kindergarten through junior college level teachers. We have two distinct foci reflected in our twin Masters of Arts in Teaching (MAT) programs – one in Science Education and one in Mathematics Education.

The Science Education Program focuses on providing teachers with the research, critical thinking, and life-long learning skills essential for leaders in today's schools as well as a foundation of content knowledge in the sciences. Core courses focus on critically evaluating and producing science education research, and applying that knowledge to the context of today's changing world. Teachers in our program need deep content knowledge as well as the pedagogical content knowledge required guiding their own students in the learning process. Special courses are designed to provide teachers with relevant content in a way that meets their individual needs and backgrounds. Discipline specialists within the department teach content courses in fields that model research-based best practices in science teaching. Our elementary specialist teaches content courses designed specifically for students with the broad and less science-rich backgrounds typical of elementary school teachers. These courses often involve collaborations with discipline specialists and emphasize the nature of science and inquiry-based instruction.

The Mathematics Education component is a content-oriented program that strives to achieve a balance between increasing subject-matter knowledge through appropriate core courses in higher-level mathematics (analysis, algebra, geometry, probability/statistics, discrete structures, etc.) and linking the content of these higher level courses with the relevant content, technological, and pedagogical issues of the mathematics curriculum in grades 8 – 14 through guided elective courses entitled "Usual and Unusual Problems Using _____ ". Currently there are seven courses in this series with the blank completed with one of Algebra, Geometry, Precalculus, Probability and Statistics, Discrete Mathematics, Mathematical Modeling, or Calculus. MATH 5310 (Seminar in the Teaching of Mathematics] is required of all students).

Students who pursue a master's degree in Interdisciplinary Studies aimed at 4–8 or 8-12 mathematics teachers also take some of these courses. There are some teachers with a primary interest in teaching computer science who take several computer science courses as core courses. Those wishing to teach in a community college are encouraged to take more core content courses as electives

D. Research Focus

Research within the department is focused on research in science and mathematics teaching and learning. Specific research areas include learning environments, knowledge transfer, design of instructional materials, advanced mathematical problem solving, teaching mathematics to gifted students, preparation of pre-service teachers, and evaluation of professional development programs.

Discipline specialists also conduct research within their fields of expertise, often through other NSM departments and centers. Examples include lunar surface thermal mapping and landing hazards, Mars crustal volatile evolution and distribution, reconstruction of plate evolution in the Caribbean, dinosaur excavations in southwest Texas, number theory with emphasis in quadratic diophantine equations, and combinatorics.

E. Strategic plan for new programs, personnel, research, grants, and challenges

The *strategic plan* of the Science/Mathematics Education faculty is to focus our research on the Pre-Kindergarten through 14 (sophomore year in college) Learning Continuum in STEM (Science, Technology, Engineering, and Mathematics) fields. As one of a handful of universities in the nation with a faculty mixing expertise in science and mathematics research with expertise in science and mathematics education research and practice, we already have an advantage in creating partnerships that bridge the diverse education and STEM disciplines. In keeping with major efforts of the National Science Foundation, we are well on our way to recognition as leaders in educational research as we continue to shape leaders in PreK-14 Science and Mathematics Education. As we grow our program we intend to continue to forge partnerships with public and private pre-college schools, other institutes of higher education, informal education entities, and most importantly, other departments and schools within the University of Texas at Dallas.

New Programs

Within the context of our mission, the MAT-SE online program directly supports the goals of the university:

- By providing able, ambitious students with a high-quality, cost-effective education that combines the nurturing environment of a liberal arts college with the intellectual rigor and depth of a major research university;
- By discovering new knowledge and creating new art that enriches civilization at large and contributes significantly to economic and social programs; and
- By enhancing the productivity of business and government with strategically designed, responsively executed programs of research, service and education.

Supporting the university's vision to become a nationally recognized top-tier university sculpted within a model of focused excellence, the ultimate goal for Science/Mathematics Education is to develop a widely recognized master's program that attracts students nationally and internationally. Through the Science/Mathematics Education program, UT Dallas has earned a solid reputation for meeting the needs of practicing classroom teachers. Like the current on-campus program, the proposed online MAT-SE will offer educators the experiences and tools they need for in-depth pedagogical and subject area understanding. This important opportunity to reach a large and diverse student population efficiently and effectively represents another milestone in the evolution of the School of Natural Sciences and Mathematics at UT Dallas. In keeping with the University's mission to provide accessible and effective education to all learners, an online program will demonstrate a productive use of state-of-the-art equipment and model a powerful collaboration to maximize the educational and scientific expertise of our unique resources.

Through our partnership with UTTC, UT Dallas is well positioned to deliver the highest caliber of science education to Texas teachers in an online format. Technology rapidly and continually changes the face of education as well as science. Particularly well suited to the Science/Mathematics Education curriculum, this unique program will place subject-specific content in a multi-disciplinary framework designed for science educators. It will help to sustain and improve the existing force of teachers, as well as uplifting and building leaders for the future.

Essential in growing our research/teaching programs to reach nationally recognized status is the addition of Ph.D. programs in science and mathematics education. Each year we turn away multiple talented students interested in continuing their research and learning with us as they earn a Ph.D. Unfortunately, without such a program we not only losing quality students each year to other institutions, but we are also losing talented potential researchers who could provide invaluable assistance to our faculty and growing program. Without a Ph.D. program and the investment in research such a program represents, we are at a significant disadvantage in competition for national research funding and must rely on first or second year graduate students to assist in research.

Personnel Improvement Goals

For faculty and the Science/Mathematics Education Department to meet the needs of our growing student population, and support the university as it strives for Tier 1 status, the faculty and support staff must also grow. Minimum requirements for reaching our goals are given below.

Faculty within 5 years (in order of priority)

- Science education researcher
- Mathematics education researcher
- Biology/chemistry science educator
- Elementary science educator/researcher
- Middle school mathematics educator
- Senior lecturer/grant writer/assistant director associated with the Center for Science/Mathematics Education Research (C-SER)

Staff within 5 years (in order of priority)

- Program coordinator and recruiter
- 3 Teaching Assistants (geosciences, physics, mathematics)
- 2 Research Assistants (science ed research, math ed research)
- 2 Undergraduate Assistants (science, mathematics)
- 1 Full time secretary for C-SER
- Lecturers for service courses (Master Teachers who have been through our programs)

The science program needs greater diversity in content and science education research expertise. Ultimately, having more than one faculty member for each science discipline would allow growth envisioned toward programs for pre-service teachers and partnerships with undergraduate and graduate programs for STEM majors in discipline departments. Since much of the course work in the Mathematics Education Program is in mathematics, the full burden for any additional course work or new offerings falls on the shoulders of two persons. With the new directions taken for public school mathematics instruction in Texas, we wish to expand the master's degree in Interdisciplinary Studies for 4-8 mathematics teachers. This would place a high priority on hiring a new mathematics education faculty. Because teaching is such an important aspect of this program, we have been fortunate to have exemplary personnel. Hopefully this unique expertise will continue to be recognized and rewarded as the department grows.

Research and Grants Goals

Research in STEM teaching and learning is a discipline (just like mathematics and science), and is an area of major emphasis and growth in the department. In support of reaching our goals we will:

- Continue to pursue funding opportunities offered through federal block-grant programs such as Teacher Quality Grants and education grants from NASA

- Pursue external support for currently unfunded research initiatives.
- Aggressively seek new major external funding from national sources including National Science Foundation and the Department of Education

Research in STEM fields will continue to be conducted by faculty within the department. Funding for these projects is, and will continue to be, sought from the NSF and NASA through the departments and programs with which discipline specialists are affiliated.

Challenges

The small faculty, a growing student population, and needed facilities will remain major challenges for the department within the next five years. More critical however, is the need to grow awareness of our work and its importance within the University and to develop our national reputation as leaders in science and mathematics education. The emphasis of the Science/Mathematics Education Department is on improving PK-14 science and mathematics education. Our mixture of specialists in STEM education research and STEM disciplines within a school of Natural Sciences and Mathematics is rare. As PK-14 STEM education and strengthening the STEM pipeline is increasingly of concern to federal and state agencies, legislators, corporations needing skilled workers, and the general public, we are well positioned for leadership roles. Facing these challenges will require significant external funding for department teaching, research and outreach programs and investment from the state and University. The department is at a crossroads – we can continue as primarily a professional masters program for local teachers or we can grow into a nationally recognized center for research and innovation in STEM teaching and learning.

II. SCIENCE/MATHEMATICS EDUCATION DEPARTMENT HISTORY

The Science/Mathematics Education Program began sometime in the mid-1970s, prior to the University offering any classes for undergraduates. It was assigned to the School of Natural Sciences & Mathematics (NSM), and was designed to offer a Master's level terminal degree for area secondary science and mathematics teachers. The Master's of Arts in Teaching in Science Education and the Master's of Arts in Teaching in Mathematics remain the only degrees offered through this department.

The Mathematics Education portion of what is now the Science/Mathematics Education Department appeared in the 1973-74 graduate catalog as a degree option within the graduate mathematics program. The basic course requirements included 18 credit hours of specific mathematics courses such as algebra, geometry, analysis, etc.; 12 credit hours of elective mathematics were required, plus six credit hours in mathematics education courses – Seminar in the Teaching of Mathematics, and Seminar in Education and Psychology of Learning.

The Science Education portion had its genesis in the 1974-75 graduate catalog. It required 36 credit hours (non-thesis) from the following array of courses. Twelve to sixteen hours of science specialization (chemistry, environmental sciences, geosciences, molecular biology, or physics) and a secondary area of science specialization composed of six-eight credit hours, again, selected from the above courses choices. Six hours of professional education, selected from the science-education course offerings, and finally, 3-12 hours of electives to complete the required minimum of 36 semester hours. The science education courses for selection consisted of (1) History and Philosophy of Science, (2) Theory of Learning, and, (3) Seminar: Teaching of Science.

The separation of science and mathematics education continued until the 1986-88 catalog when it was cross-listed under "Graduate Program in Science Education (MAT) and Mathematics Sciences (MAT) It remained cross listed until the 1996-98 catalog, when it was removed from mathematical sciences and resided exclusively in the Science/Mathematics Education Department.

The Science Education Program started with faculty from the various disciplines and the first Program Head was from geoscience (Dr. James Urban). The first science-educator (Dr. Fred Fifer) was employed in August 1974, with teaching responsibilities beginning with the Fall 1974 semester.

An additional science educator (Dr. William Kermis) was added in Fall 1980 while the first mathematics educator (Dr. Thomas Butts) joined the program in Fall 1981. The Program Head changed to a chemist (Dr. Lynn Melton) who remained until the late 80s when the first science educator (Dr. Fred Fifer) became Program Head. He remained as head (changing from Program Head to Department Chair) until his retirement in 2000. Dr. Cynthia Ledbetter then became the Department Chair and remains so to date.

A. Growth of the Department

The Science/Mathematics Education Department has grown substantially within the past five years, in terms of size of faculty and staff, the number of students seeking graduate degrees in the program (from 12 to approximately 60), and the course offerings in our Masters of Arts in Teaching (MAT), particularly with the Science Education Program.

B. Addition of Personnel

From 1999 to the present several new faculty members and senior lecturers were hired. Dr. Homer Montgomery – a paleontologist – was initially hired as a senior lecturer in 1999 and became tenure track faculty in 2001. Barbara Curry – an elementary science specialist, was also hired as a senior lecturer in 2001. In 2002, Dr. Mary Urquhart – an astrophysicist/planetary scientist, and Dr. Sherry Herron - a biologist, were hired as assistant professors. In 2005 Kathryn Skinner – Educational Research specialist, was hired as a lecturer and Dr. Titu Andreescu, another mathematician/mathematics educator, was hired as an associate professor. Dr. Rebekah Nix – an educational research specialist is housed within Teacher Development in the School of General Studies, but works closely with the Department of Science/Mathematics Education.

In order to be successful, our faculty must continue to grow. At present, a replacement biologist for Dr. Herron, who opted for a position in another university, an additional chemistry-educator, an additional science education researcher, and at least one additional faculty member in mathematics education are direly needed.

C. Evolution of Course Work

As the student populations' needs changed, course offerings also changed. The "History of Science" course gradually became "Critical Issues in Science Education" focusing on the dramatic societal changes of the last quarter of the 20th century. The two other core science education courses have evolved into a research sequence, taking the students from reading and evaluating science education research into performing their own research study. Additional content courses in science and a new prefix (SCI) appeared as the department grew both in student enrollment and in new faculty.

For over 30 years, UT Dallas has offered its MAT-SE in an on-site classroom environment. However, over the past 5 years, coursework has been increasingly enhanced by using electronic resources, i.e., CD-ROMs, WebCT and Blackboard shells, and the Internet UT Dallas now plans to offer the same program in a completely online format through UT TeleCampus (UTTC). The online program is targeted for experienced classroom teachers with content degrees. A minimum of 7 students is expected to choose the on-going online option to be launched in the Fall 2006 semester. Like the traditional program, this more flexible option will require a minimum of 36 hours in science, science education, and science education research. Delivered completely online in an asynchronous format, the online MAT-SE is unique across Texas. Fulfilling a critical need in science education, it is strongly endorsed by UT Dallas's School of Natural Sciences and Mathematics and UTTC.

The original three science education courses have doubled to six; the new SCI currently lists thirteen diverse science content courses, with several additional classes offered as special topics. All SCI courses are offered for the elective portion of the degree requirements. In the past two years the department added a Thesis option for the MAT in Science Education. In Science Education, Dr. Urquhart has added a three-course series "Physics in the Classroom" designed for secondary physical science teachers and three courses in space sciences (Astronomy: Our Place in Space, Comparative Paleontology and Astrobiology). Interdisciplinary science courses, especially designed to serve the needs of middle school teachers, have also been added, as have graduate SCI courses taught by Dr, Montgomery in Marine Science and the Basis for Evolution. Course work evolution has been strongly influenced by advancements in teaching and learning made by the science education research communities, national STEM education reform initiatives, and the changing needs of teachers under No Child Left Behind. Our secondary physical science and middle school science offerings are directly tied to No Child Left Behind through Teacher Quality Grants which dictate much of the course requirements, the population of students grant-supported programs must serve, and at times, course structures.

The Mathematics Education component has become a content-oriented program that strives to achieve a balance between increasing subject-matter knowledge through appropriate higher level mathematics courses in analysis, algebra, geometry, probability/statistics, discrete structures, and linking the content of these higher level courses with the relevant content, technological, and pedagogical issues of the mathematics curriculum in grades 7 – 14 through courses entitled "Usual and Unusual Problems Using _____ ". Currently there are seven courses in this series where the blank is completed with one of Algebra, Geometry, Pre-calculus, Probability and Statistics, Discrete Mathematics, Mathematical Modeling, or Calculus. Some of these courses are also taken by students who pursue a master's degree in Interdisciplinary Studies aimed at 4 – 8 mathematics teachers.

III. GOALS

Initiative six of the strategic plan for the University of Texas at Dallas (http://www.UT Dallasallas.edu/strategicplan/index.php?id=j) concerns reaching out to the community with its diverse workforce, cultural environment and innovative business sectors through education: "The School of Natural Sciences and Mathematics has one of the few long-standing, well established programs specializing in science and math education in the nation. Both initiatives directly affect the quality of life in the Metroplex, and both programs will continue to expand and develop as they respond to new and exciting needs." To meet the needs of our constituents, the Science/Mathematics Education Department has established goals and outcomes to support out mission and vision.

A. Mission

The mission of the Science/Mathematics Education Department (SME) is to have a positive and lasting impact on the quality of science and mathematics education and assist educators of science and mathematics in meeting the challenges of today's dynamic educational landscape in north Texas and beyond. Our mission is accomplished through high-quality content-rich professional education for teachers and educational administrators, innovative research and leadership in teaching and learning**,** educational outreach, and partnerships within UT Dallas and the broader educational community.

B. Vision

The long term vision of Science/Mathematics Education Department is to be and to produce leaders in science and mathematics education at institutional, local, state, national and international levels by highlighting national science, technology, engineering and mathematics (STEM) education reform initiatives in order to support the development of best practices and provide opportunities for participation in cutting-edge research to current and future STEM education professionals.

C. Goals

Goal 1: To facilitate the development of PK-14 classroom teachers into skilled educators with a depth of content knowledge and pedagogical content knowledge in the sciences and/or mathematics through best practices in science and mathematics education reflective of cutting-edge research and national STEM education reform initiatives.

Goal 2: To develop the independent research and critical thinking abilities of our students (Science Education) along with a familiarity with research-based developments in STEM teaching and learning and education reform efforts.

Goal 3: To increase our recognition as educators and researchers within UT Dallas, the local community, the state, and the nation through increasingly competitive and high quality Science Education and Mathematics Education Programs that produce leaders in

science and/or mathematics education. Working toward Ph.D. programs in Science and Mathematics Education is a critical part of this goal.

Goal 4: To leverage the diversity of our faculty through the integration of our ongoing science/mathematics discipline research with our innovative research and leadership in STEM teaching and learning.

Goal 5: To utilize the diverse expertise of our faculty both within the department and in collaborative efforts with other departments and schools to strengthen the STEM pipeline at all levels.

Goal 6: To broaden our impact on STEM education at local, regional, and national levels through education outreach: both directly through our own educational outreach aimed at PK-14 students, pre-college teachers and partnerships with informal education institutions and indirectly through the support of the UT Dallas community's educational outreach efforts.

D. Outcomes supported by evaluation processes

Outcomes for Goal 1: Students, through coursework required, offered, and recommended by the department, will demonstrate the attributes of skilled educators with a depth of content knowledge and pedagogical content knowledge in the sciences and/or mathematics.

Outcomes for Goal 2: Students will demonstrate independent research ability and critical thinking skills through course work and, when applicable, a thesis.

Outcomes for Goal 3: Faculty will contribute to the local, state and national initiatives and debates in STEM education as demonstrated by presentations at professional conferences, service with local, state, and national organizations, presentations at other academic institutions, and publications. Discipline specialists will remain aware of cutting-edge research in their fields, will serve as advocates for education within the STEM community, and will be active discipline researchers when possible. Faculty will continue work toward Ph.D. programs in Science Education and Mathematics Education.

Outcomes for Goal 4: Faculty will collaborate on research to merge discipline content knowledge with science/mathematics education expertise. Courses will reflect both accurate and up-to-date science/mathematics content and current research in STEM teaching and learning. Courses will be aligned with education reform initiatives such as the National Science Education Standards and the Principles and Standards for School Mathematics.

Outcomes for Goal 5: Faculty will collaborate within the department ensuring quality professional development for science and mathematics teachers. Faculty will collaborative with other departments and schools to strengthen on course work for pre-service teachers and undergraduates to strengthen STEM pipeline at all levels.

Outcomes for Goal 6: Faculty will engage ongoing outreach in local schools and work collaboratively with local districts as evidenced by outreach interactions occurring every semester and during the summer. There will be a department presence at the annual statewide Conference for the Advancement of Science Teaching and the Conference for the Advancement of Mathematics Teaching at the annual regional Conference for the Advancement of Science Teaching (mini-CAST) and NCTM Regional Conferences, and when possible at the annual meeting of the NSTA, NCTM, and other professional groups. Faculty will provide continued support of mathematics competitions at local, national, and international levels, through hosting, judging, and writing problems and will conduct summer camps and academic year activities for gifted students in mathematics and their teachers. Faculty will continue development of curriculum materials, textbooks, and outreach journal articles for national distribution.

E. Strategic Plan

Science/Mathematics Education is a growing, dynamic department. Our faculty and students are drawn from the discipline fields within NSM as well as the fields of science and mathematics education teaching and research. We are making excellent progress toward our goals of being and producing leaders in science/mathematics education and impacting trends and practices in education at our institution and beyond. We are proud of our progress in growing our externally-supported research and our student population. However, we face many challenges that can only be overcome with support and investment from UT Dallas.

Our current faculty is small, and we are missing key personnel to maintain and grow a vigorous program. Our facilities are inadequate for our needs and will not support our growth. By the nature of our work in education, we face special restrictions on grant funds that are unique within NSM and impair our research efforts. With no Ph.D. program we lose students almost as soon as they begin fruitful research with us in science/mathematics education and are at a significant disadvantage in obtaining federal funds without the restrictions we face in our current grants.

In our strategic plan we have outlined both the present state of the department and what we need to reach our potential. We recognize the fiscal challenges and facilities issues facing the entire university. However, we fully expect that if the university chooses to make Science/Mathematics Education a priority, we will become not only a self-sustaining program but an asset that will help propel the university to the nationally recognized status we at UT Dallas know we can achieve.

The *strategic plan* of the SME faculty is to focus our research on the Pre-Kindergarten through 14 (sophomore year in college) Learning Continuum in STEM (Science, Technology, Engineering, and Mathematics) fields. As one of a handful of universities in the nation with a faculty mixing expertise in science and mathematics research with expertise in science and mathematics education research and practice, we already have an advantage in creating partnerships that bridge the diverse education and STEM disciplines. In keeping with major efforts of the National Science Foundation, we are well on our way to recognition as leaders in educational research as we continue to shape leaders in PK-14 Science and Mathematics Education. As we grow our program we

intend to continue to forge partnerships with public and private pre-college schools, other institutes of higher education, informal education entities, and most importantly, other departments and schools within the University of Texas at Dallas.

To continue to nurture our research/teaching focus we must have quality facilities as a Research/Teaching Facility goal. As part of our goal of establishing a nationally recognized research/teaching program we envision a state-of-the-art facility for teaching and conducting research in science/mathematics education and in science and mathematics under the umbrella of the Center for Science/Mathematics Education Research (C-SER). This facility will be available to our faculty, our graduate students, local administrators, local teachers, and researchers interested in science and mathematics teaching and learning.

Also essential in growing our research/teaching programs to reach national and internationally recognized status is the addition of Ph.D. programs in science and mathematics education. Each year we turn away many talented students interested in continuing their research and learning with us as they earn a Ph.D. Unfortunately, without such a program we are not only losing quality students each year to other institutions, but we are also losing talented potential researchers who could provide invaluable assistance to our faculty and growing program. Without a Ph.D. program and the investment in research such a program represents, we are at a significant disadvantage in competition for national research funding and must rely on first or second year graduate students to assist in research.

Objectives that must be met in order to reach our program goals are:

1. Increase our recognition within the University.
2. Provide adequate teaching and research space for faculty and graduate students.
3. Continue to increase the number of students and programmatic offerings.
4. Increase recognition throughout the national and international research community.
5. Increase direct federal funding.
6. Increase partnerships within and beyond UT Dallas.
7. Increase participation in the Center for Science/Mathematics Education Research.

State of the Department

At this time SME can be characterized in terms of faculty/staff, grants/contracts, facilities, and collegial relationships. At this time the department is composed of:

- 3 science faculty (2 discipline specialists, 1 science education researcher)
- 2 mathematics faculty (2 discipline specialists)
- 1 administrative faculty member (non-teaching discipline specialist)
- 1 half-time senior lecturer (science pedagogy specialist)
- 1 reduced-service faculty member (science education researcher)
- 1 quarter-time lecturer (science education research specialist)
- weak connections with discipline departments through affiliate faculty
- 1 Administrative Assistant

- 1 half-time secretary
- 2 graduate teaching assistants
- 1 undergraduate assistant

This year has been highly productive in terms of grants and contracts. We have attracted more than $500,000 in outside funding. The preponderance of money is for student tuition and therefore permits program growth. Through our extensive efforts in obtaining support for our students we have brought the number of science education graduate students from 12 to 51 while maintaining a steady state of 20 or so mathematics education students. Our growth, while actively sought by the faculty has also resulted in the necessity for carrying a heavy teaching load, particularly for our three (3) junior tenure-track faculty. Faculty typically support a teaching load 50% higher than required during the academic year and substantial summer teaching along with our regular duties of establishing fundable research, publishing/presenting research, competing for more grants/contracts, and being of service to the department, the University, and to many outreach programs. The grants/contracts we have received are, for the most part, federal flow-through funds administered by the state. These contracts are considered service by funding agencies and are highly restrictive:

- Low (10% to 0%) faculty salary
- No or highly restricted travel
- Low (0% to 20%, 8% typical) allowed indirect thus little to no research support
- No TA/RA support

Our facilities, while much improved over previous years, have become strained. At this time we have:

- Offices for current faculty and staff (8 rooms)
- 1 small dedicated classroom
- 1 tiny geoscience laboratory (with renovation of additional space planned)
- 1 small storage room/office for the Center for Science/Mathematics Education Research
- 1 storage room (past capacity and also being used to house TAs)

If we are to continue to be as productive as we have been over the year, we must have more faculty and support staff, which means that we must also have more facilities.

The students we have traditionally served are the primarily kindergarten through twelfth grade practicing science and mathematics teachers from our local area and a few wishing to teach at the community college level Most graduate with a Master of Arts in Teaching; however we also provide professional development for a substantial number of non-degree seeking students. There is a small, but growing, number of students seeking dual master's degrees with an MS in mathematics and the MAT degree. Our discipline specialists teach several large classes as a service to the Mathematical Sciences and the Geosciences departments, and in the recent past the Physics and Biology departments.

With all of our accomplishments over the last few years, there is a specific issue impacting the program: state funding. The crises in school districts, with regard to state support, is that little provision is made for tuition support for teachers to obtain master's degrees and there is only a small increase in salary for teachers who receive these degrees. Our students are pursuing higher degrees mainly because they want to better themselves and/or they must obtain additional graduate hours to maintain their teaching certificates. Our growing student population, driven by teacher quality grants, requires that the faculty teach at or above capacity even as demand for additional non-grant associated coursework grows steadily.

Requirements for Success in the Short Term

For faculty to continue to perform at an optimum level, *all* of the following **critical** needs must be met within the next *year*. These needs are divided into the categories of financial support from the University, facilities, new hires, new programs and degrees, and recognition. Each of these is listed below:

Recognition by the school and University (in order of priority)

- Research in STEM teaching and learning is a discipline (just like mathematics and science)
    - Continue to pursue funding opportunities offered through federal block-grant programs such as Teacher Quality Grants and education grants from NASA demonstrate importance of these programs to UT Dallas
    - Aggressively seek new major external funding from national sources including National Science Foundation and the Department of Education
- Respect for our unique skills and what we bring to the University
    - Research in science and mathematics learning
    - Service to the educational community through our ability to assess educational learning environments
    - Research in science and mathematics content
    - Impact on the quality of the local pool of potential students for UT Dallas through our substantial work training precollege educators
- Support of our mission by administration
    - Our role within the school and University clearly defined

Faculty (in order of priority)

- Science education researcher
- Mathematics Education specialist – preferably with an expertise in middle school mathematics
- Biology and chemistry content specialists
- Senior lecturer/grant writer/assistant director associated with the Center for Science/Mathematics Education Research (C-SER)

Staff (in order of priority)

- Program coordinator (recruiting)
- 3 Teaching Assistants (geosciences, physics, mathematics)
- 1 Undergraduate Assistant

Facilities (equal priority)

- 1 office for teaching/research assistants
- 2 offices for new faculty and lecturer
- Research/Teaching Facilities
    - 2 Multipurpose science/mathematics research/teaching facilities
- Research computer lab with work stations, lab tables, work space and audio-visual equipment (within 3 years)
- Research mathematics teaching lab with work stations, lab tables, work space and audio-visual equipment (within 3 years)

Financial Support (in order of priority)

- Grow research programs (equipment, materials, personnel)
- Support junior faculty
    - Travel to national and international research meetings to increase visibility through research presentation
    - Travel to funding agencies such as NSF to meet program directors
    - Funds to allow acceptance to perform invited talks (generally partially funded by host)
    - Reduce teaching loads by hiring lecturers and TAs
- Add laboratory fees to SCI courses to pay for extensive consumable materials utilized in inquiry-based science instruction (requires Provost permission)

Support programs that allow credibility and research/teaching assistant longevity at the UT-system and at the state levels (in order of priority)

- PhD in Science Education (within 3 years)
- Certificate Program (18 hour certificate of completion)
- MAT-SE online (now in the development stage with launch anticipated in Fall 2006)

Programmatic Production

If these critical needs are met we will be able to maintain our level of productivity and increase our activities in the following areas **immediately**:

Immediate service to:

- Pre-service teachers
    - Content with appropriate pedagogy embedded
- Inservice teachers

    - Certificate programs including one aimed at teachers of gifted students in mathematics.
- Undergraduate students interested in integrated coursework
    - NATS classes
    - McDermott Scholars and Collegium V offerings
- Discipline area teaching assistants
    - Pedagogy instruction
- Master's candidates
    - MAT in Science
    - MAT in Mathematics
- Dual master's candidates
    - NSM
    - Brain and Behavioral Sciences
    - MAIS
- Within three years
    - PhD Candidates
    - Formal and Informal PreK-14 educators
        - Community college educators
        - Museum educators

Immediate Collegial Partners

- Within the University
    - All schools within NSM
    - Brain Sciences
    - Arts and Humanities
- Institutes of Higher Education
    - Curtin University of Technology, Perth, Australia
- PreK-12 Schools
    - Public and private school districts
- Informal Institutions
    - Dallas Museum of Natural History
    - Dallas Zoo
    - Heard Museum and Wildlife Sanctuary
    - Science Place
    - SciTech Discovery Center
- Business and Industry
    - PASCO Scientific

Requirements for Success in the Long Term

For faculty and the Science/Mathematics Education Department to excel and function within a Tier 1 University, *all* of the following long term needs must be met. These needs are divided into the categories of financial support from the University, facilities, new hires, new programs and degrees, and recognition. Each of these is listed below:

Faculty within 5 years (in order of priority)

- Science education researcher
- Mathematics education researcher
- Biology/chemistry science educator
- Elementary science educator/researcher (within 7 years)
- Elementary mathematics educator (within 7 years)

Staff within 5 years (in order of priority)

- 3 Teaching Assistants (geosciences, physics, mathematics)
- 2 Research Assistants (science ed research, math ed research)
- 2 Undergraduate Assistants (science, mathematics)
- 1 Full time secretary for C-SER
- Lecturers for service courses (Master Teachers who have been through our programs)

Facilities within 5 years (in order of priority)

- 2 offices for teaching/research assistants
- 3 offices for new faculty
- Research/Teaching Facilities
    - Research computer laboratory
    - Research mathematics teaching laboratory
    - 2 Research science teaching laboratories with work stations, lab tables, work space and audio-visual equipment
    - 3 Science research wet labs (biology, physics, geosciences) for small groups of research students
    - 2 Multipurpose science/mathematics teaching facilities with workstations, lab tables and audio-visual equipment (within 7 years)
- 2 offices for C-SER staff

Support (in order of priority)

- Travel for junior faculty
    - Allows faculty to establish/maintain their research agenda with their peers
        - NARST
        - AERA
        - NSF
        - Content specific organizations
- Programs that continue to allow credibility and research/teaching assistant longevity (in order of priority)
    - PhD in Mathematics
    - Certificate programs
        - Master Science Teacher
        - Master Mathematics Teacher
        - Master Technology Teacher

Programmatic Production

If these long-term needs are met we will be able to increase our level of productivity through these additional activities in the following areas:

Continued service to

- Pre-service teachers
- Undergraduate students interested in integrated coursework
- Inservice teachers
    - Certificate programs
        - Master Science Teacher
        - Master Mathematics Teacher
        - Master Technology Teacher
- Discipline area teaching assistants
- Formal and Informal PreK-14 educators
- Master's candidates
- Dual master's candidates
- Within three years of proposal
    - PhD Candidates in Mathematics Education

Develop Relationships (within 5 years)

- Opportunities for equal collaboration, particularly under the C-SER umbrella with
    - Departments within our school
    - Centers within the University
    - Schools throughout the University
    - Research community
    - Geographic community
- Grants co-authored with other departments
    - NSF
    - NIH
    - DOE

IV. ADMINISTRATION, PERSONNEL AND BUDGETS

Science/Mathematics Education (SME) is a growing, dynamic department. Our faculty and students are drawn from the discipline fields within NSM as well as the fields of science and mathematics education teaching and research. We are making excellent progress toward our goals of being and producing leaders in science/mathematics education and impacting trends and practices in education at our institution and beyond. We are proud of our progress in growing our externally supported research and our student population. However, we face many challenges that can only be overcome with support and investment from UT Dallas.

Our current faculty is small, and we are missing key personnel needed to maintain and grow a vigorous program, specifically a senior science educator who can serve as head of the department and a mathematics educator. By the nature of our work in education, we face special restrictions on grant funds that are unique within NSM and impair our research efforts.

At this time SME the department is composed of:

- 3 regular science faculty (2 discipline specialists, 1 science education researcher)
- 2 mathematics faculty (2 discipline specialists)
- 1 associated administrative faculty member (non-teaching)
- 1 half-time senior lecturer (science pedagogy specialist)
- 1 reduced-service faculty member (science education researcher)
- 1 quarter-time lecturer (educational research specialist)
- 1 administrative assistant
- 1 half-time secretary
- 2 graduate teaching assistants
- 1 undergraduate assistant
- Weak connections with each NSM discipline department and with Teacher Development through affiliate faculty

A. Faculty

Department Head Responsibilities

The department head is responsible for the day-to-day administration of the MAT programs. These responsibilities include communications with upper administration, and collegial interactions with faculty and staff. Governance of the department has historically been democratic and expressed through shared input from all concerned. Faculty are reviewed annually for their teaching performance, research and service to the university. Information from these reviews support recommendations for pay increases, promotions, and tenure. Support staff are also reviewed annually based on their service to the department through office management, fiscal responsibility, and positive interactions with the faculty. Together with the faculty, the head is responsible for the expression of the departmental vision, mission, goals and objectives that support not only the University mission, but the coursework and research that comprise the MAT degrees. Allocation of faculty teaching time and financial resources are also based on the departmental goals to promote comprehensive mathematical and scientific knowledge

and understanding; to use and contribute to current educational research and methodology to participate in various outreach programs, and to develop and support professional awareness and involvement.

Center Director Responsibilities
The center director is responsible for managing both outreach and research efforts that span not only the Science/Mathematics Education faculty, but also those of faculty, staff and student who are members of the Center for the Science/Mathematics Education Research (C-SER). While this center is under funded, outreach support has included the PASCO Science Institute, Learning Environments Institute, Seminar Series for Life-long Learners, the Penrose Lecture, and the Science Lecture Series. C-SER also supports the research undertaken through the UT-TeleCampus Grant "MAT-SE Online".

Faculty Duties
Following the requirements of the University, all faculty divide their time among teaching, research, service and outreach. Mathematics and mathematics education courses (both content and core), prior to this year were the solely the responsibility of Dr. Thomas Butts. With the hiring of Dr. Titu Andreescu, these responsibilities are now divided between them. Dr. Butts also teaches a number of mathematics courses taken by primarily by preservice teachers. Science content courses (SCI) are most commonly taught by Drs. Montgomery (geosciences) and Urquhart (physics). Dr. Ledbetter occasionally teaches ecology and/or environmental field methods. Ms. Curry generally teaches science for elementary teachers. Our fourth faculty member, Dr. Russell Hulse, acts as advisor to the department and currently serves as vice president in the Office of Research and Economic Development. Core science education courses (SCE) are taught by Drs. Fred Fifer and Cynthia Ledbetter. Dr. Fifer also regularly teaches Critical Thinking, and occasionally Ms. Curry teaches advanced science education teaching methods. In 2005-2006, Dr. Ledbetter won a grant to write several online courses and, therefore, was relieved of teaching the research course sequence. Ms. Kathy Skinner filled that role because of her training as an educational researcher. Faculty in other NSM departments, in Behavior and Brain Sciences, and in Engineering and Computer Sciences teach courses in which our MAT students enroll.

B. Support Staff

Administrative Assistant's Duties
Our Administrative Assistant is predominantly concerned with the fiscal management of departmental and contract/grant funds including monthly budget reviews and justifications of expenditures. She also takes care of correspondence for the department head, and does all paperwork for students enrolling under grants/contracts. In 2005 grants/contracts were approximately $300,000 allowing more than 50 students to enroll each semester. Ms. Kinnon is also charged with purchasing equipment, processing travel requests/vouchers, managing office operations, and maintaining faculty timesheets/time and effort reports. With Ms. Kinnon's guidance, we have implemented policies that make running the Science/Mathematics Education department run more efficiently and smoothly.

Secretary's Duties
Our Secretary III, a half-time position, is responsible for managing office materials, purchasing these types of materials, functioning as receptionist, managing student records, helping student with registration, and maintenance of student database. She also supports faculty with filing, typing and, when teaching assistants are not available, photocopying. Ms. Vielma formats reports and handles all international mailings. She is also responsible for supporting C-SER activities by making arrangements for rooms, publicity, and food. Her expertise with databases has allowed us to send C-SER information more efficiently and effectively to our alumni and supporters.

C. Budgets

Over the past five years we have attracted approximately $1,430,380 in outside funding. The preponderance of money is for student tuition and therefore permits program growth. Through our extensive efforts in obtaining support for our students, we have brought the number of graduate students from 12 to 51. Our growth, while actively sought by the faculty, has also resulted in the necessity for carrying a heavy teaching load, particularly for our three (3) junior faculty. Faculty typically support a teaching load 25% to 50% higher than required during the academic year and substantial summer teaching along with our regular duties of establishing fundable research, publishing/presenting research, competing for more grants/contracts, and being of service to the department and University. The grants/contracts we have received are, for the most part, federal flow-through funds administered by the state. These contracts are considered service by funding agencies and are highly restrictive:

- Low (10% to 0%) faculty salary
- No or highly restricted travel
- Low (0% to 20%, 8% typical) allowed indirect cost thus little to no research support
- No TA/RA support

The annual State budget has historically been divided into two parts: the instructional budget and, a separate budget for classified salaries and program operations, the latter two comprising departmental operations.

Instructional Budget

	FY02	FY03	FY04	FY05	FY06
Faculty					
Academic	$224,850	$338,756	$339,424	$341,615	$383,318
Summer	$46,960	$82,274	$79,032	$62,438	$74,065
Subtotal	$271,810	$421,030	$418,456	$404,053	$457,383
Lecturers					
Academic					$14,012
Summer	$3,000	$2,000	$2,000		
Subtotal	$3,000	$2,000	$2,000	$0	$14,012
Teaching Assistants					
Academic		$11,440	$27,730	$24,192	$28,914
Summer		$6,330	$3,691	$9,108	$9,108
Subtotal	$0	$17,770	$31,421	$33,300	$38,022
TOTAL FAC/LEC/TA	$274,810	$440,800	$451,877	$437,353	$509,417
Classifieds	$25,700	$25,783	$17,412	$33,362	$43,692
Wages		$2,123		$1,510	$192
TOTAL CLASS/WAGES	$25,700	$27,906	$17,412	$34,872	$43,884
GRAND TOTAL	**$300,510**	**$468,706**	**$469,289**	**$472,225**	**$553,301**

Program Operation

	FY02	FY03	FY04	FY05	FY06
Travel	$ 2,504	$5,214	$1,062	$1,468	$1,000
Maintenance and Operations	$ 18,246	$ 20,384	$ 17,654	$ 22,524	$23,403
Capital	-	-	-	$2,074	$2,765
Subtotal Operations	$ 20,750	$ 25,598	$18,715.45	$ 26,066	$ 27,168
Information Technology	-	-	-	-	$3,210
Infrastructure		$6,110	$2,607.09	$898	-
Additional Funds	$976	$931	-	$245	$3,000
State Funds	-	-	-	$2,932	-
Grand Total	$ 21,726	$ 32,639	$ 21,323	$ 30,140	$ 33,378
YTD Actuals	$ 46,530	$ 53,585	$ 36,128	$ 62,245	$ 71,152
Salaries	$ 25,700	$ 25,784	$ 17,412	$ 33,362	$ 43,692
Wages	-	$2,123	-	$1,510	$192
Other Pay	$80	$80	-	$1,307	$100
Difference	$20,750	$ 25,598	$18,716	$26,066	$27,168

Actuals are reported for years FY02 thru FY05
Budget is reported for FY06
The field trip accounts are self-supporting and not part of this analysis

With all of our accomplishments over the last few years, there are two specific issues impacting the program: state funding and inability to assess laboratory fees. Because of the marked decrease in state support, there is little money available for tuition support for teachers seeking to obtain master's degrees and there is only a small increase in salary for teachers who receive these degrees. Our students are pursuing higher degrees because they want to better themselves and/or they must obtain additional graduate hours to maintain their teaching certificates. Our growing student population, recently driven by teacher quality grants, requires that the faculty teach above capacity even as demand for additional non-grant associated coursework grows steadily. Further, since all of our SCI courses are laboratory intensive, we have high costs required to replace materials and to acquire/replace equipment.

V. SERVICE COURSES

Service courses are conducted in collaboration with other departments within the School of Natural Sciences and Mathematics and the School of General Studies. A broad range of courses is taught based on the expertise and availability of the Science and Mathematics Education faculty. The audience in these classes is also broad, ranging from freshmen in interdisciplinary studies to seniors majoring in mathematics, specific science disciplines, or interdisciplinary studies. Many of these students are seeking teacher certification.

A. Alignment with departmental mission/vision/ goals

Directly aligned with our goals, we leverage diversity of our faculty through the integration of our ongoing science/mathematics research with our innovative work and leadership in STEM teaching and learning. Within the school of Natural Sciences and Mathematics (NSM), in particular, programs served by this department include Geosciences, Physics, and Mathematics. Outside of NSM, our faculty teaches courses for the Teacher Development Program through the School of General Studies. In this way we utilize the diverse expertise of our faculty in collaborative efforts with other departments and schools.

Teaching in all of the areas listed above has a positive impact on the quality of science and mathematics education at UT Dallas and beyond. This faculty is specifically trained to excel in teaching as well as in their specific discipline. Equipped with expert pedagogical content knowledge, our faculty has the ability to convey relevant content to the students, delivered in a manner suitable for optimum learning.

B. Proposed growth of undergraduate offerings

To increase our visibility as educators and researchers within the UT Dallas community, we need to increase the competitiveness and high quality of the Science and Mathematics service courses we teach.

As the emphasis of the nation focuses on science and mathematics education, of primary concern is the improvement in content knowledge of prospective teachers. Collaboration of our faculty with faculty in other NSM departments for the purpose of coursework development to improve prospective teachers' content and pedagogy will have a ripple effect that will be felt for years to come in the eventual education of the general population.

This department's visibility throughout the University enables our faculty to directly interact with students in a variety of disciplines, attracting students with STEM backgrounds into areas of pre-college and college teaching. Research demonstrates that teachers utilize instructional methods they have been exposed to in their own undergraduate courses. The faculty of this department is uniquely positioned to provide STEM coursework reflective of current STEM educational research and national reform initiatives. In particular, significant improvement is needed in the coursework providing

the science and mathematics content knowledge and pedagogical content knowledge to undergraduates pursuing teacher certification for PK through 8th grade. We have designed courses in geometry, problem solving, and mathematical modeling for prospective 4-8 mathematics teachers and are in the process of developing content coursework in other areas that can address this deficit. Prospective secondary teachers in STEM degree programs are not, in general, exposed to appropriate pedagogical content knowledge to insure the success of their own students. Offering courses for this population would be a natural extension of our program.

C. Evaluation of programs and courses

Currently, faculty members receive feedback on student perceptions of current service courses through the general evaluation system used by the University. The Science and Mathematics Education faculty consistently receive very high ratings for service courses offered. However, even with high ratings, there is always room for improvement. Our faculty takes this one step further by using student assessments within the framework of courses to determine instructor efficacy. Changes and improvements in teaching strategies and course design reflect the findings of the in-course assessments as well as from the end of course comments made by the students. From these assessments, and based on our attainment of our goals, the program undergoes continuous evaluation, allowing it evolve to serve the growing number of students with whom we interact.

VI. GRADUATE COURSE OFFERINGS

The decision to award MAT degrees potentially impacts every person within the State of Texas. However, theory does not effect change; people do. Living in a closed system requires each of us to imbue all students with an understanding of the impact our decisions have on our natural world. The second-largest state in the United States in both land area and population, Texas ranks 38th in full-time college enrollment (US Census Bureau, 2000). It is not surprising that the highest degree obtained by the majority of teachers in Texas (73.6 percent) is a bachelor's degree; approximately 25 percent have earned masters or doctoral degrees. Even though there are more teachers in urban and major suburban districts with advanced degrees than in 1,032 remaining smaller districts, still the number of teachers with advanced degrees in large districts continues to decline, from 32.7 to 25.1 percent since 1988-89 (TEA, 1999).

Through support of the University mission and goals, and in keeping with the University strategic plan, core courses prepare students to take active roles in leadership through their abilities to conduct research and to excel in mathematics and/or science. Being well versed in these areas requires students to successfully complete rigorous courses in educational research, and in science and/or mathematics disciplinary fields (Biology, Brain and Behavioral Sciences, Chemistry, Computer Sciences, Geosciences, Mathematical Sciences, and/or Physics). Core courses focus on evaluating, selecting, and conducting research for use in highlighting best practices to impact decisions affecting science and mathematics education.

Science Education

The MAT in Science requires three core courses in science education research. These courses give students a well-rounded perspective on the effects of science and science education on society. SCE 5301, Critical Issues in Science Education, requires that students explain the connections among the various topics discussed across the duration of the class and relate these connections to the teaching of science in their classes as well as to the decisions their students can make regarding such issues as energy, environmental pressures, food production, and the like. SCE 5305, Evaluating Research in Science Education, requires that students use relevant research to support their position on an issue in the teaching of science such as space for teaching, gender difference, constructivism, inquiry, and so forth. Finally, SCE 5308, Research in Science Education, moves students into leadership roles by requiring that students produce a research report worthy of publication in a professional science education journal and a formal presentation of their research study through an electronic presentation for use in a professional setting such as a conference, school board session, city council meeting and the like. Each of these core courses requires a grade of B or better for successful completion.

Should students decide to complete this degree through the Thesis Option, they are required to complete at least six hours of SCE 8398, Thesis Research. Students produce a research thesis that follows the UT-Dallas guidelines for rigor (see Policy on Procedures for Completing a Graduate Degree, Policy Memorandum 87-Iii.25-48). Research topics include evaluation of teaching practices, interactions of science and society, and the impact of science research on student learning.

Mathematics Education

The Mathematics Education component has become a content-oriented program that strives to achieve a balance between increasing subject-matter knowledge through appropriate core courses in higher-level mathematics (analysis, algebra, geometry, probability/statistics, discrete structures, etc) and linking the content of these higher level courses with the relevant content, technological, and pedagogical issues of the mathematics curriculum in grades 7 – 14 through guided elective courses entitled "Usual and Unusual Problems Using _____". Currently there are seven courses in this series where the blank is completed with one of Algebra, Geometry, Precalculus, Probability and Statistics, Discrete Mathematics, Mathematical Modeling, or Calculus. MATH 5310 (Seminar in the Teaching of Mathematics) is required of all students.

Students who pursue a master's degree in Interdisciplinary Studies aimed at 4–8 or 8-12 mathematics teachers also take some of these courses. There are some teachers with a primary interest in teaching computer science who take several CS courses as core courses. Those wishing to teach in a community college are encouraged to take more core content courses as electives

Content Course Offerings

To fulfill our mission is to have a positive and lasting impact on the quality of science and mathematics education and to assist educators of science, mathematics in meeting the challenges of today's dynamic educational landscape in north Texas and beyond. The Science/Mathematics Education Department (SME) also provides science and mathematics content courses. These courses focus on specific content areas incorporating findings of cutting-edge science and/or mathematics discipline and education research and require that students are able to demonstrate a mastery of content knowledge and apply pedagogical content knowledge to their own teaching. Courses with a SCI prefix focus on integrated lecture and laboratory-based content to provide depth of understanding within the context of the National Science Education Standards and the national goals of STEM education reform. Designed specifically for pre-college teachers at different levels (early childhood through elementary, middle grades, and high school), these classes provide opportunities research in science and the interactions with research scientists. Courses with MATH prefixes follow this same pattern in that they provide the content needed for these teachers to work not only at the secondary school level, but also in community colleges.

Enrollment

The vision of the Science/Mathematics Education Program is to produce recognized leaders in science/mathematics education who have a positive impact on the mathematics and science education of students. The enrollment in the program has increased from 12 degree seeking students to approximately 60 in science education while there have usually been 20 or so students in the mathematics education programs including those in Interdisciplinary Studies. This increase in science education is due, for the most part, to faculty success in attracting funding for tuition. The vast majority of these students are practicing teachers; therefore, all of our graduate coursework is offered at night and/or in the summer sessions.

The following table shows the number of students taught by SME faculty from Summer 1999 through Fall 2005.

Semester	*Undergraduate Science*	*Graduate Science/ Science Education*	*Undergraduate Mathematics*	*Graduate Mathematics/ Mathematics Education*
Fall 2005	231	62	217	18
Spring 2005	182	76	71	20
Summer 2005	60	91	0	45
Fall 2004	224	90	36	16
Spring 2004	269	57	62	18
Summer 2004	33	78	0	34
Fall 2003	343	57	24	8
Spring 2003	470	55	46	30
Summer 2003	58	39	0	38
Fall 2002	260	37	18	12
Spring 2002	505	67	42	55
Summer 2002	112	27	0	35
Fall 2001	316	23	40	20
Spring 2001	368	18	103	10
Summer 2001	130	57	38	74
Fall 2000	220	38	7	7
Spring 2000	166	71	27	51
Summer 2000	39	30	16	26
Fall 1999	225	32	8	14
Spring 1999	165	42	37	48
Summer 1999	14	34	1	42
Grand Total	4390	1081	793	621

A. Fit with the Department of Science/Mathematics Education Mission/Vision/Goals

Courses offered within the Science and Mathematics Education Programs are designed to support the long-term vision of the department be and to produce leaders in science and mathematics education at institutional, local, state, national and international levels by highlighting national science, technology, engineering and mathematics (STEM) education reform initiatives in order to support the development of best practices and provide opportunities for participation in cutting-edge research to current and future STEM education professionals. All courses, but especially core courses, are directly aligned with the department mission and goals as shown in the accompanying table.

B. Proposed growth of course offerings

To increase our visibility as educators and researchers within the UT Dallas community, we need to increase the competitiveness and variety of the science and mathematics education and content courses we teach for our own graduate students. We also have

great potential to provide coursework to graduate students in STEM disciplines that supports the higher education teaching mission of the university.

As we scrutinize our programs and courses offered in other departments and schools within the University in which our students enroll, we have identified some areas that require more/new classes. These new course offerings will help us to expand our service to the community as well as to the University. Content courses required for science and mathematics teaching credentials for elementary and secondary levels are supplied through the various NSM departments and while they provide the knowledge base teachers will need, they do not put that knowledge in the context of appropriate pedagogy. We propose to offer courses at the graduate level that integrate appropriate pedagogy with rigorous science and mathematics content. We also propose to offer courses at the graduate level that integrate science and mathematics to instruct teachers in the appropriate use of both within single lessons.

Our expertise in STEM content, as well as in STEM education, is unique within the university. There seems to be a large gap between courses offered for students interested in mathematical applications and for students' whose interests are in number theory and other theoretical mathematical areas. As a service to the University, we propose courses in theoretical mathematics that have broad appeal to students in computer science and engineering, as well as those mathematics students who are interested in a different level of mathematical inquiry. Such courses could be offered to both graduate students and advanced undergraduate students and would leverage the content expertise of both of our mathematics education faculty members. In addition, Dr. Urquhart is unique as a planetary scientist at UT Dallas, and is well suited to offer coursework in planetary science to physics and geoscience graduate students and advanced undergraduates should her teaching load permit such activity.

As a service to departments within NSM we propose to offer a course for discipline area teaching assistants and prospective future faculty that provides them with instruction in pedagogy designed for the adult learner. These teaching assistants have the science and/or mathematics content needed to teach at the university level, but they may never have had any instruction in how to communicate with students in a formal setting. Such courses may naturally integrate with undergraduate courses designed prospective high school teachers in STEM degree programs.

The State of Texas is requiring more professional development for teachers to meet the demands of Federal mandates. To fulfill our mission and that of the University, we must provide courses that help teachers acquire advanced teaching credentials. Such credentials include the Master Mathematics Teacher, Master Science Teacher, and the Master Technology Teacher.

Finally we seek to develop niche in mathematics for gifted students and their teachers. For teachers we are going to develop a 15-hour certificate program. The first course in this program is for teachers of gifted students in grades 5-8 and will be offered in Fall 2006.

C. New degree programs

Through this proposed distance education option, UT Dallas will provide the opportunity for more teachers to gain organized knowledge that make practical changes in education effective. Teachers are the perfect audience for a distance learning option because they are typically place-bound, time-constrained, and self-disciplined. The research suggests that teacher turnover is largely attributable to the sense of isolation caused by the inherent disparity of grade levels, subject areas, and classroom walls. Distance education provides a way to combat 'burn-out' by enabling a sense of community through professional networking. A common misconception about teaching is that an educator's workday ends when their students leave. Course availability 24 hours-a-day/7 days-a-week provides the convenience and flexibility that practicing educators need to focus on their studies after their students' papers are graded, lessons plans are prepped, and family matters are handled. People who enter educational fields are typically lifelong learners; they are open to new and different ways of learning and are motivated to transfer these experiences to their teaching. In other words, they fuel their teaching practice with their learning experience.

There are currently nine web-based master's programs featuring the natural sciences. All of the existing programs are offered through a College of Education. The proposed K-14 program is unique across the UT System, Texas, and the US in that it consists of science, research methods, and science education classes. Because it originates from within the School of Natural Sciences and Mathematics, direct and frequent contact of the science education faculty and with the School's research scientists will help to maximize exposure to vanguard science research and provide thesis committee members who have long had experience with students in the MAT program and are sensitive to the needs of science educators. Presently, only Curtin University of Technology (Western Australia) awards a comparable degree as an online option through their Science and Mathematics Education Centre.

To explore the potential market for an online MAT option specifically, UT Dallas posted a brief electronic survey form at the bottom of the Science/Mathematics Education course description web page. Over 320 unsolicited responses are on record indicating interest in digital/distance learning opportunities. This high response rate, within a large market of candidates with access to high-speed Internet at school campuses/regional service centers, reflects the immediate need for and marketability of the proposed online option. As such, faculty and staff at UT Dallas have been working toward realizing this goal through UTTC for nearly five years.

Many schools in the North Texas area are now laptop and technology-rich schools. This change requires teachers to change their teaching techniques to better utilize materials, information and equipment that are available with student-centered technology. In the fall of this year (2006) we will make available our first completely online Master's of Arts in Teaching Science. This type of presentation meets the needs of a diverse population of students, 'Closing the Gap' for those who cannot gain advanced education in a traditional face-to-face mode. Courses offered parallel the traditional courses required of our on-site students; all online students will be required to complete a master's thesis.

In meeting the needs of our changing constituents, we will propose three new degrees from the Science/Mathematics Education program. Web Mediated Learning is becoming ubiquitous in education. Not only are whole degree programs provided in an online format, but also increasing traditional coursework has a strong online component. To that end, we will propose a Masters of Teaching in Web Mediated Learning. Coursework will be planned and executed with faculty and administrators from Engineering and Computer Science and Arts and Technology.

Along with new courses to serve the science and mathematics education community, we continue to propose advanced courses within the context of a Doctor of Philosophy in Science Education and soon a Doctor of Philosophy in Mathematics Education. The coursework for both proposed degrees will include advanced educational research methodology, evaluation and assessment, educational leadership, and interdisciplinary science and mathematics content courses. Coursework will also include research in informal education in association with museums, zoos, and other educational entities. At the doctoral level we anticipant integration between the science and mathematics content essential to today's leaders in STEM education. Although professional education of science and mathematics teachers will always be an important component of the department mission, offering of a doctoral program will shift the emphasis of the department toward the cutting-edge research in teaching and learning. Leadership at a national level is reflective of a strong research program and is essential to meeting department goals and achieving the department vision.

D. Evaluation of programs and courses

Teaching undergraduates is a window on how well science and mathematics teachers are preparing students for college. Further, teaching Collegium V courses gives us access to the best and brightest students to compare to the general population at UT Dallas. Teaching this broad range of undergraduates, therefore, permits us to evaluate our effectiveness in teaching our graduate students, who are K-12 science and mathematics teachers. Faculty members also work directly with preK-12 teachers and students through numerous educational outreach efforts and have an intimate understanding for the needs of pre-college teachers that cannot be gleaned from scholarly literature. The real-life evaluation and reflection in which the faculty regularly engages provides much richer assessments and deeper understanding of the broad picture of the overall state of education in Texas than can be provided through a simple pre/post-test. Courses taught by the Science/Mathematics Education Department faculty integrate their diversity of expertise: from the deep discipline content knowledge of trained researchers in specific STEM fields to higher-order pedagogical content knowledge reflective of STEM education research and reform initiatives. Our courses, especially those supported by Teacher Quality Grants, regularly employ formative and summative assessments to ensure high quality. Courses are dynamic to meet the needs of students rather than static to minimize the burden on faculty.

If program evaluation is limited to the percentage of graduates versus the percentage of students taught, then our MAT programs are quite successful. In the last 40 years we have graduated more than 500 students in science education and more than 300 in

mathematics education. This is approximately 90 percent of the students who enrolled in the MAT programs.

However, we are more concerned with the depth of understanding our graduates have developed. Each course is evaluated based on the departmental mission, vision, goals, and objectives. If our students meet the objectives for each class, we can then say that we are fulfilling our goals (see syllabi for evaluation methods and student assessments used in each course). Multiple methods are used in the determination of how well students are meeting course objectives. As professional educators and educational researchers, each faculty member models best practices in all classes taught. Teaching methods reflect findings of the education research community and foster independent learning guided by thoughtful experts in each subject taught. Students are encouraged to ask questions of faculty and one another, explore, apply knowledge, extend their learning outside of the classroom environment, and share their relevant experiences with classmates.

Embedded assessments of student learning are typical rather than the exception. Faculty members carefully monitor written assignments, in-class group work, and class discussions to assess the performance, participation, and areas of needed intervention for each student. The small class sizes typical of graduate courses offered by the department allow for mentorship of students and individualized instruction. Faculty members who guide required independent research evaluate the research performance, the written papers and the oral presentations to determine how well the learning expectations are being met.

The same instructors who have taught the on-campus courses will teach the online classes, thus ensuring consistency and quality between program options and ongoing evaluation. Quantitative and qualitative data will be derived from the UTTC online evaluation system. Specific questions will assess conformance of each class delivery (as presented in the syllabi) to the overarching program goals. Other valid and reliable instruments may also be used as appropriate.

The MAT-SE online program is viewed as a single entity and will be evaluated as such. In particular, data will be collected, analyzed, and interpreted within the current and past market context, in terms of: enrollment statistics to determine the number of Texas science teachers seeking advanced degrees, employment location to determine the geographic influence of the program, presentations and publications to suggest the amount of contributions to the growing field of educational research in PK-14 science, and teacher and student survey results to suggest the degree of constructivist practice in science education overall and at pertinent grade level units.

According to UTTC policy, an Academic Affairs Oversight Committee will continually evaluate the program's efficiency and assess its effectiveness. In addition, under UT Dallas Policy Memorandum 94-III.24-63, Academic Program Review, the program will be reviewed formally every five years.

Continuous internal evaluations of the Science/Mathematics Education Program under the direction of the Department Head will encompass curriculum changes and completion rates, faculty and student profiles, class enrollment and satisfaction, relevant thesis topic

availability, and the employment market for graduates. Exit interviews will be conducted with students who do, or do not, successfully complete the online program.

VII. OUTREACH

Educational outreach by the personnel within the Science/Mathematics Education Department is as diverse as the areas of expertise of the faculty. Outreach activities are not motivated by service requirements or mandated by the school or department. Rather, each faculty member is passionately striving to make a difference in the quality of STEM education and public awareness of science and mathematics from his/her own internal motivation. The alignment with the department mission, vision, and goals is natural rather than forced, and demonstrates an appropriate fit of the faculty within the department.

A. Fit with Department Mission/Vision/Goals

Education outreach is essential to the mission of the Science/Mathematics Education Department, and is reflected in our goal to broaden our impact on STEM education at local, regional, and national levels through education outreach, both directly through our own educational outreach aimed at PK-14 students, pre-college teachers and partnerships with informal education institutions and indirectly through the support of the UT Dallas community's educational outreach efforts. Many outreach efforts reflect teaching duties and serve as recruitment opportunities for students into department MAT programs. This is especially true for grant mandated summer institutes and long-term programs like the Regional Collaborative for Excellence in Science Teaching. (However it should be noted that these time-intensive and often collaborative efforts do not necessarily impact official teaching load.) Other outreach efforts are intertwined with our STEM education research and grants and contracts, and new research and funding opportunities may even be driven by outreach experiences.

Faculty members are heavily involved in a wide variety of educational outreach activities. Major areas for outreach include:

1. Working directly with pre-college students, with university students, and with teachers. Hosting and working extensively in mathematical competitions for students from grades 4 – college.
2. Developing curricular materials for use by students and teachers.
3. Designing programs for gifted students and their teachers,
4. Working closely with area school districts and private schools.

Some specific recent examples of outreach performed by one or more faculty members and broken down by population served are given below:

Outreach Involving Direct Contact with PK-12 and University Students

- Regular (weekly to monthly) science lessons for children at St. Philips Academy in Dallas, Children's World Learning Center in Plano and Boon Elementary in Allen
- Science Explorers Night at Boon Elementary (in Allen) and Boon Elementary after school science program coordination

- Science lessons for Brownies and field testing of space science curriculum with students Richardson Independent School District
- Awesome Math summer camp designed to improve middle school and high school students' mathematical problem-solving
- UT Dallas Math Club
- International field experiences with an integrated science and humanities focus.
- Greek cruise conducted in association with the McDermott scholars program.
- Guest speakers for courses within Natural Sciences and Mathematics, Teacher Development, and in Arts and Humanities.
- Guest speakers for student groups
- Mentoring of high school, undergraduate, and graduate students in STEM fields.

Outreach Supporting PK-12 Education

- Competition activities include serving as coordinator and chief problem writer for - Greater Dallas Council Teachers of Mathematics Competitions for grades 7–12 and the Dallas ISD Mathematics Olympiad grades 4–12.
- Contest writer for the Chinese Institute of Engineers competition for grades 4–6.
- Robotics competitions supported in collaboration with the School of Engineering and Computer Science
- Judges for local science fairs.
- Judges for teacher small grant competitions.
- Former chair AMC and Problem writer Putnam exam,
- Editor and Writer for *Reflections* – online journal for high school and undergraduate education
- MathMeet Online – An online contest for middle and high school students across North America.

Outreach Involving PK-12 Teachers

- Providing multi-week summer science institutes for teachers.
- Hosting a Regional Collaborative for Excellence in Science Teaching that provides monthly professional development for more than 30 collaborative members who are classroom teachers and district science specialists.
- Providing science content via Teacher Quality Grant programs
- Organization and hosting of the 2005 Origins Conference in conjunction with NSTA.
- Organizing committee membership for the National Science Teachers Association in Dallas, 2005
- Recent talks/inservice presentations for mathematics education include *Teaching Algebra and Geometry Through Problem Solving* , *Twenty Questions [or More], Teaching Mathematics Through Problem Solving: A Personal Perspective, "Conversely Speaking, Teaching Mathematical Reasoning: Some of My Favorite Examples" and "Using Mathematics: From Cryptography to Catching Criminals"*
- Workshops and short courses at local, state, and regional conferences for science teachers, and invited school district in-service presentations and workshops including: *"Voyage Through Astronomy with Stars and Planets", "Scale in the Solar System",*

"Weather in Space?!? What's That?", "A Scientist in a Preschool Classroom", "Explore Earth's Ionosphere with CINDI", "Challenging and Inspiring Exploration Through Content", "Mars in the Classroom", "Penny Ante Science", "TAKS Objectives in Inquiry Based Instruction"

- Curriculum development for the joint NASA/Air Force/UT Dallas Coupled Ion Neutral Dynamics (CINDI) project in collaboration with the Center for Space Sciences.
- Creation of the *Cindi in Space* comic book for middle school students in collaboration with the Center for Space Sciences (both English and Spanish)
- Development and field-testing of the middle school *Stars and Planets* astronomy curriculum in partnership with the Richardson Independent School District.
- Development and field-testing of a scale model solar system activity for middle elementary in partnership with teachers at Herbert Marcus Elementary in Dallas and Boon Elementary in Allen, TX.
- Providing Full Option Science System (FOSS) instruction for elementary teachers.
- Providing "Project WILD" instruction for teachers
- Writing for the "We All Use Math Every Day" – the outreach program for the NUMB3RS TV shows coordinated by Texas, the "Student Math Notes" of the National Council of Teachers of Mathematics, and the "Figure This" grant program coordinated by the NCTM.
- Curriculum development team member for NASA's RoverQuest project.

Outreach Involving Informal Education Institutions

- Service on the Board of the Sci-Tech Discovery Center in Plano.
- Collaborations with local planetaria
- Collaborations with the Science Place and Dallas Museum of Natural History (primarily through administrative faculty member Dr. Russell Hulse).

Public/Community Outreach

- Seminar Series for Life-Long Learners provided through the Center for Science/Mathematics Education Research
- Organization of and participation in the Center for Science Education Seminars for Life-Long learners.
- Living and Dying with Dinosaurs, a lecture series at UT Dallas.
- Dallas Museum of Natural History, juvenile dinosaurs of Big Bend, lecture series.
- Cottle Lecture Series, dinosaurs of Texas, keynote address, Sul Ross University, Alpine.
- Cambridge University Roundtable, U.K., invited speaker and author on the subject of evolution and education.
- University of Texas at Austin, invited participant, Intelligent Design vs. Evolutionary Theory.
- Grace Museum, Abilene, juvenile dinosaurs of Texas, invited speaker.

Indirect Outreach – Policy and Support of Outreach Efforts by UT Dallas Community

- Integrating DLESE into Long-Term Professional Development for Teachers, *Digital Library for Earth Science Education in Action Forum* at 2005 annual meeting
- Panel Member - Pre-Service Educator Preparation and the Role of the Earth and Space Science Community Meeting (2005)
- Service on the advisory panel for the American Mathematics Competitions
- Support of Women in Physics annual summer camps for middle school girls.
- Sharing of teaching strategies with university faculty through an invited workshop at the quad-annual Cosmos in the Classroom conference in 2004.
- Providing a lending library of Earth and space science support materials to facilitate outreach activities of UT Dallas faculty and students.
- Partnership with NASA and Honeywell's FMA Live! Physics program.
- Support of physics faculty doing Science Night PTA events for local schools.
- Membership and participation in the Metroplex Areas Science Supervisors (MASS) – an organization involving more than 50 Metroplex school districts, informal education organizations, and higher-education institutions.
- Membership and participation in Texas Education Science Leaders Association
- Membership and participation in activities of the National Council of Teachers of Mathematics, Mathematical Association of America, McMath Supervisors Group.
- Membership and participation in the NASA Education and Public Outreach Pre-service Teaching Committee.
- Science and pedagogical content reviews for NASA, textbook publishers, and the Texas Science Teacher.
- Advocating for science education at national science discipline professional meetings such as the American Geophysical Union.
- Facilitating communications between the broader UT Dallas community and local school districts.

B. Proposed Areas of Growth

Over-commitment in outreach activities for this faculty is of concern with respect to proposed areas of growth. *The Science/Mathematics Education Department cannot become general outreach service providers for Natural Sciences and Mathematics or the broader University community*. However, the expertise of the department makes it uniquely suited to the facilitation of educational outreach efforts within the school and institution, and local STEM community. Such efforts could be coordinated through the Center for Science Education if sufficient staff were available to minimize the burden on faculty already extremely active in their own outreach efforts in addition to their regular duties of teaching, research, and service.

Future plans (pending available personnel and resources) include:

- Coordinate and host a UT Dallas "Share-a-Thon" event to increase awareness of educational outreach programs (especially STEM outreach programs) within the university among the UT Dallas faculty, staff, students, and potential local education

partners and industry.

- Assist programs and students in the replication of the Women in Physics camps for other disciplines – included seeking outside funding support for such programs.
- Become a GLOBE program training site
- Become a lunar sample/meteorite certification training site
- Develop a program for gifted mathematics students through a summer camp, academic year activities, and online activities including a journal
- Increase partnerships with local school districts and informal institutions
- Increase faculty in-service trainings of teachers in local school districts

VIII. TEACHING

Housed within the School of Natural Sciences and Mathematics, the UT Dallas Science/ Mathematics Education Department provides a unique opportunity for students to merge theory and practice in science/mathematics education. Building on fundamental coursework in mathematics, science, society and technology, students benefit from direct interaction with renowned experts and specialists in biology, chemistry, geology, mathematics, physics, science/mathematics education, as well as other related schools and departments. The principles of hands-on inquiry and teacher-as-researcher transfer directly into the classroom as students observe and participate in diverse educational settings. Real-world experience integrates the core concepts of science and mathematics with the subtleties of pedagogy that spring from guiding students in the construct of their own knowledge.

Our philosophy upholds the stated mission of the University of Texas at Dallas (http://www.UTDallas.edu/strategicplan/) by "(1) producing engaged graduates, prepared for life, work, and leadership in a constantly changing world, (2) advancing excellent educational and research programs in the natural and social sciences . . . and (3) transforming ideas into actions that directly benefit the personal, economic, social, and cultural lives of the citizens of Texas." Teaching in the Science/Mathematics Education Department directly supports the University goals of becoming a "global force in innovative, transdisciplinary research and education in emerging areas of technology, science, and learning, a ground-breaking leader in both framing and answering the questions faced by business, policy makers, and the public and a synergistic partner with local industry, government, and cultural organizations as well as local K-12 schools, community colleges, and universities." As professional educators and educational researchers, each faculty member models best practices in all classes taught. Faculty members who mentor required independent research evaluate the research performance; the written papers and the oral presentations to determine how well the learning expectations are being met.

A. Faculty Participation

Since 1999 the number of faculty has increased, allowing us to offer diverse courses that more nearly meet the objectives of the department to promote comprehensive mathematical and scientific knowledge and understanding by producing skilled and knowledgeable science and mathematics educators who are capable of transferring their knowledge to adults and to children. These educators must demonstrate a depth of knowledge in science and/or mathematics as well as in science education and/or mathematics education. Our courses must use and contribute to current educational research and methodology by producing qualified practitioners and researchers within the fields of science and/or mathematics education who can use cutting edge research to make a difference in science and mathematics education and who can apply their research to the classrooms. Courses in the MAT programs must develop and support professional awareness and involvement by producing forward thinkers who can change the course of science and mathematics education for the benefit of all children and who can inform the public as to the best methods for teaching science and mathematics to children. We are preparing skilled practitioners and researchers who can instruct pre- and in-service teachers in the best methods for teaching science and mathematics to children.

The faculty in the online program will be the same as for the on-campus program. All faculty meet their regular teaching load requirements. Degree plans and course scheduling will accommodate the continual involvement of senior faculty to ensure rigorous coursework. The credentials of the existing and any new faculty will continue to meet or exceed the Southern Association's minimum standards for credentials and experience. Faculty will teach science education classes and may teach science content in their fields of expertise. Any Teaching Assistants involved in the program are expected to have a minimum of three years teaching experience and a content area degree to enter the program. TAs will support 'core' faculty by helping to prepare materials for lessons, monitoring discussion groups, and assisting with individual tutoring or supplemental learning needs. TAs will not replace faculty in the actual teaching of classes.

The Science/Mathematics Education Department offers the three Science Education (SCE) core courses and six to ten Science (SCI) courses over an academic year. Two to four Mathematics Education (MATH) courses are offered during the same period. Core Courses in MATH, CS, STAT, OPRE and other related programs are available for Master's students. During the summer, three MATH courses, and several SCE and/or SCI courses are offered – some of which are taken on field trips. Students may also take other content courses in biology, physics, chemistry, geoscience, and mathematics disciplines.

Each member of the faculty typically carries a teaching load that exceeds the minimum requirements. Individual teaching loads for each semester are given in the table below. In addition to regular teaching, all faculty members support the departmental mission and goals through Outreach Programs for K-12 students and teachers as well as support for the department from within. This includes participation in programs sponsored by the department and the University that are not reflected in the regular teaching load.

Due to the nature of our department and student population, the faculty carries a year-round teaching obligation that distinguishes us from other departments within NSM. Our student population is primarily comprised of full-time teachers who have limited flexibility in the time they can take courses. As a result, it is necessary to provide ample opportunity for summer coursework in order to meet the departmental mission and goals in serving our student population.

Drs. Montgomery, Andreescu, and Butts, and Ms. Curry regularly teach undergraduate courses, some of which are taken largely by preservice teachers. These courses are reflected in the listings. Service courses taught by this department support the departmental goals of providing innovative teaching and learning in STEM disciplines to other departments and schools within the University. Developing this collaboration further is one of our goals; however, due to the size of the faculty and the demands placed upon members, it has become increasingly difficult to offer a variety of electives and/or to develop new courses for the respective programs.

Teaching loads

Faculty	Fall 2005	Spring 2006	Summer 2006
Andreescu	12.6	10.2	
Butts	10.7	12.9	
Curry	12.9	11.7	

Fifer	13.2	12.3	
Ledbetter	5.0	9.5	
Montgomery	16.7	9.6	
Skinner	4.5	4.5	
Urquhart	11.4	10.8	
	Fall 2004	Spring 2005	Summer 2005
Andreescu	-	-	6.0
Butts	11.7	12.3	9.0
Curry	12.3	13.8	12.0
Fifer	5.1	10.5	4.5
Ledbetter	16.35	11.2	15.0
Montgomery	14.2	13.7	10.9
Urquhart	14	12.6	11.4
	Fall 2003	Spring 2004	Summer 2004
Butts	9.0	14.7	9.6
Curry	10.5	13.6	8.05
Fifer	8.1	4.5	4.5
Herron	9.45	10.5	6.3
Ledbetter	9.6	10.2	9.0
Montgomery	10.6	10.9	13.6
Urquhart	10.75	11.7	9.1
	Fall 2002	Spring 2003	Summer 2003
Butts	8.1	11.3	13.6
Curry	10.5	13.5	8.0
Fifer	8.1	.8	10.0
Herron	7.5	10.5	3.0
Ledbetter	9.6	9.0	5.9
Montgomery	14.8	19.1	12.7
Urquhart	7.5	10.5	3.0
	Fall 2001	Spring 2002	Summer 2002
Butts	8.3	14.2	11.6
Curry	5.4	7.5	3.0
Fifer	8.1	3.0	4.5
Ledbetter	10.8	11.2	9.6
Montgomery	11.7	19.7	10.5
	Fall 2000	Spring 2001	Summer 2001
Butts	7.5	12.0	21.9
Curry	-	7.5	-
Fifer	7.5	1.5	9.9
Ledbetter	14.7	9.6	12.6
Montgomery	14.1	18.4	16.4
	Fall 1999	Spring 2000	Summer 2000
Butts	8.7	12.3	17.2
Fifer	12.0	10.2	12.0
Ledbetter	9.0	11.25	7.8
Montgomery	16.0	10.75	16.7

B. Staff Participation

Staff members in the Science and Mathematics Education Department provide outstanding support for faculty. A full-time administrative assistant and a half-time secretary share the responsibilities of supporting seven very busy faculty members. Their work helps to relieve the faculty of day-to-day operations so that their can focus on teaching can be maintained.

The department currently supports two graduate teaching assistants and one undergraduate student assistant. Courses in this department are typically presented in a mixed lab/lecture format. The student staff assists the faculty through their support of best practice modeling and opportunities for optimum learning for the students. This is done through class preparation, extensive materials management, and classroom assistance.

C. Student evaluations

The faculty in Science/Mathematics Education exceed the teaching goals in quantity and, most importantly, in quality. Members have been recognized by outside groups as outstanding teachers. Currently, faculty members receive feedback on student perceptions of current service courses through the general evaluation system used by the University. The Science and Mathematics Education faculty consistently receives very high ratings (typically 4.0 to 5.0 out of 5.) for service courses offered. However, even with high ratings, there is always room for improvement. Our faculty takes this one step further by using student assessments within the framework of courses to determine instructor efficacy. Changes and improvements in teaching strategies and course design reflect the findings of the in-course assessments as well as from the end of course comments made by the students.

D. Programmatic evaluations

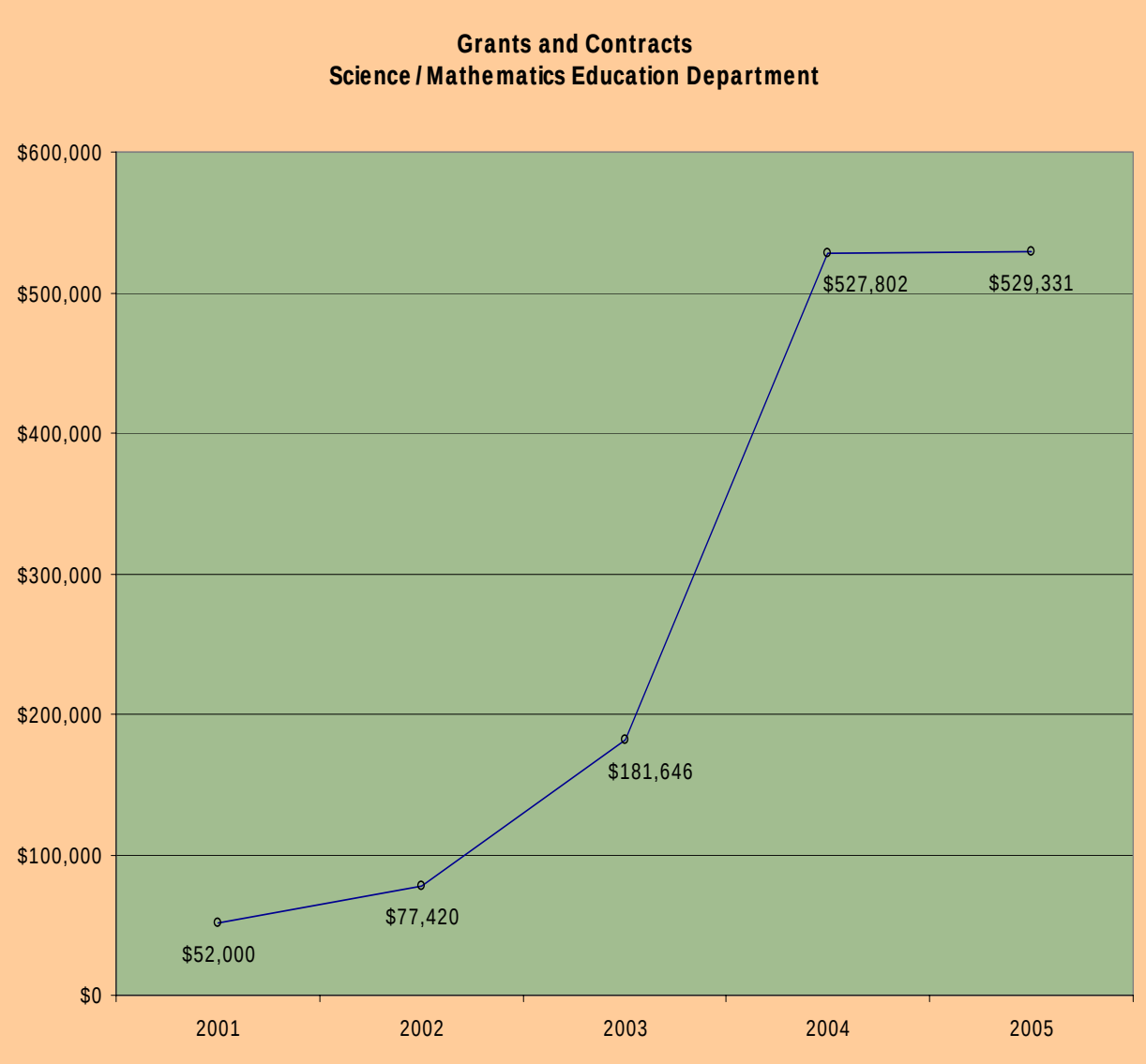
Program evaluation is conducted by collaboration of the entire faculty. Faculty performance is viewed through end-of-term evaluations as well as in-class observations. In striving to enhance instruction, faculty continuously collaborate and discuss methodologies that are appropriate to the class population and content. Utilizing research-based pedagogy and incorporating it into instructor self-assessment and peer-assessment of strategies within the context of each course, allow for optimization of instruction. Whereas we are primarily a self-evaluating department, portions of our program are extensively assessed by external evaluators as required by grants and contracts associated with those components. We also consider the needs of the students as determined by reflective discussions and written commentary.

Evaluation of actual course content and student performance is also critical to our mission as a department. As a faculty, we are concerned with the depth of understanding our graduates have developed. Each course is evaluated based on the departmental mission, vision, goals, and objectives. If our students meet the objectives for each class, we can then say that we are fulfilling our goals (see syllabi for evaluation methods and student assessments used in each course). Multiple methods are used in the determination of how well students are meeting course objectives. As professional educators and educational researchers, each faculty member models best practices in all classes taught. Teaching methods reflect findings of the education research community and foster independent learning guided by thoughtful experts in each subject taught. Students are encouraged to ask questions of faculty and one another, explore, apply knowledge, extend their learning outside of the classroom environment, and share their relevant experiences with classmates. Embedded assessments of student learning are typical

rather than the exception. Faculty members carefully monitor written assignments, in-class group work, and class discussions to assess the performance, participation, and areas of needed intervention for each student. The small class sizes typical of graduate courses offered by the department allow for mentorship of students and individualized instruction. Faculty members who guide required independent research evaluate the research performance, the written papers and the oral presentations to determine how well the learning expectations are being met.

IX. GRANTS AND CONTRACTS

Since the last self-study, the number of contracts and grants received by the department has grown significantly, as shown by the figure below.



A. Fit With Departmental Mission/Vision/Goals

The Science/Mathematics Education Department has received a number of grants and contracts from outside sources. Many were funded by the State of Texas or via National Science Foundation funds flowing through the University of Texas at Austin. Most of these were for long-term professional development with the goal of upgrading science/mathematics content and pedagogical content knowledge of science teachers. Other grants were for the development of learning materials for use by teachers in pre-college classrooms and associated professional development. The total funds received for these projects during the past five years amount to $529,331. Presently Science Education faculty have grants with the Texas Education Association, the University of Texas System, the Texas Commission on Environmental Quality, and NASA. Listed below is a

breakdown of received grants/contracts for the faculty from 2001 to present. Pending proposals are not included.

2005	
Description	**Amount**
The Physical Universe in the Classroom, PI, funded by the Texas Education Agency, 05/05 through 07/2006.	$81,990
Integrating Space Weather into UT Dallas Professional Development Programs for Teachers, Co-I NASA, Office of Science, 10/05-09/08. (Funded through the Center for Space Sciences).	$44,906
Regional Collaborative for Excellence in Science Education, PI, funded through the University of Texas at Austin, 3/2004 through 7/2005.	$105,000
Teaching Environmental Science, PI, funded by the Texas Commission on Environmental Quality, 5/2004 through 9/2004.	$20,000
MAT-SE Online: Co-PI funded by UT-TeleCampus (August – July) 2005-2007.	$79,435
Teacher Quality Grant "Taking them to the Top": PI Funded by Texas Education Agency (June – May) 2005-2006	$82,000
Hillcrest Foundation (Renovation of Kusch Auditorium): Co-I 2005.	$116,000

2004	
Description	**Amount**
Bringing Stars and Planets into Middle Schools with a New Set of Astronomy Lesson Plans, PI, NASA IDEAS Program, 04/04 through 03/07.	$35,180
UT Dallas/Mesquite ISD Integrated Physics and Chemistry Program, Co-I, funded by the Texas Education Agency, 05/04 through 09/2005.	$79,819
UT Dallas-NSF-DISD: Co-I "Chemistry LABoratory Experience" (June – May) 2004-2005.	$98,700

Texas Clean Air Grant: Co-PI, "AIR: You Are the Key" (June – August) 2004-2005.	$5,400
Teacher Quality Grant: "Taking Then to the Top" PI, funded by the Texas Education Agency (June – May) 2004-2005.	$80,000
Bringing Stars and Planets into Middle Schools with a New Set of Astronomy Lesson Plans, PI, NASA IDEAS Program, 04/04 through 03/07.	$35,180
UT Dallas/Mesquite ISD Integrated Physics and Chemistry Program, Co-I, funded by the Texas Education Agency, 05/04 through 09/2005.	$79,819
Regional Collaborative for Excellence in Science Education, PI, funded through the University of Texas at Austin, 3/2004 through 7/2005.	$23,000
Regional Collaborative for Excellence in Science Education, PI, funded through the University of Texas at Austin, 9/2004 through 7/2005.	$23,000
Teaching Environmental Science, PI, funded by the Texas Commission on Environmental Quality, 5/2004 through 9/2004.	$23,000
UT Dallas/Mesquite ISD Integrated Physics and Chemistry Program, PI, funded by the Texas Education Agency, 05/04 through 09/2005.	$79,819
UT Dallas/Richardson ISD 8th Grade Program, funded by the Texas Education Agency, 05/2004 – 09/2005.	$79,884

2003

Description	**Amount**
Regional Collaborative for Excellence in Science Education, PI, funded through the University of Texas at Austin, 9/1/02 through 8/31/03.	$23,920
Project ESTT (Enhancing Science Teaching in Texas), PI, Funded through the	$28,700

National Science Foundation, 1/9/03 through 11/30/03.	
UT Dallas/Mesquite ISD Integrated Physics and Chemistry Program, PI, Funded through The Texas Higher Education Coordinating Board, 5/19/03 through 4/1/04.	$79,026
Geography, Resources and Environment of Hispanic America: Co-PI (August – July).	$50,000

2002

Description	**Amount**
Eisenhower/Teacher quality grant, Start Sep 1, 2003 for 12 months.	$23,920
MT SCIENCE: Mobile Technology for teaching and learning SCIENCE in the real world: Co-PI (August – August) 2002.	$50,000
Course Development for Online Instruction: PI (June – August) 2002.	$3,500

2001

Description	**Amount**
UT Dallas Dinosaur Airlift, Bell Helicopter Textron, Requested funding for the airlift of the new UT Dallas-Dallas Museum of Natural History dinosaur from the desert in Big Bend National Park, approximately.	$30,000
Removal and Study of an Articulated Late Cretaceous (Maastrichtian) Gigantic Sauropod Neck, National Science Foundation.	$22,000

B. Proposed Areas for Growth

More external funding is needed to support our research programs in teaching and learning, our outreach programs, and as to serve our student population. Several pending proposals are being prepared for submission to multiple agencies, including the National Science Foundation and NASA.

C. Impediments to Funding Opportunities

Although the faculty has been highly successful at identifying and obtaining funding through federal block-grant programs to the state of Texas, we have not yet been successful in our proposals to major NSF STEM education programs. Our junior faculty has primarily sought NSF funds. Our rejections are likely due to the normal development

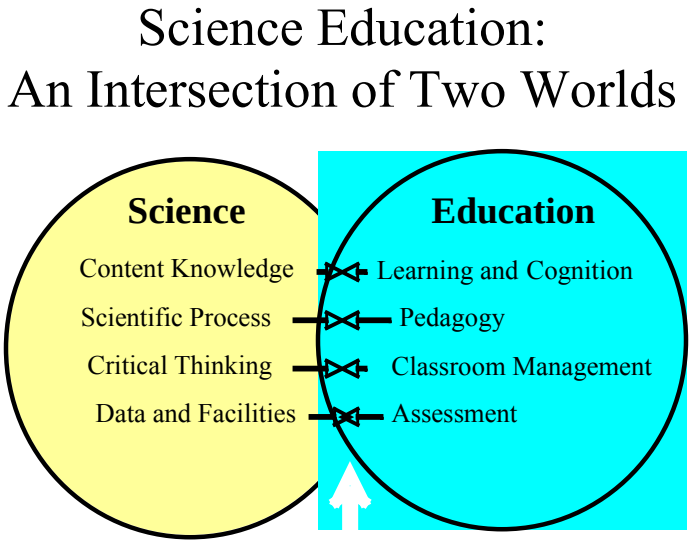
of the skills of the junior faculty in writing major proposals and the learning curve for becoming familiar with NSF programs. Our faculty members also lack the personal contacts with program officers that are known to improve success rates at other institutions. National recognition for our research programs in teaching and learning is critical for obtaining major funding, and our faculty is growing its reputation through presentations at national meetings and service with national and state organizations supporting STEM education. It is anticipated that when (and if) we receive permission to offer a doctoral program in Science Education, we will become better qualified for funding from the National Science Foundation and the Department of Education.

X. RESEARCH

Research within the Department of Science/Mathematics is diverse and reflects the nature of its faculty. Current research by faculty members falls into major categories: Research in teaching and learning of science and mathematics, and discipline science and mathematics research within the fields of our STEM discipline specialists.

A. Fit with Department Mission, Vision, and Goals

Research in science and mathematics teaching and learning conducted by the faculty involves early childhood through adult learners and teachers, and is focused on several areas including learning environments, knowledge transfer, design of instructional materials, advanced mathematical problem solving, teaching of gifted students in mathematics, preparation of pre-service teachers, and evaluation of professional development. Our research in science and mathematics education is crucial to achieving the department vision to be and to produce leaders in science and mathematics education at institutional, local, state, national and international levels by highlighting national science, technology, engineering and mathematics (STEM) education reform initiatives in order to support the development of best practices and provide opportunities for participation in cutting-edge research to current and future STEM education professionals. Research in teaching and learning also directly supports our mission and our goals.



Quality science education requires the successful integration of skills and knowledge from two very different fields (Urquhart, 2002). Mathematics education likewise requires expertise from mathematicians and educators.

Discipline specialists also conduct research within their fields of expertise, often through other NS&M departments and centers. Examples include lunar surface thermal mapping and landing hazards, Mars crustal volatile evolution and distribution, reconstruction of plate evolution in the Caribbean, dinosaur excavations in southwest Texas, number

theory with emphasis in quadratic diophantine equations, and combinatorics. A major strength and area of uniqueness for our department is having STEM researchers as faculty who share the same passion for improving STEM education as our education research faculty. Continuing to be active within their respective discipline facilitates the transfer of knowledge gained from cutting-edge research into classrooms, brings our students directly in regular contact with scientists and mathematicians, and insures the credibility and accuracy of science and mathematics content within our program. Each of these benefits directly serves our vision, mission, and goals.

B. Faculty Publications, Presentations, and Honors

Each faculty member has an extensive list of publications and presentations. Several samples are given later in this section; many more can be found in their vitas in the Appendix.

C. Proposed Areas for Growth

Recently hired discipline faculty members increasingly collaborate with education research faculty in research, and will continue to do so. The faculty is also partnering with other departments, research centers, and schools on joint projects and proposals in STEM education. From these interactions research in STEM and teaching and learning is expanding, and will continue to do so. Increasing numbers of graduate students in STEM disciplines are demonstrating an interest in pursuing discipline-specific education research with Science/Mathematics Education faculty. Hiring new faculty will extend these opportunities to new STEM content areas and open up new directions for STEM education research.

We anticipate that Ph.D. programs in Science and Mathematics Education will shift the department focus more strongly toward research, diversify our research in teaching and learning, and make the faculty more competitive in seeking external funding from major NSF and Department of Education Programs.

Discipline specialists within the faculty are also working to strengthen research programs within the fields for which they were trained. Renewed national interest in lunar science, paleontological discoveries in the Caribbean and southwest Texas by the faculty, and the hiring this year of an active mathematics researcher all demonstrate areas for potential growth of department research. We are, however, first and foremost a department of science and mathematics *education*. STEM-discipline trained faculty are dedicated to the educational mission and vision of the department and will remain so through any growth in their science and mathematics research programs.

Faculty Honors:

Butts, T. (2000). Certificate of Commendation for Work with Dallas ISD.

Fifer, F. (1999-2000). President, Science Teachers Association of Texas.

Fifer, F. (2002). Outstanding Educator Award, Partners Recognition Dinner, College of General Studies, The University of Texas at Dallas.

Fifer, F. (2003). Skoog Cup, Texas Tech University Howard Hughes Medical Institute Education Program, Science Teachers Association of Texas – Region 17, Science Teachers

Association of Texas. Presented to higher education faculty member in appreciation for outstanding contributions in the development of quality science education.

Ledbetter, C. (2004). Nancy Dillard-Lyon Outstanding Volunteer Award from St. Philips School for work with children in science.

Ledbetter, C. (1999). Lifetime Member of the Science Teachers Association of Texas

Urquhart, M.L. (2005). Outstanding Faculty Instructor Award for the School of Natural Sciences and Mathematics, University of Texas at Dallas

Urquhart, M.L. (2003). Appointment to NASA RoverQuest Project

Urquhart, M.L. (2000–2002). National Research Council Postdoctoral Research Award

Selected Faculty Publications:

Andreescu, T., Muskarov O., & Stoyanov, L. (2005). *Minima and maxima in geometry*. Boston, MA: Birkhauser.

Andreescu, T., & Andrica, D. (2005). *Complex numbers from A to ... Z.* Boston, MA: Birkhauser.

Andreescu, T., & Feng, Z. (2005). 103 Trigonometry problems: From the training of the USA IMO team. Boston, MA: Birkhauser.

Andreescu, T., & Andrica, D. (2004). On a Diophantine equation and its ramifications. *The College Mathematics Journal, 35*(1),15-21.

Andreescu, T., & Andrica, D. (2002). *An introduction to Diophantine equations*. Fort Lauderdale, FL:GIL Publishing House.

Andreescu, T., & Feng, Z. (2003). *A path to combinatorics for undergraduates.* Boston, MA: Birkhauser.

Andreescu, T., & Enescu, B. (2004). *Mathematical Olympiad treasures.* Boston, MA: Birkhauser.

Andreescu, T., & Andrica, D. (2003). *360 problems for mathematical contests.* Fort Lauderdale, FL: GIL Publishing House.

Andreescu, T., & Savchev, S. (2002). *Mathematical miniatures",* Washington, DC> Mathematical Association of America.

Andreescu, T., & Feng, Z. (2002). *102 combinatorial problems: From the training of the USA IMO Team.* Boston, MA: Birkhauser.

Butts, T., Rubenstein, R. N., & Craine, T. , et al. (2003, 2001). *Integrated mathematics*. Books 1– 3. Boston, MA: McDougal Littell.

Butts, T., Phillips, E., & Shaughnessy, M. (2003). *Functions and algebraic methods*. New York, NY: Harper Collins.

Butts, T. (1986-2006). I. Dallas, TX: Greater Dallas Council Teachers of Mathematics Competition Committee

Butts, T. (1999-2006). DISD math Olympiads for grades 4 – 12. Dallas, TX: Dallas Independent School District.

Butts, T. (2005). We all use math every day: Outreach program for NUMB3RS. Dallas, TX: Texas Instruments.

Curry, B. (2001). Hands on learning for pre-service teachers: Getting it right! *The Texas Science Teacher, 30*(1), 26.

Curry, B. (2000). Book review: Awesome experiments in light and sound. *The Texas Science Teacher, 29*(1), 35.

Curry, B. (2004). Effective geological fieldwork as part of a graduate program for practicing science teachers. *The Texas Science Teacher, 33*(1), 16.

Fifer, F. (1999). *Maximizing opportunities for all children*. Dallas, TX: Arrow Reprographics.

Nix, R.K., Fraser, B.J., **& Ledbetter, C.E**. (2005). Evaluating an integrated science learning environment using the Constructivist Learning Environment Survey (CLES). *Learning Environments Research 8,* 109 - 133.

Ledbetter, C. and Nix, R. (2002). Evaluation of an integrated science learning environment that bridges university classes and field trips. *Australian Association for Research in Education*, CD.

Ledbetter, C. (2000). *TEKSing through Penny ante Science (6 volumes).* Dallas, TX: SCE Associates.

Ledbetter, C. & Nix, R. (2000). Bringing back Big Bend: Teachers' adventure to be shared through virtual tour. *Dallas Outdoors, 1*(5), 9-11.

Pessagno, E., Cantu-Chapa, A., Hull, D., Kelldorf, M., Longoria, J., Martin, C., Meng, X., **Montgomery, H**., Fucugauchi, J., & Ogg, J. (1999). Stratigraphic evidence for northwest to southeast tectonic transport of Jurassic terranes in Central Mexico and the Caribbean (western Cuba): in Mann, P., ed., Caribbean Basins. Sedimentary Basins of the World, 4, Elsevier Science, Amsterdam, p. 123-150.

Fiorillo, A, Main, D., Bhattacharya, J., & **Montgomery, H.** (2000). Paleoecological analysis of a Juvenile Titanosaurid locality with the Javelina Formation of Big Bend National Park. *National Park Service Research, 4.*

Montgomery, H. (2000). Condemnation of 1277. *The Texas Science Teacher, 29*(1) 4.

Montgomery, H. (2001). Scientists through the eyes of children. *The Texas Science Teacher, 30*(1), 5-9.

Montgomery, H. (2001). Who needs a geological education, anyway? *The Texas Science Teacher, 30*(2), 7-8.

Montgomery, H. (2002). Analysis of a science education field trip to the Rocky Mountains, what have we learned? *The Texas Science Teacher, 31*(2), 28-31.

Montgomery, H. (2002). Sex, natural selection, and evolutionary implications. *The Texas Science Teacher, 31*(2), 5-6.

Montgomery, H. (2003). Primitive medical science. *The Texas Science Teacher, 32*(1), 5-9.

Montgomery, H. (2003). The evolution of an undergraduate service course – How to cope with success of an Age of Dinosaurs course: *Journal of Geological Education, 51*(3), 299-303.

Montgomery, H. (2004). Deposition and emplacement of Permian reefs in Sierra Plomosa, Chihuahua, Mexico. *Revista Mexicana de Ciencias Geologicas, 21*(2), 236-246.

Montgomery, H. (2004). Effective geological fieldwork as part of a graduate program for practicing science teachers. *The Texas Science Teacher, 33*(1), 16-23.

Montgomery, H. (2004). Evolution and the inevitable social quicksand of sexual selection. *The Texas Science Teacher, 33*(2), 5-7.

Montgomery, H. (2005). Constructivist pedagogical preferences of undergraduate students in geoscience service courses at the University of Texas at Dallas. *The Texas Science Teacher, 34*(1), 25-30.

Cabrol, N. A., Grin, E. A., Carr, M. H., Sutter, B., Moore, J. M., Farmer, J. D., Greeley, R., Kuzmin, R. O., DesMarais, D. J., Kramer, M.G., Newsom, H., Barber, C., Thorsos, I., Tanaka, K. L., Barlow, N. G., Fike, D. A., **Urquhart, M. L**., Grigsby, B., Grant, F. D., & de Goursac, O. (2003). Exploring Gusev Crater with Spirit: Review of science objectives and testable hypotheses. *Journal of Geophysical Research, 108*(E12), ROV 17-1.

Lucey, P.G, Blasius, K.R., Bussey, B., Hoelter, R.L., Gillis, J.J., Lawson, S.L., Mellon, M.T., Spenser, J., **Urquhart, M.L.,** Vasavada, A.R., & Wang, A.T. (2004) An imaging radiometer for measurement of lunar cold trap temperatures. Applications with Weather Satellites II, ed. Menzel et al., 5660, pp. 98-106.

Urquhart, M.L., & Bober, K. M. (2005). Impacting classroom teachers through long-term professional development. *Lunar Planetary Science, 37*, 1480.

Urquhart, M.L., & Gulick, C. (2002). Heat flow, thermal conductivity, and the plausibility of the "White Mars" hypothesis. *Lunar Planetary Science, 33,*1680.

Urquhart, M.L., & Gulick, C. (2003). Plausibility of the "White Mars" hypothesis based upon the thermal nature of the Martian subsurface. *Geophysics Research Letters, 30*, 1622.

Urquhart, M.L. (2004). From Mars to the classroom, *Texas Science Teacher, 33*, 38-41.

Urquhart, M.L. (2005). Impact of low thermal conductivity layers on the bulk conductivity of a Martian crustal column. *Lunar Planetary Science, 37*, 2337.

Urquhart, M.L. (2003). Possibilities of life on other worlds: Our solar system and beyond. *Texas Science Teacher, 32*, 37-41,

Urquhart, M.L. (2003). Space science in the early elementary classroom: A new twist on the classic scale model solar system activity. *Lunar Planetary Science, 35*, 1658.

Urquhart, M.L. (2002). Stars and planets: A new set of middle school activities. *Lunar Planetary Science, 35*, 2007.

Urquhart, M.L. (2004). The Cassini Spacecraft approaches Saturn. *Texas Science Teacher, 33*, 41.

Urquhart, M.L. (2003). Understanding our place in space: Scale in astronomy. *Texas Science Teacher, 32*, 37-41.

Urquhart, M.L., & Hairston, M.R. (2003). Bringing ionospheric exploration into pre-college classrooms: Meeting the challenges of EPO for the CINDI. *American Geophysical Union*, abstract #ED41E-01.

Urquhart, M.L., & Hairston, M.R. (2005). Space science for middle school teachers: Integrating CINDI E/PO into a long-term professional development program. *American Geophysical Union, abstract* #ED11C-1109.

Selected Faculty Presentations:

Andreescu, T. (2002). How to write a good problem. Invited lecture at Texas Tech University, TX.

Andreescu, T. (2002). Mathematics competitions and mainstream curriculum. Invited lecture at University of California at Los Angeles, CA.

Andreescu, T. (2002). On a class of Diophantine equations and its ramifications. Invited lecture at MAA Sectional Meeting, Ripon, WI.

Andreescu, T. (2002). Some of my favorite problems. Invited lecture at MathPath, Black Hills State University, Spearfish, SD.

Andreescu, T. (2002). The American mathematics competitions. Invited lecture at Ohio University, Athens, OH.

Andreescu, T. (2002). The mathematical Olympiad summer program. Invited lecture at University of Colorado, Colorado Springs, CO.

Andreescu, T. (2003). The US team at the International Mathematical Olympiad. Invited lecture at University of Puget Sound, WA.

Andreescu, T. (2005). Inducción matemática, un método elegante y de gran alcance. Paper presented at Seminario de Educación Matemática Iberoamericano con Énfasis en solución de Problemas, Cartagena, Colombia.

Andreescu, T. (2005). Mathematical Olympiad challenges. Invited lecture at Hotchkiss School, Lakeville, CT.

Andreescu, T. (2005). The USA Mathematical Olympiad and the MO Training Program. Invited lecture at "Math Time", Voineasa, Valcea, Romania.

Andreescu, T. (2005). To Putnam and beyond. Invited lecture at MAA Sectional Meeting, Arlington, TX.

Butts, T. (2002, February). Teaching mathematical reasoning: Some of my favorite examples [varies with audience]. Invited lecture at Conference on Mathematics Teaching 6–12, Huntsville, TX.

Butts, T. (2002, July). Geometry problems to motivate & fascinate [talk varies with audience]. Invited lecture at Conference for the Advancement of Mathematics Teaching, San Antonio TX.

Butts, T. (2002, July). 20 questions (& more) [varies with audience]. Invited lecture at Conference for the Advancement of Mathematics Teaching, Dallas, TX.

Butts, T. (2003, April). Teaching mathematical reasoning: Some of my favorite examples [varies with audience]. Invited lecture at National Council of Teachers Annual Meeting, San Antonio, TX.

Butts, T. (2003, July). Geometry problems to motivate & fascinate [talk varies with audience]. Invited lecture at Conference for the Advancement of Mathematics Teaching, San Antonio TX.

Butts, T. (2003, July). 20 questions (& more) [varies with audience]. Invited lecture at Conference for the Advancement of Mathematics Teaching, Dallas, TX.

Butts, T. (2004, July). Teaching mathematical reasoning: Some of my favorite examples [varies with audience]. Invited lecture at Conference for the Advancement of Mathematics Teaching, San Antonio, TX.

Butts, T. (2004, July). Geometry problems to motivate & fascinate [talk varies with audience]. Invited lecture at Conference for the Advancement of Mathematics Teaching, San Antonio TX.

Butts, T. (2004, July). 20 questions (& more) [varies with audience]. Invited lecture at Conference for the Advancement of Mathematics Teaching, Dallas, TX.

Butts, T. (2004, September). Teaching mathematics through problem solving: A personal perspective. Invited lecture at UT Dallas Center for Science/Mathematics Education Research Seminar for Lifelong Learning, Richardson, TX.

Butts, T. (2005, April). Conversely speaking. Invited lecture at MAA State Conference, Arlington, TX.

Butts, T. (2005, July). Teaching algebra and geometry through problem solving. Paper presented at the Conference for the Advancement of Mathematics Teaching, Dallas, TX,

Butts, T. (2005, July). 20 questions (& more) [varies with audience]. Invited lecture at Conference for the Advancement of Mathematics Teaching, Dallas, TX.

Butts, T. (2005, October). Teaching mathematics through problem solving: A personal perspective. Invited lecture at Knox College Alumni Mathematics Symposium, Galesburg, IL.

Butts, T. (2005, October). Using mathematics: From cryptography to catching criminals. Invited lecture at Mu Alpha Theta Honor Society, Bishop Lynch HS, Dallas, TX.

Curry, B. (2002, April). Utilizing problem solving and inquiry in the teaching of earth science at the college level. Geological Society of America, South-Central Section Meeting, Alpine, TX.

Curry, B. (2005, November). Inquiry in the science classroom. Invited lecture at UT Dallas Center for Science/Mathematics Education Research Seminar for Lifelong Learning, Richardson, TX.

Fifer, F. (2004, November). Critical thinking: A novel way of learning. Invited lecture at UT Dallas Center for Science/Mathematics Education Research Seminar for Lifelong Learning, Richardson, TX.

Fifer, F., & Ledbetter, C. (1999, October). Penny Ante Science using the TEKS. Paper presented at the Conference for the Advancement of Science Teaching, Lubbock, TX.

Fifer, F., & Ledbetter, C. (2000, October). Penny Ante Science & the TEKS. Paper presented at the Conference for the Advancement of Science Teaching, College Station, TX.

Fifer, F., & Ledbetter, C. (2001, October). Penny Ante Science & the TEKS. Paper presented at the Conference for the Advancement of Science Teaching, Austin, TX.

Fifer, F., & Ledbetter, C. (2002, November). Tackling the TAKS with Penny Ante Science. Paper presented at the Conference for the Advancement of Science Teaching, El Paso, TX.

Fifer, F., & Ledbetter, C. (2004, January). Tackling the TAKS with Penny Ante Science. Paper presented at the Mini-Conference for the Advancement of Science Teaching, Castleberry, TX.

Fifer, F. & Ledbetter, C. (2005, January). Problem solving with Penny Ante Science. Paper presented at the International Science Education Conference, Honolulu, Hawaii.

Fifer, F., & Ledbetter, C. (2005, April). Problem solving with Penny Ante Science. Paper presented at the National Science Teachers Association annual conference, Dallas, TX.

Hulse, R. (2004). Science, from Nobel to neighborhoods. Invited lecture at UT Dallas Center for Science/Mathematics Education Research Seminar for Lifelong Learning, Richardson, TX.

Fiorillo, A., & **Montgomery, H**. (2001, October). Depositional setting and paleoecological significance of a new sauropod bonebed in the Javelina Formation (Cretaceous) of Big Bend National Park, Texas. Paper presented at the Society of Vertebrate Paleontology, 61st annual meeting, Bozeman, MN.

Montgomery, H., & Fiorillo, A. (2001, October). Depositional setting and paleoecological significance of a new sauropod bonebed in the Javelina Formation (Cretaceous) of Big Bend National Park, Texas. Paper presented at the Geological Society of America, 35th annual meeting, Boston, MA.

Montgomery, H. (2002, April). Texas science teachers and earth science issues in the Big Bend Region. Paper presented at the Geological Society of America, South-Central Section Meeting, Alpine, TX.

Montgomery, H. & Ledbetter, C. (2002, October). A constructivist approach to field geology for science teachers. Paper presented at the annual meeting of the Geological Society of America, Denver, CO.

Houston, Linda S., Fraser, B., & **Ledbetter, C.** (2003, April). An evaluation of elementary school science kits in terms of classroom environment & student attitudes. Paper presented at the annual meeting of American Education Research Association, Chicago, IL.

Nix, R. & **Ledbetter, C**. (March 2001). A web (page) that works: What a concept (map)! Paper presented at the National Association for Research in Science Teaching annual meeting, St. Louis, MO.

Nix, R. & **Ledbetter, C.** (2001, December). Evaluation of an integrated science learning environment that bridges university classes & field trips. Paper presented at the annual meeting of Australian Association for Research in Education, Fremantle, Western Australia.

Nix, R. & **Ledbetter, C.** (2002, April) Drawing conclusions: A quick assessment of student understanding through concept map evaluation. Paper presented at the annual meeting of the National Association for Research in Science Teaching in New Orleans, LA.

Nix, R. & **Ledbetter, C.** (2002, November). Bringing back Big Bend. Paper presented at the Conference for the Advancement of Science Teaching, El Paso, TX.

Nix, R., Fraser, B., & **Ledbetter, C.** (2003, April). Evaluating an integrated science learning environment using a new form of the Constructivist Learning Environment Survey. Paper presented at the annual meeting of American Education Research Association, Chicago, IL.

Nix, R., **Ledbetter, C**., & Fraser, B. (2004, April). Designing, delivering & evaluating a field-based science course for teachers using the Constructivist Learning Environment Survey (CLES). Paper presented at the annual meeting of the National Association for Research in Science Teaching, Vancouver, BC.

Nix, R., **Ledbetter, C**., & Fraser, B. (2004, April). Use of the Constructivist Learning Environment Survey (CLES) to inform design, guide delivery, & enable multi-level evaluation of a field-based science course for teachers. Paper presented at the annual meeting of American Education Research Association, San Diego, CA.

Pujana, I., Stern, R. J., & **Ledbetter, C**. (2004, March). Developing a new undergraduate science course focused on Hispanic students at the University of Texas at Dallas: Geography, resources, & environment of Latin America. Paper presented at the South-Central - 38th Annual Meeting of the Geological Society of America, College Station, TX.

Urquhart, M.L., Hairston, M.R., Richardson, J., & Olson, C. (2003, November). Exploring Earth's ionosphere with CINDI. Paper presented at American Geophysical Union, Houston, TX.

Urquhart, M.L. (2004, April). How classroom techniques from a successful graduate astronomy course for pre-college teachers can apply to the undergraduate classroom. Invited paper presented at Quad Annual Cosmos in the Classroom Conference on Undergraduate Astronomy Education, Houston, TX.

Urquhart, M.L., & Turner, N. (2004, April). Developing a sense of scale. Invited paper presented at Quad Annual Cosmos in the Classroom Conference on Undergraduate Astronomy Education, Houston, TX.

Urquhart, M.L., & Hairston, M.R. (2004, November). Weather in *space*? What's that? Exploring Earth's ionosphere with CINDI. Paper presented at Conference for the Advancement of Science Teaching, Corpus Christi, TX.

Urquhart, M.L. (2004, November). Scale in the solar system, Paper presented at Conference for the Advancement of Science Teaching, Corpus Christi, TX.

Urquhart, M.L. (2005, April). Explore earth's ionosphere with CINDI. Paper presented at National Science Teachers Association Annual Meeting, Dallas, TX.

Urquhart, M.L. (2005,April). A scientist in a preschool classroom. Paper presented at National Science Teachers Association Annual Meeting, Dallas, TX.

Urquhart, M.L. (2005, June). Challenging and inspiring exploration through content. Invited paper presented at REACH Professional Development Meeting, Richardson Independent School District.

Urquhart, M.L. (2005, November). Weather in space?!? What's that? Let CINDI be your guide. Paper presented at Conference for the Advancement of Science Teaching, Houston, TX.

Urquhart, M.L. (2005, November). Voyage through astronomy with stars and planets. Paper presented at Conference for the Advancement of Science Teaching, Houston, TX.

XI. SPACE

As part of our goal of establishing a nationally recognized research/teaching program we envision a state-of-the-art facility for teaching and conducting research in science/mathematics education and in science and mathematics under the umbrella of the Center for Science/Mathematics Education Research (C-SER). This facility will be available to our faculty, our graduate students, local administrators, local teachers, and researchers interested in science and mathematics teaching and learning.

A. Fit with Mission/Vision/Goals

Recent and planned improvements in department office space, research and teaching facilities, and storage have been critical to achieving the mission of the department. To make our vision a reality and to achieve our goals for teaching, research, outreach, and leadership in the fields of science and mathematics education we must continue the positive trend in our facilities growth that began with our move into Founders North. Active science and mathematics researchers need facilities not only for their own work but to work with students. To adequately serve our students and to conduct the STEM education research critical to our success as leaders in STEM education, we require teaching/research facilities that demonstrate our institution's commitment to quality STEM education. The Department of Science/Mathematics Education is one of the few organizations within UT Dallas that has a primary role in interacting with members of the community and serving as ambassadors for STEM education. The state of our facilities impacts not only our ability to meet our goals and achieve our vision, but also reflects the commitment to STEM education of the community as a whole.

B. Offices

Office space required for our *current* six full time faculty members is approximately 100 square feet each (600 sq. ft.) with the normal connections to the Internet, phones, and electricity. Two offices are also available for a Visiting Scholar and a Lecturer, another 200 square feet. In addition we have a 320 square foot reception/sitting area, which includes storage for files, professional journals for student use and a tutoring area. Our support staff members occupy two offices (200 sq. ft.) with the same amenities as the faculty enjoy.

C. Research Laboratories

The old kitchen area, adjacent our office suite, is scheduled for renovation during the spring semester of 2006. The new facility, which will encompass approximately 540 square feet containing Dr. Montgomery's microscope room behind a separate locked door, two separate rooms for storage of teaching materials, and a main area that will be used for our courses that require wet lab benches (Marine Science, Ecology/Paleoecology of Galveston Bay, etc.), as well as for ongoing work by several of Dr. Montgomery's Geoscience graduate students in the areas of paleoecology and paleontology.

No research laboratories or dedicated computing facilities exist for other faculty or their students. Due to the nature of his geoscience research Dr. Montgomery's needs have been the greatest but are not unique within the department.

D. Teaching Laboratories

We have a new laboratory/classroom in Founders North that is busy every evening and some days. We share the Berkner laptop lab with all the departments in Natural Sciences and Mathematics. If the laptop lab is unavailable over the course of a year, it impacts some of our classes significantly. Sizes of both teaching facilities are inadequate for our grant-supported courses mandated to serve a minimum of 20 students.

Our immediate storage space issue has been solved: 432 square feet for storage of laboratory equipment and preparation of laboratory materials. However, science education is an especially materials-rich endeavor and our need will continue to grow with our department and our grant-supported programs.

E. Proposed areas for growth

Our immediate needs are for two offices for new faculty (200 square feet) in both science education and mathematics education, and for dedicated educational and teaching research space. At this time the Center for Science/Mathematics Education Research occupies 100 square feet (one office), which includes not only office space but storage. This space needs to at least double so that the actual operation of C-SER can move out of the department head's office.

Offices

Within five years we hope to have five new faculty members, one new staff member and three new teaching assistants along with the current group of eight faculty/staff members. These additions will bring our department personnel to a total of 17. We will need a total of eleven offices for faculty members, two offices for teaching assistants, and a reception area and offices for the three staff members; 600 square feet of office space plus an additional 300 square feet of storage and preparation space. Research assistants working with our department faculty, either in science/mathematics discipline research or in science/mathematics education research will require additional office space and computing capacity beyond that provided for teaching assistants.

Research Laboratories

We propose to provide flexible research laboratory space for existing physics and mathematics faculty that provides computing facilities and workspace for faculty and their research assistants to work on collaborative projects. In addition, we anticipate that new hires of content experts in biology, chemistry, and mathematics will require research facilities appropriate to their field. Simply allowing partial access to teaching laboratories in other departments as was done with Sherry Heron in Biology is not an acceptable solution and will make retention of new hires more difficult.

Research Classrooms

We propose that rooms be designed and built for research in science and mathematics as well as demonstration of educationally sound science and mathematics instruction. Development of four modular research classrooms could be done over a five year period, two now to provide space for our growing Master's of Arts in Teaching programs, and two within the next three years for the growth of our Doctor of Philosophy degrees in Science Education and in Mathematics Education.

The four research classrooms will provide a multipurpose learning environment to conduct instruction in a variety of science and mathematics disciplines. Each set of two can be constructed using a modular format. The initial facility consists of two 36' X 36' research classrooms with approximately 1300 square feet of classroom space joined by a 12' X 36' utility section and a 12' X 36' office unit on one end. Each research classroom can seat up to 24 participants. The 12' X 36', approximately 400 square foot, utility unit provides an area for a drying oven, acid storage cabinets and other equipment storage accessible by both classrooms, plus office space for teaching assistants. The classrooms and offices are networked to provide connections to the Internet. The office unit will provide storage and office space for faculty.

Each research classroom is assigned a primary and a secondary role. Research classroom A is designed as the main laboratory science room with a secondary role for lecture and group discussion. The primary role of research classroom B is computer and information technology aided science and mathematics instruction with a capacity for wet laboratory investigation and lecture instruction.

Research Classroom A – Laboratory Science

The wet laboratory will accommodate science instruction and research. It would be equipped with fixed laboratory workstations around the perimeter of the room. Each station would be equipped with a computer terminal for data collection and analyses. Central classroom seating will provide a lecture/discussion facility for 24 participants. The room would incorporate a demonstration station, and a ceiling mounted projection system linked to a multimedia computer workstation.

Research Classroom B – Internet Assisted Laboratory

The Internet assisted laboratory is configured to provide 24 modular computer workstations for Internet aided instruction and research. Fixed laboratory counters are arranged on either side of the room to provide facilities to support science instruction. The classroom is equipped with high-speed computer network connections and overhead projection systems to model the latest teaching tools and instruction methods.

Three to four years after construction of these two research classrooms we will need another set. These areas will in constant use by the Science/Mathematics Education Department, particularly if we include pre-service elementary and secondary science classes in our teaching.

XII. PROGRAM EVALUATION

Evaluation on of the Science/Mathematics Education Department is necessary to determine if we are fulfilling our mission and our vision. These are to have a positive and lasting impact on the quality of science and mathematics education and assist educators of science and mathematics in meeting the challenges of today's dynamic educational landscape in north Texas and beyond. The long term vision of Science/Mathematics Education Department is to be and to produce leaders in science and mathematics education at institutional, local, state, national and international levels by highlighting national science, technology, engineering and mathematics (STEM) education reform initiatives in order to support the development of best practices and provide opportunities for participation in cutting-edge research to current and future STEM education professionals.

Our mission is accomplished through high-quality content-rich professional education for teachers and educational administrators, innovative research and leadership in teaching and learning**,** educational outreach, and partnerships within UT Dallas and the broader educational community. Under UT Dallas Policy Memorandum 94-III.24-63, Academic Program Review, the Masters of Arts in Teaching programs will be reviewed formally every five years. Interim internal evaluations under the direction of the Department Head will encompass curriculum changes and completion rates, faculty and student profiles, class enrollment and satisfaction, relevant thesis topic availability, and the employment market for graduates. Exit interviews will be conducted with students who do, or do not, successfully complete the online program.

The program itself is viewed as a single entity and will be quantitatively and qualitatively evaluated as such. The Southern Association of Colleges and Schools accredit UT Dallas as a Level IV institution with no public sanctions. In particular, to measure the extent to which we are meeting the main program objectives, data will be collected, analyzed, and interpreted within the current and past market context, in terms of:

1. enrollment statistics to determine the number of Texas science and mathematics teachers seeking advanced degrees,
2. employment location to determine the geographic influence of the program, and
3. presentations and publications to suggest the amount of contributions to the growing field of educational research in K-14 science and mathematics.

Many of these data will be derived from the UT TeleCampus online evaluation system and/or the UT-Dallas 'regular' evaluation. Specific questions not covered in the standardized evaluations will be written to assess conformance of each class delivery (as presented in the syllabi) to the overarching program goals. Other valid and reliable instruments may also be used as appropriate. For example, versions of the 20-item Constructivist Learning Environment Survey (CLES, adapted by Nix, 2002) may be used to assess the degree to which the principles of constructivist practice have been implemented to inform objective 4. The 5 CLES scales directly support national reform goals and SBEC Standard II. Results will allow for determination of the perceived project and actual school classroom learning environments. A variety of methods for analyzing the current environment will allow faculty (and teachers) to use their knowledge to help students achieve.

Instructor performance is a vital factor in the success of each course. Course instructors, both lead and supporting, are assessed through a variety of quantitative and qualitative measures, as appropriate to the course. End-of-course evaluations are administered and reviewed, along with additional surveys for general course improvement. All participants and observers are encouraged to send comments and suggestions directly to the instructor, Department Head and/or program coordinator via email, phone, mail, or consultation.

The same instructors who have taught the on-campus courses will teach the online classes, thus ensuring consistency and quality between program options. Quantitative and qualitative data will be derived from the UTTC online evaluation system. Specific questions assess conformance of each class delivery (as presented in the syllabi) to the overarching program goals. Other valid and reliable instruments may also be used as appropriate.

A. Student evaluations

The faculty in Science/Mathematics Education exceed the teaching goals in quantity and, most importantly, in quality. Members have been recognized by outside groups as outstanding teachers. Currently, faculty members receive feedback on student perceptions of current service courses through the general evaluation system used by the University. The Science and Mathematics Education faculty consistently receives very high ratings (typically 4.0 to 5.0 out of 5.) for service courses offered. However, even with high ratings, there is always room for improvement. Our faculty takes this one step further by using student assessments within the framework of courses to determine instructor efficacy. Changes and improvements in teaching strategies and course design reflect the findings of the in-course assessments as well as from the end of course comments made by the students. From these assessments, and based on our attainment of our goals, the program undergoes continuous evaluation, allowing it evolve to serve the growing number of students with whom we interact.

B. Programmatic evaluations

Program evaluation is conducted by collaboration of the entire faculty. Faculty performance is viewed through end-of-term evaluations as well as in-class observations. In striving to enhance instruction, faculty collaborate discussing methodologies that are appropriate to the class population and content. Utilizing research-based pedagogy and incorporating it into instructor self-assessment and peer-assessment of strategies within the context of each course, allow for optimization of instruction. Whereas we are primarily a self-evaluating department, portions of our program are assessed by external. We also consider the needs of the students as determined by reflective discussions and written commentary.

Evaluation of actual course content and student performance is also critical to our mission as a department. As a faculty, we are concerned with the depth of understanding our graduates have developed. Each course is evaluated based on the departmental mission, vision, goals, and objectives. If our students meet the objectives for each class, we can then say that we are fulfilling our goals (see syllabi for evaluation methods and student assessments used in each course). Multiple methods are used in the determination of how well students are meeting course objectives. As professional educators and

educational researchers, each faculty member models best practices in all classes taught. Teaching methods reflect findings of the education research community and foster independent learning guided by thoughtful experts in each subject taught. Students are encouraged to ask questions of faculty and one another, explore, apply knowledge, extend their learning outside of the classroom environment, and share their relevant experiences with classmates. Embedded assessments of student learning are typical rather than the exception. The small class sizes typical of graduate courses offered by the department allow for mentorship of students and individualized instruction. Faculty members who guide required independent research evaluate the research performance; the written papers; and the oral presentations to determine how well the learning expectations are being met.

Our mission is accomplished through high-quality content-rich professional education for teachers and educational administrators, innovative research and leadership in teaching and learning**,** educational outreach, and partnerships within UT Dallas and the broader educational community.

C. Goals and evaluation measures

Goal 1: To facilitate the development of PK-14 classroom teachers into skilled educators with a depth of content knowledge and pedagogical content knowledge in the sciences and/or mathematics through best practices in science and mathematics education reflective of cutting-edge research and national STEM education reform initiatives.

Outcomes for Goal 1: Students, through coursework required, offered, and recommended by the department, will demonstrate the attributes of skilled educators with a depth of content knowledge and pedagogical content knowledge in the sciences and/or mathematics.

Goal 2: To develop the independent research and critical thinking abilities of our students (Science Education) along with a familiarity with research-based developments in STEM teaching and learning and education reform efforts.

Outcomes for Goal 2: Students will demonstrate independent research ability and critical thinking skills through course work and, when applicable, a thesis.

Goal 3: To increase our recognition as educators and researchers within UT Dallas, the local community, the state, and the nation through increasingly competitive and high quality Science Education and Mathematics Education Programs that produce leaders in science and/or mathematics education. Working toward Ph.D. programs in Science and Mathematics Education, as well as a successful implementation of the MAT-SE online are critical parts of this goal.

Outcomes for Goal 3: Faculty will contribute to the local, state and national initiatives and debates in STEM education as demonstrated by presentations at professional conferences, service with local, state, and national organizations, presentations at other academic institutions, and publications. Discipline specialists will remain aware of

cutting-edge research in their fields, will serve as advocates for education within the STEM community, and will be active discipline researchers when possible. Faculty will continue work toward Ph.D. programs in Science Education and Mathematics Education.

Goal 4: To leverage the diversity of our faculty through the integration of our ongoing science/mathematics discipline research with our innovative research and leadership in STEM teaching and learning.

Outcomes for Goal 4: Faculty will collaborate on research to merge discipline content knowledge with science/mathematics education expertise. Courses will reflect both accurate and up-to-date science/mathematics content and current research in STEM teaching and learning. Courses will be aligned with education reform initiatives such as the National Science Education Standards and the Principles and Standards for School Mathematics.

Goal 5: To utilize the diverse expertise of our faculty both within the department and in collaborative efforts with other departments and schools to strengthen the STEM pipeline at all levels.

Outcomes for Goal 5: Faculty will collaborate within the department ensuring quality professional development for science and mathematics teachers. Faculty will collaborative with other departments and schools to strengthen on course work for pre-service teachers and undergraduates to strengthen STEM pipeline at all levels.

Goal 6: To broaden our impact on STEM education at local, regional, and national levels through education outreach: both directly through our own educational outreach aimed at PK-14 students, pre-college teachers and partnerships with informal education institutions and indirectly through the support of the UT Dallas community's educational outreach efforts.

Outcomes for Goal 6: Faculty will engage ongoing outreach in local schools and work collaboratively with local districts as evidenced by outreach interactions occurring every semester and during the summer. There will be a department presence at the annual statewide Conference for the Advancement of Science Teaching and the Conference for the Advancement of Mathematics Teaching at the annual regional Conference for the Advancement of Science Teaching (mini-CAST) and NCTM Regional Conferences, and when possible at the annual meeting of the NSTA, NCTM, and other professional groups. Faculty will provide continued support of mathematics competitions at local, national, and international levels, through hosting, judging, and writing problems and will conduct summer camps and academic year activities for gifted students in mathematics and their teachers. Faculty will continue development of curriculum materials, textbooks, and outreach journal articles for national distribution.

D. Other measures

Teaching this broad range of undergraduates permits us to evaluate our effectiveness in teaching our graduate students, who are K-14 science and mathematics teachers. Faculty

members also work directly with PK-12 teachers and students through numerous educational outreach efforts and have an intimate understanding for the needs of pre-college teachers. The real-life evaluation and reflection in which the faculty regularly engages provides much richer assessments and deeper understanding of the broad picture of the overall state of education in Texas than can be provided through a simple pre/post-test.

Courses taught by the Science/Mathematics Education Department faculty integrate their diversity of expertise. Our courses, especially those supported by Teacher Quality Grants, regularly employ formative and summative assessments to ensure high quality. Courses are dynamic to meet the needs of students rather than static to minimize the burden on faculty. Each course is evaluated based on the departmental mission, vision, goals, and objectives. Embedded assessments of student learning are typical rather than the exception. If our students meet the objectives for each class, we can then say that we are fulfilling our goals (see syllabi for evaluation methods and student assessments used in each course). Multiple methods are used in the determination of how well students are meeting course objectives. Students are encouraged to ask questions of faculty and one another, explore, apply knowledge, extend their learning outside of the classroom environment, and share their relevant experiences with classmates.

Continuous internal evaluations of the Science/Mathematics Education Program under the direction of the Department Head will encompass curriculum changes and completion rates, faculty and student profiles, class enrollment and satisfaction, relevant thesis topic availability, and the employment market for graduates. In the last 40 years we have graduated more than 500 students in science education and more than 300 in mathematics education. This is approximately 90 percent of the students who enrolled in the MAT programs.

APPENDIX A – PERSONNEL FOR SPRING 2006

Department Chair	Cynthia E. Ledbetter, Ph.D.
Administrative Assistant	Tommie Kinnon
Assistant Professor	Homer Montgomery, Ph.D.
Assistant Professor	Mary L. Urquhart, Ph.D.
Associate Professor	Titu Andreescu, Ph.D.
Professor Emeritus.	Fred L. Fifer, Jr., Ph.D.
Professor	Thomas R. Butts, Ph.D.
Professor	Russell Hulse, Ph.D.
Science Education Specialist/Senior Lecturer. .	Barbara Curry, M.Ed.,M.A.T.
Secretary III	Monica Vielma

APPENDIX B – CURRICULUM VITAE OF FACULTY

Please see the following pages.

Included:

- Dr. Titu Andreescu
- Dr. Thomas R. Butts
- Ms. Barbara Curry
- Dr. Fred L. Fifer, Jr.
- Dr. Russell Hulse
- Dr. Cynthia E. Ledbetter
- Dr. Homer Montgomery
- Dr. Mary Urquhart

Curriculum Vitae
Titu Andreescu

Citizenship: USA

Work Address: School of Natural Sciences and Mathematics
University of Texas at Dallas
2601 N. Floyd Road, FN 33
Richardson, TX 75080
Telephone: 972- 883-2437
Email: titu.andreescu@utdallas.edu

Home Address: 17817 Coit Rd., Apt. 6105
Dallas, TX 75252
Telephone: 214-549-6146

Education:

Ph.D. in Mathematics, 2003
University of West Timisoara, Romania
Thesis advisor: Dr. Mihail Megan
Dissertation title: Research on Diophantine Analysis and Applications

B.A. and M.S. in Mathematics, 1980
University of West Timisoara, Romania

Professional Experience:

Jan. 2005-present — Associate Professor, Science/Mathematics Education Department, School of Natural Sciences and Mathematics, University of Texas at Dallas (UTD), Richardson TX.
Taught courses in Advanced Problem Solving, Euclidean Geometry for Teachers, Applied Calculus, College Algebra, and Theoretical Concepts of Calculus. Outreach activities included writing questions for the on-line UTD/UWW Mathematics Meet, sponsoring the Math Club, and organizing and training the UTD W. L. Putnam Mathematics Competition team.

Aug, 2003-Dec, 2004 — Visiting Scholar, University of Wisconsin-Whitewater (UWW), Whitewater, WI.
Taught courses in Algebra, Finite Mathematics for Business, College Geometry and Geometry for Elementary Teachers. Outreach activities included writing questions for two online UWW Mathematics Meets, and the Rock-Valley Conference Mathematics Meet, teaching a one-day teacher inservice on coaching middle and high school math teams, helping UWW students prepare for the W. L. Putnam mathematical competition, and authoring a weekly problems column for the *Royal Purple*, the UWW campus newspaper.

May-July, 2003 — Visiting Scholar, Tokai University, Tokyo, Japan.

International Mathematical Olympiad (IMO) Jury Executive

1998-May, 2003 — Director, Mathematical Association of America (MAA) American Mathematics Competitions (AMC), University of Nebraska-Lincoln (UNL), Lincoln, NE.
Responsible for overseeing operation of all of the AMC programs, including preparation of test items, compilation of tests, promotional activities, and grading and evaluation of exams.

Awarded a generous grant ($600,000.00) by the Akamai Technologies Foundation, making possible the expansion of the MOSP, which incorporates the training of the US Team for the IMO, from 30 to 175 students in 2002.

1991-1998 — Mathematics Teacher, Illinois Mathematics and Science Academy (IMSA), Aurora, IL.
Taught courses in advanced problem solving, calculus, multivariable calculus, differential equations, and number theory to high school students from throughout Illinois who were attending a state-sponsored school for highly gifted students. Developed curricula to promote student understanding of mathematics, with special emphasize on problem solving. Trained IMSA students to excel in the AMC examinations.

1980-1990 — Mathematics Teacher, Loga Academy, Timisoara, Romania.
Loga Academy is a special school for mathematically gifted Transylvanian students. Timisoara is the second largest city in Romania, population 550,000. Taught courses ranging from algebra and geometry to analysis and advanced problem solving. Trained Loga's students to strive in Mathematical Olympiads, including achieving gold medals in the IMO.

Other Student-oriented Activities:

1995-2002 — Director of the Mathematical Olympiad Summer Program (MOSP) and Leader of the US delegation to the IMO. In addition to MOSP teaching responsibilities, oversaw the work of the other instructors and closely supervised their teaching.

1994-2002 — Head Coach of the USA Mathematical Olympiad Team. Led the US team to its historic 1st place in 1994 when all six American students achieved perfect scores, unique performance in the 45-year history of the IMO. Led Team USA to 2nd place in 1996 and 2001, and 3rd place in 1998, 2000, and 2002 in a field of more than 80 participating countries.

1993-1999 — Grading room chair of American Regions Mathematics League (ARML)

1993-1994 and — Assistant Coach of the USA IMO Team

2003-Present

1991-1998 Coach of the Chicago Area All-star Mathematics Team

1991-1998 Co-sponsor of the IMSA chapter of Mu Alpha Theta

1983-1989 Counselor, Romanian Ministry of Education. Designed and implemented specialized programs to optimize the education of gifted middle and high school students, involving close interaction with university professors and senior teachers associated with Romania's best secondary schools. Assistant Coach of the Romanian Mathematics Olympiad Team and Deputy Leader of the Romanian Team for the Mathematical Contest of the Balkan Countries and the IMO.

Academic Honors/Awards:

2001-2003 On the list of MAA lecturers. The MAA has a program whereby each MAA section may invite at the MAA's expense one speaker from the list to lecture at their annual section meeting.

1995 Certificate of Appreciation Presented by President of the MAA for "Outstanding service as Coach of the USA Mathematical Olympiad Program in preparing the USA Team for its perfect performance in Hong Kong at the 1994 IMO".

1994 First place winner of Edith May Sliffe Award for Distinguished High School Mathematics Teaching, awarded by President of the MAA.

1983 Distinguished Teacher Award bestowed by the Romanian Secretary of Education.

Membership in Professional Societies:

- American Mathematical Society, since 1995
- Mathematical Association of America, since 1994
- National Council of Teachers of Mathematics, since 1992
- American-Romanian Academy, since 2002

Other Professional Activities:

2002-Present Consultant and reviewer for Birkhauser Boston

1999-Present Consultant for *Best Practices in Education (BPE).* BPE gives US teachers and researchers opportunities to identify, adapt, and disseminate exemplary practices and curricula from abroad.

1997-1999 Co-authored (with Mark Saul) the problem solving column in *Quantum*, a

quarterly mathematics journal for high school/college students and professionals

1993-1996 Authored monthly Problem Solving Column in the *Illinois Mathematics Teacher Journal*

1993-1995 Editor of *IMSA Mathematics Journal*

1986-1989 Secretary of the Romanian Mathematical Society, Timisoara

1981-1989 Editor-in-chief of Timisoara's *Mathematical Gazette*, Romania's mathematics journal with the second largest circulation

Invited Talks, Presentations, and Workshops:

Frequently invited to give lectures, run workshops, or assist with mathematics competition training at locations throughout the United States and the world. Have made presentations and given seminars and workshops in numerous countries throughout the globe, including Argentina, Austria, Australia, Brazil, Bulgaria, Canada, Colombia, Dominican Republic, France, Germany, Greece, Hong Kong, Hungary, India, Israel, Italy, Japan, Latvia, Lithuania, Mexico, Peru, Poland, Russia, South Korea, Taiwan, Turkey, United Kingdom, and the United States of America. Recent representative presentations include the following:

Recent Lectures, Seminars, and Workshops Given Abroad:

- Seminario de Educación Matemática Iberoamericano con Énfasis en solución de Problemas, Cartagena, Colombia, 2005
- Inivited lecturer at "Math Time", Voineasa, Valcea, Romania, 2005
- Lecturer at Tokai University in Tokyo, Japan, June, 2003
- Delivered a series of lectures to students and secondary teachers in Taipei and other major cities throughout Taiwan, March-April, 2002
- Trained the Israeli Mathematics Olympiad Team for a week at the Technical Institute, Haifa, Israel, April, 2002
- Worked with Columbian and Peruvian students training for the IMO at Antonio Narino University in Bogota, Columbia for a week in each of five years from 1996 through 2000
- Opening lecturer at Canada/USA MathCamp in Toronto, Canada, July, 2000
- Keynote speaker at the Gauss private school in Lima, Peru, January, 2000
- Consultant to the Iberoamerican Mathematics Olympiad in Puerto Plata, Dominican Republic, September, 1999
- Worked with Brazilian students preparing for their National Olympiad and the IMO at "Farias Brito" School in Fortaleza, Brazil, February, 2000 and February, 1999
- Keynote speaker at *MathCamp* in Vancouver, Canada, August, 1998
- Delivered a talk entitled *Mathematical Induction, an Elegant and Powerful Method* at the University of South Wales in Sidney, Australia, December, 1998
- One of four international experts involved in training university students preparing to be future coordinators of the IMO, Argentina, July, 1996

Recent Lectures in the United States:

- Hotchkiss School, Lakeville, CT, 2005
- MAA Sectional Meeting, Arlington, TX, 2005
- Mathematical Sciences Research Institute, Berkeley, CA, 2004
- University of Puget Sound, WA, 2003
- University of Colorado, Colorado Springs, CO, 2002
- MathPath, Black Hills State University, Spearfish, SD, 2002
- University of California at Los Angeles, CA, 2002
- Texas Tech University, TX, 2002
- MAA Sectional Meeting, Ripon, WI, 2002
- Ohio University, Athens, OH, 2002
- Phillips Exeter Academy, NH, 2002
- Hunter College, NY, 2002
- Stuyvesant High School, NY, 2002
- University of South Alabama, AL, 2001
- Colby College, ME, 2001
- Brooklyn Tech High School, NY, 2001
- Academy for Advancement of Science and Technology, NJ, 2001

Extramural Grant Support:

Co-principal Investigator, Akamai Technologies Grant to MAA American Mathematics Competitions. Amount: $600,000. Duration: 2000-2002 (with T. Straley and D. Albers)

Principal Investigator, U.S. Office of Naval Research Grant to MAA American Mathematics Competitions. Amount: $51,885 (1999), $54,830 (2000), $56,120 (2001). Duration: 1999-2002

Co-principal Investigator, U.S. Army Research Office Grant to MAA American Mathematics Competitions. Amount: $50,000. Duration: 2000-2001 (with W. Mientka)

Recent Committees:

2001-2002, 2004-Present	On the three-member panel of question writers for the W. L. Putnam Mathematical Competition, the premier collegiate-level mathematics contest in North America
2003-Present	Member of the IMO Advisory Board, the governing body of the International Mathematical Olympiad
2003-2004	Discussion Leader of Problem Solving Section at 10th International Congress of Mathematics Education (ICME), Copenhagen, Denmark
2002-Present	Member of the Editorial Board, Acta Universitatis Apulensis-Mathematica, "1 December 1918" University, Alba Iulia, Romania

2002-Present Secretary of the Asian-Pacific Mathematics Olympiad

1999-Present Leader of International Project in Problem Solving sponsored by Best Practices in Education. This project involves curriculum writing and interaction with teachers from the USA, Bulgaria, Romania and Hungary. Chaired, to date, four International workshops

1999-2000 Chaired Mathematics Competition Section at 9th International Congress of Mathematics Education (ICME), Makuhari, Japan

1996-2004 Chaired USAMO Committee, restructuring the contest to more closely resemble the IMO in format

Current Research Interests:

- Number Theory with emphasis in Quadratic Diophantine Equations
- Combinatorics
- Mathematics Education
- Problem Solving

Publications:

Refereed Research Articles (21)

T. Andreescu, *On a Class of Diophantine Equations, American Mathematical Monthly*, submitted

T. Andreescu, D. Andrica, *On the Diophantine Equations* $x^2 + uxy + vy^2 = \pm 1$, The Fibonacci Quarterly, submitted

T. Andreescu, D. Andrica, *Diophantine Representations of Some Generalized Lucas Sequences*, The Fibonacci Quarterly, submitted

T. Andreescu, W. Stromquist, Z. Sunik, *Bandwith Reduction in Rectangular Grids,* Discrete Mathematics, accepted

T. Andreescu, D. Andrica, *On a Diophantine Equation and its Ramifications,* The College Mathematics Journal, 1(2004) (**MR** 2023403)

T. Andreescu, C. Mortici, *O ecuatie diofantica cu aplicatii neasteptate [A Diophantine Equation with Unexpected Applications]* (Romanian), Gazeta Matematica seria B, 1(2003), 8-14

T. Andreescu, *Solutions to the Diophantine Equation* $(x + y + z + t)^2 = xyzt$, Studia Universitatis "Babes-Bolyai" – Mathematica, Vol. XLVIII, No.2 (2003), 3-7

T. Andreescu, *On the Equation* $x^3 + y^3 + z^3 + t^3 = n$, Matematika Plus, No. 3-4 (2002), 19-20

T. Andreescu, *A Note on the Equation* $(x+y+z)^2 = xyz$, General Mathematics, Vol. 10, No. 3-4 (2002), 17-22

T. Andreescu, D. Andrica, *Solvability and Unsolvability of the Diophantine Equation* $ax^2 - by^2 = c$, Octogon Mathematical Magazine, Vol. 10 (2002), No. 2, 706-709

T. Andreescu, D. Andrica, *Note on a General Negative Pell's Equation*, Octogon Mathematical Magazine, Vol. 10 (2002), No. 2, 703-705

T. Andreescu, *Note on the Equation* $x^2 + axy + y^2 = 1$, University of West Timisoara, Preprint Nr. 141 (2002), 1-6

T. Andreescu, *Asupra unei probleme de divizibilitate [On a Divisibility Problem]* (Romanian), Revista Matematica Timisoara, 1, 2(1988), 13-16

T. Andreescu, *O inegalitate integrala [An Integral Inequality]* (Romanian), Revista Matematica Timisoara, 1(1985), 20-21

T. Andreescu, D. Andrica, *Ecuatia lui Pell. Aplicatii [The Pell's Equation. Applications]* (Romanian), seria Caiete metodico-stiintifice, Nr. 15(1984), West University of Timisoara

T. Andreescu, D. Andrica, *Asupra unei clase de ecuatii de forma* $Ax^2 - By^2 = C$ *care nu admite solutie de baza [On a Class of Equations of the Type* $Ax^2 - By^2 = C$ *without Fundamental Solutions]* (Romanian), Gazeta Matematica seria B, 12(1983), 446-447

T. Andreescu, D. Andrica, *Conditii in care numerele an+b si cn+d sunt simultan patrate perfecte [Conditions Under Which an+b and cn+d are Simultaneously Perfect Squares]* (Romanian), Gazeta Matematica seria B, 7(1983), 265-266 (**MR** 85c: 11026) (**Zbl**: 0522.10008)

T. Andreescu, D. Andrica, *Existenta unei solutii de baza pentru ecuatia* $ax^2 - by^2 = 1$ *[The Existence of a Fundamental Solution to the Equation* $ax^2 - by^2 = 1$*]* (Romanian), Gazeta Matematica seria B, 2(1981), 52-54 (**MR** 83i: 10015) (**Zbl**: 0486.10015)

T. Andreescu, D. Andrica, *Rezolvarea in numere naturale a ecuatiei* $ax^2 - by^2 = 1$ *[On Solving the Diophantine Equation* $ax^2 - by^2 = 1$*]* (Romanian), Gazeta Matematica seria B, 4(1980), 146-148 (**MR** 81k: 10025) (**Zbl**: 0454.10008)

T. Andreescu, *O extindere a unei probleme de teoria numerelor [An Extension of a Number Theory Problem]* (Romanian), Gazeta Matematica seria B, 1(1980), 13-16 (**MR** 81f: 10012) (**Zbl**: 0428.10012)

T. Andreescu, D. Andrica, *Asupra unor clase de identitati [On a Class of Identities]* (Romanian), Gazeta Matematica seria B, 11(1978), 472-5 (**MR** 80j: 05011)

Expository Articles (5):

T. Andreescu, D. Andrica, *Proving Some Geometric Inequalities by Using Complex Numbers*, American Mathematics Monthly, submitted

T. Andreescu, C. Mortici, *Lema Intervalelor Inchise [On the Closed Intervals' Lemma]* (Romanian), Revista Matematica Timisoara, 2(2003), 3-9

T. Andreescu, B. Enescu, *Poligoane echiangulare (o caracterizare algebrica) [Equiangular Polygons (an Algebraic Characterization)] (*Romanian), Gazeta Matematica seria B, 1(2003) 3-10

T. Andreescu, D. Andrica, M. Drimbe, *Principiul trinomului in stabilirea unor inegalitati algebrice [The Trinomial Principle in Algebraic Inequalities]* (Romanian), Gazeta Matematica seria B, 9(1985), 332-338

T. Andreescu, *Asupra calculului unei sume [On the Computation of a Summation] (*Romanian), Gazeta Matematica seria B, 7(1980), 305-307

Research Monographs Authored (3):

T. Andreescu, O. Muskarov, L. Stoyanov, *"Minima and Maxima in Geometry"*, Birkhauser Boston, 2005, 264 pp.

T. Andreescu, D. Andrica, "*Complex Numbers from A to ... Z",* Birkhauser Boston, 2005, 364 pp.

T. Andreescu, D. Andrica, *An Introduction to Diophantine Equations*, GIL Publishing House, 2002, 198 pp. Also published in Romanian as: *O introducere in studiul ecuatiilor diofantiene,* Editura GIL, 2002, 202 pp.

Expository Books Authored (10):

T. Andreescu, C. Mortici, *Mathematical Bridges*, Birkhauser Boston, to appear

T. Andreescu, Z. Feng, *"103 Trigonometry Problems: From the Training of the USA IMO Team"*, Birkhauser Boston, 2005, 214 pp.

T. Andreescu, V. Cartoaje, G.Dospinescu, M. Lascu, *"Old and New Inequalities",* GIL Publishing House, 2004, 128 pp.

T. Andreescu, Z. Feng, *A Path to Combinatorics for Undergraduates,* Birkhauser Boston, 2003, 280 pp.
T. Andreescu, B. Enescu, "*Mathematical Olympiad Treasures",* Birkhauser Boston, 2004, 300 pp.

T. Andreescu, D. Andrica, *"360 Problems for Mathematical Contests",* GIL Publishing House, 2003, 320 pp.

T. Andreescu, S. Savchev, "*Mathematical Miniatures",* Mathematical Association of America, 2002, 230 pp.

T. Andreescu, Z. Feng, *"102 Combinatorial Problems: From the Training of the USA IMO Team"*, Birkhauser Boston, October 2002, 128 pp.

T. Andreescu, Z. Feng, *"101 Algebra Problems: From the Training of the USA IMO Team"*, Australian Mathematics Trust, July 2001, 150 pp.

T. Andreescu, R. Gelca., "*Mathematical Olympiad Challenges"*, Birkhauser Boston, 2000, 260 pp.

Books Edited (17)

T. Andreescu, Z. Feng, P.-S. Loh, editors, *USA and International Mathematical Olympiads 2004,* Mathematical Association of America, Mathematical Association of America, to appear.

T. Andreescu, Z. Feng, G. Lee, P.-R. Loh, editors, *Mathematical Olympiads: Problems and Solutions from Around the World, 2001-2002*, Mathematical Association of America, to appear.

T. Andreescu, Z. Feng, editors, *USA and International Mathematical Olympiads 2003,* Mathematical Association of America, 2004, 86 pp.

T. Andreescu, Z. Feng, G. Lee, editors, *Mathematical Olympiads: Problems and Solutions from Around the World, 2000-2001*, Mathematical Association of America, 2003, 280 pp.

T. Andreescu, Z. Feng, editors, *USA and International Mathematical Olympiads 2002,* Mathematical Association of America, 2003, 120 pp.

T. Andreescu, Z. Feng, editors, *Mathematical Olympiads: Problems and Solutions from Around the World, 1999-2000*, Mathematical Association of America, 2002, 260 pp.

T. Andreescu, Z. Feng, editors, *USA and International Mathematical Olympiads 2001,* Mathematical Association of America, 2002, 120 pp.

T. Andreescu, Z. Feng, editors, *USA and International Mathematical Olympiads 2000*, Mathematical Association of America, 2001, 120 pp.

T. Andreescu, Z. Feng, editors, *Mathematical Olympiads: Problems and Solutions from Around the World, 1998-1999*, Mathematical Association of America, 2000, 280 pp.

T. Andreescu, K. Kedlaya, editors, *Mathematical Contests 1997-1998: Olympiad Problems from Around the World, with Solutions*, American Mathematics Competitions, 1999, 224 pp.

T. Andreescu, K. Kedlaya, editors, *Mathematical Contests 1996-1997: Olympiad Problems from Around the World, with Solutions*, American Mathematics Competitions, 1998, 180 pp.

T. Andreescu, K. Kedlaya, P. Zeitz, editors, *Mathematical Contests 1995-1996: Olympiad Problems from Around the World, with Solutions*, American Mathematics Competitions, 1997, 200 pp.

T. Andreescu, et al., *Buletin matematic in sprijinul concursurilor scolare* (Romanian), Arad, litografiat, 1986, 206 pp.

T. Andreescu, et al., Probleme de matematica date la concursurile si examenele din 1984 (Romanian), Timisoara, 1986, 356 pp.

T. Andreescu, et al., *Probleme de matematica date la concursurile si examenele din 1983* (Romanian), Timisoara, 1984, 288 pp.

T. Andreescu, et al., *Teme si probleme pentru pregatirea olimpiadelor de matematica* (Romanian), Piatra Neamt, litografiat, 1984, 204 pp.

T. Andreescu , et al., *Enunturile si solutiile problemelor date la barajele pentru selectionarea loturilor largite si echipelor nationale de matematica* din anii 1975-1983 (Romanian), Piatra Neamt, litografiat, 1984, 212 pp.

References:

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VITA

Thomas Randle Butts

Present Position
Professor, Mathematics Education
University of Texas at Dallas

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Science and Mathematics Education Program
University of Texas at Dallas
P.O. Box 830688 FN 33
Richardson, TX 75083
972 - 883 – 4007

Educational Background
B.A. Knox College [Mathematics, Education], 1965
M.S. Michigan State University [Mathematics], 1967
PhD. Michigan State University [Mathematics], 1973

Previous Positions

1981	University of Texas at Dallas
1980,1981	Visiting Assistant Professor, The Ohio State University
1975 - 1981	Assistant Professor/Executive Officer Case Western Reserve University
1973 – 1975	Instructor /Acting Assistant Chairman Michigan State University

Research Interests
Mathematical Problem Solving, Visual Learning in Mathematics, Making Elementary Mathematics Meaningful, Mathematical Modeling and Proof in Mathematics

Thesis Title
On the Genus Field and Its Applications to Four Problems in Algebraic Number Theory

Selected Publications and Grants

- Integrated Mathematics, Books 1– 3, Senior Authors: Rheta N. Rubenstein, Timothy V. Craine, Thomas R. Butts; [8 additional authors] McDougal Littell, Boston, Massachusetts 1994, 1995, revised 1998, 2001, 2003
- Functions and Algebraic Methods with E. Phillips and M. Shaughnessy, Harper Collins, 2003 - updated version of Intermediate Algebra: Applications and Problem Solving, 2nd ed.1994
- Exploring Mathematics, Grades 6 - 8 [3 books], with 7 others, Scott Foresman, 1991, 1994, 1997
- Problem Solving, Grades 6-8, Module 13,Texas Education Agency, 1988, revision 1991, 166 pages.
- Problem Solving in Mathematics, Scott Foresman, 1973
- Guidelines for Teaching Algebra I and II [with 6 others], TEA, 1993
- Problem Solving Sourcebook, Grade 8, with J. Schultz, Scott Foresman, 1985

- "Posing Problems Properly", Problem Solving in School Mathematics, 1980 NCTM Yearbook, pp. 23 - 33
- "In Praise of Trial and Error", Mathematics Teacher, March 1985, pp. 167-173
- "Learning by Example", Mathematics Teacher, Feb. 1982, pp. 109-113
- "Fixed Point Iteration - An Interesting Way to Begin a Calculus Class", Two Year College Mathematics Journal , Jan. 1981, pp. 1-7
- "Algorithm" and "Number Theory" [revised 1998] , World Book Encyclopedia,
- Eisenhower grant: "Arithmetic Understanding Through Problem Solving", a program with K-4 teachers at Acton Elementary School in Duncanville ISD, 1994
- Eisenhower grant: Working with secondary mathematics teachers in Terrell, TX, 1995-1996

Selected Invited Talks

Teaching Algebra and Geometry Through Problem Solving]
Conf. for the Advancement of Mathematics Teaching, Dallas, TX, July, 2005

Teaching Mathematics Through Problem Solving: A Personal Perspective
Knox College Alumni Mathematics Symposium, Oct. 2005
UTDallas Lifelong Learning Seminar, Sept. 2004

Teaching Mathematical Reasoning: Some of My Favorite Examples [talk varies with audience]
Conference for the Advancement of Mathematics Teaching, San Antonio TX, July 2004
San Antonio, TX, National Council of Teachers Annual Meeting, April 2003
Conference on Mathematics Teaching 6–12, Huntsville, TX Feb. 2002

"Geometry Problems to Motivate and Fascinate" [talk varies with audience]
Conference for the Advancement of Mathematics Teaching, San Antonio TX, July 2004
Conference for the Advancement of Mathematics Teaching, Houston, TX, July 2003
Conference for the Advancement of Mathematics Teaching, Dallas, TX, July 2002
Conference for the Advancement of Mathematics Teaching, Dallas, TX, July 1999

"20 Questions [and More]" [talk varies with audience]
Conf. for the Advancement of Mathematics Teaching, Dallas, TX, July, 2005
Conference for the Advancement of Mathematics Teaching, San Antonio TX, July 2004
Conference for the Advancement of Mathematics Teaching, Houston, TX, July 2003
Conference for the Advancement of Mathematics Teaching, Dallas, TX, July 2002

"Conversely Speaking"
MAA State Conference, UTArlington, April, 2005

Conf. on Mathematics Teaching 6–12, Huntsville, TX Feb. 2004

"Mathematical Modeling for Teachers and Students"
Conference for the Advancement of Mathematics Teaching, Dallas, TX, July 1999
Conference for the Advancement of Mathematics Tching, Houston, TX, Aug. 1997
Conference for Secondary Mathematics Teaching – Huntsville, January, 1997;
Conference for the Advancement of Mathematics Teaching, Dallas, TX, Aug. 1996

"Teaching Problem Solving to Teachers and Other College Students"
Annual Meeting of the National Council of Teachers of Mathematics,
Orlando, FL, Apr. 1989

Numerous talks in Greater Dallas to teacher groups, student groups, inservice groups. Recent examples include workshops at McKinney ISD, Frisco ISD, Ursuline Academy, Bishop Lynch HS, Lake Highlands HS.

Teaching Experience

University of Texas at Dallas

- MMSEC grant - organize and conduct monthly all-day seminars and a summer course on various areas of elementary mathematics for lead teachers [K–6] from several elementary schools in DISD. Produced a substantial packet of materials each month and assisted with ordering appropriate manipulative materials, 1991-1992, 1993-1994
- Developed and taught a series of courses for secondary [6 – 12] mathematics teachers under the title Usual and Unusual Problems Using _____ [Algebra, Geometry, Precalculus, Calculus, Probability and Statistics, Discrete Mathematics, Mathematical Modeling]
- Developed and taught undergraduate courses in Mathematical Modeling for Teachers, Mathematical Problem Solving for Teachers, Foundations of Measurement and Informal Geometry [for 4–8 teachers]
- Taught one small grade 8 class in Algebra at Solomon Schecter Academy [1987-1989]
- Taught: Teaching Strategies in Mathematics, Curriculum and Instruction in Mathematics and Computer Science, Curriculum and Instruction in Mathematics for Elementary Teachers, Seminar in the Teaching of Mathematics and Computer Science
- Supervised over 175 student teachers in mathematics and computer science [granted "eminence" by the Texas Education Agency]
- Developed and taught courses for retraining teachers to become mathematics teachers through various programs sponsored by ARCO, Dallas ISD, and UTD.
- Developed and taught courses/workshops in algebra, geometry, and problem solving for teachers in Plano ISD, Dallas ISD, and other districts.
- Taught courses in Modern Geometry, Non-Euclidean Geometry, Real Analysis, Linear Algebra, Modern Algebra, Probability and Statistics, Applied Mathematics, Mathematical Modeling, Business Calculus, Mathematical Reasoning, and College Algebra/Precalculus.

The Ohio State University/Michigan State University

- Worked primarily in Mathematics Inservice Program teaching courses in problem solving and mathematics to elementary /secondary math teachers.[OSU] Taught all courses for elementary teachers, most courses for secondary teachers; developed and supervised [with E. Phillips] the remedial mathematics program for underprepared students .[MSU]

Case Western Reserve University

- CWRU had a small secondary teacher preparation program until 1980. I was responsible for all secondary teachers and the Math for Elementary Teachers.

- Taught number theory, calculus, linear algebra, for engineering and mathematics majors
- Coached the Putnam Team [finished first once; never below tenth] and conducted a weekly Problem Solving Seminar.

University and Community Service

University of Texas at Dallas

- American Junior High School Mathematics Examination [sponsored by MAA, NCTM, and 6 other groups] Chair: [1984 – 1990] Advisory panel [1990 -]
- Texas State Coordinator [1984 – 1992]
- American High School Mathematics Examination, Advisory panel [1982 -]
- Dallas ISD Math Olympiads, writer [1999 –]
- Editor, Student Math Notes committee, NCTM [2004-2005], member [2002 –]
- Writer: "We All Use Math Every Day" – the outreach program for the NUMB3RS TV shows coordinated by Texas Instruments [Oct. 2005 –]
- Editor, Mathematical Log, the official journal of Mu Alpha Theta, national high school mathematics honorary society, [1990 – 1997]
- Member, Content Writing Team for NCTM Media Grant: Figure This - Public Engagement and Understanding Initiative [1998 – 2001]
- General Chairman: NCTM Southern Regional Meeting, 1998
- Member: Program Committee 1988 NCTM Annual Meeting
- General Chairman: NCTM Southwestern Regional Meeting, 1986
- Greater Dallas Council of Teachers of Mathematics: vice-president [1985-86]; Contest Committee Chairman [1987 –], acting president [1995 - 1997, 2001,2004 -]
- Member - Mathematical Modeling Action Team, Texas SSI, [1997-8]
- Reviewer for NSF Teacher Enhancement Section [3 times]
- Southern Association Evaluator [many times]
- Science Fair judge [many times]
- Member - Committee on Qualifications UTD [1989 - 1991]
- Member - Natural Science Dean's Committee on Personnel [1998 - 1999]
- Member of advisory panel for several local and state projects
- Site liaison - Woodrow Wilson Foundation Summer Institutes for Teacher Teaching Teachers Program, [1991 – 1994]
- Reviewer – Texas Mathematics Teacher [2004 -]
- College Mathematics Journal [1998 -]

Case Western Reserve University and The Ohio State University

- Staff member for Ohio Regional Conferences in Mathematics Education - an NSF sponsored series of two-day conferences on problem solving, calculators, and general mathematics [1979 - 1980]

Michigan State University

- Co-director of the "Seminar in College Teaching" for all new graduate teaching assistants. [1971 - 1975]

Administrative Experience

Case Western Reserve University and Michigan State University

- At both schools I performed the role of Assistant Chairman responsible for scheduling, teaching assignments, student counselor and advisor, department representative on university committees, and contact person for the general public.

Barbara Ann Curry

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Education

Master of Arts in Teaching in Science Education, 1998
University of Texas at Dallas Emphasis in Geosciences
Successful completion of Secondary Life/Earth Sciences ExCET test
Master of Arts, Audiology, 1979
University of Illinois, Champaign-Urbana
Bachelor of Science, Deaf Education, 1977
Texas Woman's University
All-Level Deaf Education Teacher Certification
Elementary (K-6) Teacher Certification

Experience

University of Texas at Dallas Fall 1998 – Present

- Science Education Specialist/Senior Lecturer –Graduate Program in Science and Mathematics Education.
- Instructor for graduate elementary science classes, each one content specific for life, physical and earth sciences.
- Instructor for elementary science methods course for pre-service teachers.
- Organization and implementation of extended field experiences for teachers, in particular, total responsibility for coordinating field crew and logistics for the "Dino Airlift"– May 2001, and coordination and logistics for summer field experiences for teachers
- Recruiting of students for the Graduate Program in Science Education.
- Graduate Advisor for Graduate Program in Science and Mathematics Education
- Natural Science and Mathematics Committee for Graduate Recruitment

University of Texas at Dallas Fall 1995 - Summer 1998

- Graduate Teaching Assistant-Science Education. Duties included organization and utilization of science education lab.

Prairie Creek Elementary, Richardson ISD, Richardson, TX Fall 1991 to Spring 1995

- Classroom teacher for multihandicapped hearing impaired students.

Environmental Studies Center, Richardson ISD, Richardson, TX
Spring 1988 - Spring 1991

- Instructor – assisted in development and implementation of all level hands-on environmental education program.

Audiology and Business positions Fall 1979-Fall 1987

Additional Experience

The Texas Science Teacher 2000 – 2004
Assistant Editor for professional journal published by the Science Teachers Association of Texas.

NASA Summer 2001
Review panel to assess Earth Systems Education materials to be used for national distribution by NASA.

Cambridge Physics – Boston, Massachusetts Summer 2001
Institute for training in the Cambridge Physics curriculum for Integrated Physics and Chemistry.

Brownsville, Texas ISD Fall 2000 – Spring 2001
Conducted a series of In-Service training sessions for elementary teachers on FOSS (Full Option Science System) also including TEKS correlations and integration of science with other disciplines.

Dallas, Texas ISD Fall 2000 – Spring 2001
In-Service training sessions for elementary teachers in the understanding and implementation of the FOSS (Full Option Science System) kit based science program.

Midland, Texas ISD August 2000
Two day hands-on science In-Service for middle school teachers.

TEX-TEAMS Training Spring 1999, Spring 2000
Development and presentation of the technology portion for TexTeams training K-2 in science, Patterns, Properties and Models, and Systems, through The Dana Center, University of Texas at Austin.

TexLI Institute American Physical Society May 1999 – Present
Richardson ISD team member for the development and implementation of a district wide hands-on kit-based elementary science education program.

Dallas County Schools Spring 1999,
Correlation of extensive video library with the Texas Essential Knowledge and Skills

Building a Presence for Science (NSTA) 1999 – Present
Key leader for selected districts in Region 10. Purpose: To develop a network of science

Mesquite ISD, Mesquite, TX Fall 1998 - Fall 2000
Presentation of a series of 8 In-Service programs on how to implement the science TEKS for Grades K-1.

TAG Science Program – St. Phillips School Fall 1998 - Spring 1999
Development and implementation of after school gifted program for students in grades 2 through 5.

Wilmer-Hutchins ISD, Dallas, TX Fall 1998 to Spring 1999
Assist in the presentation of In-Service programs for hands-on, inquiry-based science education for elementary teachers utilizing FOSS.

Dallas Arboretum June 1997
Coordinator for Kids Nature Club. Duties included development of curriculum, training and supervision of volunteer staff, coordination of scheduled groups.

Publications

- "Hands on Learning for Pre-Service Teachers: Getting it Right!" *The Texas Science Teacher*, April 2001, Volume 30, Number 1, Page 26
- Book Review, Awesome Experiments in Light and Sound, *The Texas Science Teacher*, April 2000, Volume 29, Number 1, Page 35

- "Effective Geological Fieldwork as Part of a Graduate Program for Practicing Science Teachers" *The Texas Science Teacher,* April 2004, Volume 33, Number 1, Page16

Grants

- **Co-PI: Texas Regional Collaborative for Excellence in Science Teaching,** funded through University of Texas at Austin, TEA, 8/31/05 through 8/31/06, Total Funded: $105,000
- **Co-PI: Teacher Quality Grant, Texas Higher Education Coordinating Board**, UTD/Richardson ISD Integrated Physics and Chemistry Program, 5/19/03 through 4/1/04, Total funded: $79,026
- **Co-PI: Texas Commission For Environmental Quality** Environmental Course for Teachers, 6/2/05 through 8/31/05, Total Funded: $19,000,
- **Co-PI: Teacher Quality Grant, Texas Higher Education Coordinating Board** UTD/Richardson ISD Eighth Grade Science, 8/1/04 through 12/31/05,Total Funded: $79,884
- **Co-PI: Texas Commission For Environmental Quality** Environmental Course for Teachers, 6/2/04 through 8/31/04, Total Funded: $24,000,
- **Co-PI: Regional Collaborative For Excellence in Science Education**, funded through the University of Texas at Austin, 3/01/04 through 7/31/05, Total funded: $23,000
- **Co-PI: Texas Regional Collaborative for Excellence in Science Teaching,** funded through the University of Texas at Austin, 3/1/04 through 7/31/05, Total funded: $23,000
- **Co-PI: Regional Collaborative For Excellence in Science Education**, funded through the University of Texas at Austin, 9/1/02 through 8/31/03, Total funded: $23,920
- **Co-PI: National Science Foundation**, Project ESTT (Enhancing Science Teaching in Texas) 1/9/03 through 11/30/03, Total funded: $28,700
- **Co-PI: Teacher Quality Grant, Texas Higher Education Coordinating Board**, UTD/Mesquite ISD Integrated Physics and Chemistry Program, 5/19/03 through 4/1/04, Total funded: $79,026

Refereed Conference Presentations

Curry, B., Utilizing Problem Solving and Inquiry in the Teaching of Earth Science at the College Level. Geological Society of America, South-Central Section Meeting. Abstract with Program, Sul Ross University, Alpine, Texas

And Others

Inquiry in the Science Classroom, Seminar Series for Lifelong Learners, November 14,2005, Sponsored by the UT Dallas Department of Science and Mathematics Education

Professional Affiliations

- National Science Teachers Association (NSTA)
- Science Teachers Association of Texas (STAT)
- Texas Council of Elementary Science (TCES)
- Metroplex Association of Science Supervisors (MASS)

VITA

PERSONAL DATA

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Married, 3-sons

EDUCATIONAL DATA

1960	B.S. Stephen F. Austin State University, Nacogdoches, TX, Biology and General Business
1970	M.S. East Texas State University, Commerce, TX, Earth Science
1973	Ph.D. Peabody College/Vanderbilt University, Nashville, TN, Curriculum and Instruction - Science Education

PROFESSIONAL DATA

1962-71	**Teacher**, Earth and Physical Science, Tyler I.S.D., Tyler, TX.
1967-70	**Assistant Principal** (Part Time), J. R. Moore Jr. High School, Tyler I.S.D., Tyler, TX.
1971-73	**Deputy Director**, CEMREL, Inc., [Educational Research and Development Laboratory], Nashville, TN.
1973-75	**Project Director**, Region 10 Education Service Center, Richardson, TX.
1974-80	**Assistant Professor**, The University of Texas at Dallas, Science/Mathematics Education, Richardson, TX.
1974-78	**Visiting Assistant Professor**, Southern Methodist University, Education Department, Dallas, TX.
1977 (Summer)	**Visiting Associate Professor**, Moorhead State University, Education Department, Moorhead, MN.
1980-90	**Associate Professor**, The University of Texas at Dallas, Science/Mathematics Education, Richardson, TX.
1981-2000	**Program Head**, Science/Mathematics Education Program, The University

	of Texas at Dallas, Richardson, TX.
1983-2000	**Director**, Center for Research in Teaching and Learning, The University of Texas at Dallas, Richardson, TX.
1990-1993	**Associate Dean**, The University of Texas at Dallas, Undergraduate Studies, Richardson, TX.
1990-2000	**Professor**, The University of Texas at Dallas, Science/Mathematics Education, Richardson, TX.
1996-1999	**Director,** Office of Teacher Education, The University of Texas at Dallas, Richardson, TX.
2000-Present	**Professor Emeritus,** Partitime Lecturer, The University of Texas at Dallas, Richardson, TX.

PROFESSIONAL MEMBERSHIPS

Sigma Xi, National and local memberships. Served as Secretary, Treasurer, Vice-President for Programs and President of the UT-Dallas Chapter.

Phi Delta Kappa, International and local memberships. Served as Vice-President and President of the Dallas/Metro-North Chapter.

National Science Teachers Association, National membership. Served on Junior High School Curriculum Review Committee, twice nominated for District Director -District-10, served on national convention planning team - facilities (Dallas), co-coordinator for college papers (Houston), served as college paper coordinator (Ft. Worth Regional).

Science Teachers Association of Texas, State membership. Served on various planning committees, nominated for Vice-President, chaired programming for regional conference. Elected President for 1999-2000.

Texas Association of Teacher Educators, State membership, served on Board of Directors.

Texas Society of College Teachers of Education, State membership.

Texas Association for Environmental Education, State membership, served on Board of Directors.

Texas Association for Science Supervisors, State membership.

Metroplex Association for Science Supervision, local membership.

UNIVERSITY/COMMUNITY SERVICE

Chair, Senate Committee - Parking and Security

Member, Senate Committee - Student Life

Chair, Council on Teacher Education

Member, Dallas I.S.D. Teacher Center

Chair, Northeast Texas Suburban Teacher Education Center

Member, ad hoc, Search Committee - Multicultural Education faculty position.

Member, ad hoc, Search Committee - Mathematics Education faculty position.

Member, ad hoc, Search Committee - Science Education faculty position.

Member, ad hoc, Tenure Review Committee - Milton Cohen (English Education).

Chair, ad hoc, Tenure Review Committee - William Kermis (Science Education).

Chair, ad hoc, Tenure Review Committee - Thomas Butts (Mathematics Education).

Consultant, Joint Dissemination Review Panel Application for Exemplary Programs (U.S.O.E., N.I.E.), Washington, D.C., 1978.

Member, Undergraduate Study Committee - Admission, Recruitment and Retention of Freshmen, UT-Dallas.

Member, Undergraduate Study Committee (Natural Sciences and Mathematics) - Undergraduate Curriculum.

Member, Clark Committee (Recruitment of exemplary high school juniors for summer internships)

Member, National Energy Foundation (TU-Electric Region) Board of Directors.

Chair, Dissertation Committee, Segun Ogunbemi, Humanities Program, UT-Dallas, 1984.

Co-Author, (Press Release), "Math/Science Slump in Texas Schools Threatens State's and Student's Futures," News and Information Service, UT Dallas, Richardson, TX.

Research Quoted, "Study: Students Who Shun Math Limit Job Choice," Dallas Times Herald, Thursday, August 14, 1986.

Research Quoted, "Too Few Students In Texas Take Math, Research Says," Dallas Morning News, Friday, August 15, 1986.

Interviewed, "Options for the 80's," KZPS-FM (92.5) KAAM-FM (1310), Vickie Robbins, News and Public Affairs Director, May 08, 1986.

Interviewed, “Math/Science Problems in Texas/U.S.," KERA-FM (90.1), Karen Dennard, Public Affairs Director, July 28, 1986.

Interviewed, "Math/Science Education Problems for the 21st Century," KRLD-AM (1190), Metro-News, August 15, 1986.

Interviewed, "Math and Science -- Shortages/Needs," KVIL-FM (103.1), Daily Metro News/Interview Programming, August 15, 1986.

Member, Biological Research Committee, The 32nd Annual Dallas Morning News Regional Science and Engineering Fair.

Member, Advisory Committee, Texas Aviation and Space Education Forum, Inc.

Chair, Dissertation Committee, Penelope Colbaugh, Biology Program, UT-Dallas., 1988.

Area Chair, Science Evaluation, Mesquite I.S.D. Southern Association Evaluation.

Chair, "Joint Dissemination Review Panel Application for Exemplary Programs," Dallas I.S.D.,Dallas, TX.

Chair, "K-12 Science Curriculum Continuum," Greenhill School, Dallas, TX.

Chair, Evaluation of First Baptist Academy, Utilizing the Kunkel-McIlhinney Model for Program Evaluation, First Baptist Academy, Dallas, TX.

Chair, "Laboratory Organizational Techniques for Middle School and High School Science Courses," Ft. Worth I.S.D., Ft. Worth, TX.

Area Chair, Science Evaluation, Irving I.S.D. Southern Association Evaluation.

Area Chair, Science Evaluation, The Waldon School Southern Association Evaluation.

Area Chair, Science Evaluation, Lancaster I.S.D. Southern Association Evaluation.

Area Chair, Science Evaluation, North Dallas High School, Dallas I.S.D. Southern Association Evaluation.

Area Chair, Science Evaluation, North Garland High School, Garland I.S.D. Southern Association Evaluation.

Area Chair, Science Evaluation, Vanston Middle School, Mesquite I.S.D. Southern Association Evaluation.

Area Chair, Science Evaluation, McDonald Middle School, Mesquite I.S.D. Southern Association Evaluation.

Area Chair, Science Evaluation, Allen I.S.D. Southern Association Evaluation.

Area Chair, Newman Smith High School, Carrollton-Farmers Branch I.S.D. Southern Association Evaluation.

Area Chair, Science/Mathematics Education, Texas Education Agency Self-Study Report, UT-Dallas, 1977.

Area Chair, Science/Mathematics Education, Texas Education Agency Self-Study Report, UT-Dallas, 1988.

Chair, ad hoc Committee - Cynthia E. Ledbetter, Promotion and Review, Science Education

Chair, ad hoc Committee - Thomas R. Butts, Review for Full Professor, Math Education

Member, Committee on Teaching Effectiveness

Member, University Library Committee

Chair, Council on Teacher Education, UT-Dallas

Member, Advisory Board, Urban Systemic Initiative, Dallas ISD, Dallas, TX.

HONORS

1968	Nominated, **Earth Science Teacher of the Year-Texas.**
1977	Invited Speaker, **World Conference On Curriculum and Instruction,** Istanbul, Turkey.
1981	Invited Speaker, **World Conference for Pure and Applied Physics International Conference on the Teaching of Science,** Trieste, Italy.
1981-82	Fulbright Nominee, **Science/Mathematics Curriculum Study**, Cypriot Turkish Office of Education, Cyprus.
1984	Concurrent Speaker, "Integrating Science Activities Into Other Subject Areas," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Annual Convention, Arlington, TX.
1984	Concurrent Speaker, "Field Collecting Techniques for elementary Science Teachers," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Annual Convention, Arlington, TX.

1985 Keynote Speaker, (Science Section), "Critical Issues in Science Education," Texas Junior College Association Convention, Dallas, TX.

1985 Keynote Speaker, "Critical Issues In American Education," Texas Association of Non-Public Schools Annual Convention, Dallas, TX.

1986 Keynote Speaker, "Critical Issues in Science/Mathematics Education - Challenges for the Future," Mesquite I.S.D. All School ln-Service Program, Mesquite, TX.

1986 Keynote Speaker, "Critical Issues Not In the Reform Reports," Ashland Community College, Kentucky Community College Annual Meting, Ashland, KY.

1988 Nominee, **Chancellor's Council Outstanding Teacher Award**, University of Texas System.

1988 Nominee, **Alvin C. Eurich Foundation Award for Outstanding Teaching**.

1988 Nominee, **Minne Stevens Piper Award for Outstanding Teaching.**

1989 Speaker, "Status of Science/Mathematics In Texas Public Schools," Fifth Annual Eisenhower Grants Meeting, San Antonio, TX.

1989 Speaker, "Critical Issues in Science Education," Dallas I.S.D. Science Teachers Association Annual Spring Banquet, Dallas, TX.

1990 Concurrent Speaker, "Hand's On, Mind's On Science," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Annual Convention, Ft. Worth, TX.

1990 Recipient, **Chancellor's Council Outstanding Teacher Award,** University of Texas System.

1990 Recipient**, Certificate of Appreciation for Exemplary Leadership,** South and West Dallas Learning Centers, Dallas, I.S.D.

1990 Recipient, **Honorary Life Membership Award**, Science Teachers Association of Texas.

1991 Recipient, **TTOPS Award for Outstanding Service,** Texas Teachers of Physical Science Association.

1992 Recipient, **Texas Academy of Science Fellow Award**, Texas Academy of Science Annual Convention.

1994 Recipient of Patent, **Educational Device**, Patent No. 5,299,806, Granted April 05, 1994.

1998-99 President-Elect, Science Teachers Association of Texas.

1999-0 0 President, Science Teachers Association of Texas.

2002 Recipient, Outstanding Educator Award, Partners Recognition Dinner, College of General Studies, The University of Texas at Dallas, February, 2002.

2003 Recipient, Skoog Cup, Texas Tech University Howard Hughes Medical Institute Education Program, Science Teachers Association of Texas – Region 17, Science Teachers Association of Texas. [Presented to higher education faculty member in appreciation for outstanding contributions in the development of quality science education. 2002-2003

EDUCATIONAL IN-SERVICE AND WORKSHOP ACTIVITIES

Presenter, "Texas Science Framework," Ellis County In-Service, Ferris, Texas.

Consultant, "Elementary Science Programs," St. Michael's School, Dallas, Texas.

Consultant, "Elementary Science Programs," St. John's School, Dallas, Texas.

Consultant, "Teacher Competencies in Science Teaching," Garland I.S.D., Garland, TX.

Presenter, "Texas Science Framework Proposal," Science Teachers Association of Texas Convention, Edinburg, TX.

Presenter, "UT-Dallas M.A.T. Science Education Program," Grapevine I.S.D., Grapevine, TX.

Presenter, "UT-Dallas M.A.T. Science Education Program," Plano I.S.D., Plano, TX.

Presenter, "Hands On Science," Association for the Education of Teachers of Science Annual convention, El Paso, TX.

Presenter, " Higher Order Thinking Skills," Region 10 E.S.C. MiniCAST Convention, Mesquite, TX.

Presenter, "UT-Dallas M.A.T. Program," Highland Park I.S.D., Dallas, TX.

Presenter, "Secondary Math-A Laboratory Approach," Azle I.S.D., Azle, TX.

Presenter, "Middle School Science Teaching," Lamar Middle School, Irving, TX.

Presenter, "Science Teaching - An Approach for the 80's," National Science Teachers Association Regional Convention, Phoenix, AZ.

Presenter, "New Science Framework/PAL Program - A Blending of Innovative Curriculum With An Effective Instructional Process," World Conference On Education, Istanbul, Turkey.

Presenter, "Positive Active Leadership Program," National Association of Secondary School Principals Convention, Las Vegas, NA.

Presenter, "The DSII Mini-Grant Project," Region 10, 11, 13, 20, and 21 Education Service Centers, Texas.

Presenter, "The MOD Project," Conference at the Chase, St. Louis, MO.

Presenter, "The MOD Project," Regions 10, 11, 13, 20, and 21 Education Service Centers, Texas.

Presenter, "Prescriptive Reading Program," Samuel High School English Department, Dallas I.S.D., Dallas, TX.

Presenter, "Word Attack Skills Program," Sherman I.S.D., Sherman, TX.

Presenter, "Improving Curriculum Through Positive Active Leadership," Association for Supervisors and Curriculum Developers/World Congress of Curriculum and Instruction, World Conference, Houston, TX.

Presenter, "Earth Science Revisited," Texas Academy of Sciences, Arlington, TX.

Presenter, "Laboratory Techniques for Secondary Science Teachers," Coppell I.S.D. In-Service, Coppell, TX.

Presenter, "The JDRP Process," Promises and Practices Workshop, Region IV, Lubbock, TX.

Presenter, "Development of Activity/Learning Centers for Alternatives in Classroom Teaching," Carrollton-Farmers Branch I.S.D., Carrollton, TX.

Presenter, "The JDRP Process," NDN/TAB Region III Virginia Conference, Richmond, VA.

Presenter, "The JDRP Process," TAB Task Force Meeting, Dallas, TX.

Presenter, "The JDRP Process," NDN/TAB Region III Georgia Conference, Atlanta, GA.

Presenter, "The JDRP Process, NDN/TAB Region IV Texas Conference, Dallas, TX.

Presenter, "The JDRP Process," NDN/TAB Region III Conference on Higher Education, Knoxville, TN.

Presenter, "Textbook Evaluation Format," Texas Association for Supervision and Curriculum Developers Convention, Dallas, TX.

Presenter, "The Region V NDN/TAB Evaluation Model for State Facilitators and Developers/Demonstrators," Dallas, TX.

Presenter, "IHE/NDN Task Force Report," Region III Conference on Higher Education, Roanoke, VA.

Presenter, "Science Textbook Selection," Grapevine-Colleyville I.S.D., Grapevine, TX.

Presenter, "Laboratory Organization," Dallas I.S.D., Dallas, TX.

Presenter, "Science Textbook Selection," National Science Teachers Association Convention, Atlanta, GA.

Presenter, "Classroom Management," Carrollton-Farmers Branch I.S.D., Carrollton, TX.

Presenter, "Management Training," National Diffusion Network, Region IV, Dallas, TX.

Presenter, "Texas State Facilitator Project," Region VII E.S.C. (Kilgore, TX), Region VI (Huntsville, TX), Region 10 (Richardson, TX).

Presenter, "The Special Learner in Science-Elementary and Secondary Classrooms," Madisonville I.S.D., Madisonville, TX.

Presenter, "The Special Learner in Science-Elementary and Secondary Classrooms, Sealy I.S.D., Sealy, TX.

Presenter, "The Special Learner in Science-Elementary and Secondary Classrooms," Navasota I.S.D., Navasota, TX.

Presenter, "Strategies to Make the Middle and Secondary School Science Program Come Alive," Sherman I.S.D., Sherman, TX.

Presenter, "The Special Learner in Science," Magnolia I.S.D., Magnolia, TX.

Presenter, "The Special Child in Science," Crockett I.S.D., Crockett, TX.

Presenter, "Special Children in Science Classrooms," Hearne I.S.D., Hearne, TX.

Presenter, "Science Textbook Evaluation Workshop," Plano I.S.D., Plano, TX.

Presenter, "Instructional Strategies for Science Teaching," Allen I.S.D., Allen, TX.

Presenter, "Classroom Management Techniques for Science Teachers," Garland I.S.D., Garland, TX.

Presenter, "Classroom Management," Student Teaching Seminar, The University of Texas at Dallas, Richardson, TX.

Presenter, "Classroom Management and Learning Techniques: Middle School and High School Science Classrooms," Coppell I.S.D., Coppell, TX.

Presenter, "Room Arrangement and Teacher Mobility - Factors In Maintaining Effective Classroom Management," American Association of School Administrators Convention, Las Vegas, NA.

Presenter, "Energy and the Environmental Tradeoffs - Theme for Summer Field Trip Study," National Science Teachers Association Convention, Boston, MA.

Presenter, "Environmental Tradeoffs - A Case for Science Education," Brookhaven College Advanced Placement Student Seminars, Dallas, TX.

Presenter, "Learning Styles and Classroom Management - Synthesis for Quality Teaching," Coppell I.S.D., Coppell, TX.

Presenter, "Science Laboratory Techniques - New Inputs for Process Teaching," Conroe I.S.D., Conroe, TX.

Presenter, "Learning Styles - The Effect On Mathematics Teaching," Dallas, I.S.D., Dallas, TX.

Presenter, "Laboratory Mandates - H.B. 246 Implication," Dallas I.S.D., Dallas, TX.

Presenter, "Option's for the 80's - Mathematics/Science Training Institutes," UT-Dallas/CBE/ARCO/DISD, Spartanburg, South Carolina.

Presenter, "Management Techniques for the Mainstreamed Child," Waxahachie I.S.D., Waxahachie, TX.

Presenter, "Learning Styles of Mainstreamed Children," Waxahachie I.S.D., Waxahachie, TX.

Presenter, "Instructional Alternatives for Mainstreamed Children," Waxahachie I.S.D., Waxahachie, TX.

Presenter, "Laboratory Activities for Physical Science," Richardson I.S.D., Richardson, TX.

Presenter, "Laboratory Activities - Discrepant Events," Richardson I.S.D., Richardson, TX.

Presenter, "Science Education Summer Field Trip: An Experience in Team Teaching," Texas Academy of Science Convention, Waco TX.

Presenter, "Authentic Assessment," Odessa ISD, Odessa, TX.

Presenter, "Discrepant Events - The Techniques of Reaching Inquisitive Minds," Tulsa Diocese, Tulsa, OK.

Presenter, "Penny Ante Labs," National Science Teacher Association Convention, St. Louis, MO.

Presenter, "Decision Making Techniques," University of Texas at Arlington National Energy Foundation Workshop, Arlington, TX.

Presenter, "Energy Related Laboratory Activities," Regional National Energy Foundation Workshop, Dallas, TX.

Presenter, "Maximizing Learning Styles," Los Fresnos C.I.S.D., Los Fresnos, TX.

Presenter, "Decisions," Hurst-Euless Bedford I.S.D., Hurst, TX.

Presenter, "Maximizing Minimums," Communities In Schools-D.I.S.D., Dallas, TX.

Presenter, "Energy Related Laboratory Activities," Frisco I.S.D., Frisco, TX.

Presenter, "Science Laboratory Activities," Wylie I.S.D., Wylie, TX.

Presenter, "Science Activities for Minimal Facilities Settings," Midlothian I.S.D., Midlothian, TX.

Presenter, "Decision Making for the 21st Century," Dallas, I.S.D., Dallas, TX.

Presenter, "Biomedical Laboratory Activities," Sanger I.S.D., Sanger, TX.

Presenter, "Penny Ante Science Activities," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Annual Convention, Galveston, TX.

Presenter, "Learning/Teaching Styles-What Every Student-Teacher Should Know," Northeast Texas Suburban Teacher Education Center Meeting, University of Texas at Dallas, Dallas, TX.

Presenter, "Strategies for Meeting Learning Styles (ECH - 2), Los Fresnos C.I.S.D., Los Fresnos, TX.

Presenter, "Strategies for Meeting Learning Styles (3-6), Los Fresnos C.I.S.D., Los Fresnos, TX.

Presenter, "Critical Issues In Science Education," Richardson I.S.D, Richardson, TX.

Presenter, "Penny Ante Science Labs (Elementary)," Green Country Science Teacher In-Service, Bartlesville, OK.

Presenter, "Penny Ante Science Labs (Secondary)," Green Country Science Teacher In-Service, Bartlesville, OK.

Presenter, "Penny Ante Science Labs," Edunetics Corporation Meeting, Arlington, VA.

Presenter, "Penny Ante Science Labs," Carrollton I.S.D., Carrollton, TX.

Presenter, "Penny Ante Science Labs," Irving I.S.D., Irving, TX.

Presenter, "Penny Ante Science Labs," Tulsa Science Teachers In-Service, Tulsa, OK.

Presenter, "Science Processes," Dallas I.S.D., Dallas, TX.

Presenter, "Penny Ante Science Labs," Castleberry I.S.D., Ft. Worth, TX.

Presenter, "Penny Ante Labs Revisited," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Convention, Waco, TX.

Presenter, "Hand's On Science," Southwest Educational Research Association Annual Convention, Kansas City, MO.

Presenter, "Performance Based Testing," Texas Association of Science Supervisors Semi-Annual Meeting, San Antonio, TX.

Presenter, "FOSS Manipulative Science Materials," Dallas Catholic Diocese, Dallas, TX.

Presenter, "MMSEC, A Viable Alternative for Elementary Science," Texas Academy of Science Annual Convention, San Marcos, TX.

Presenter, "Hand's On Science for Elementary," Plano I.S.D., Plano, TX.

Presenter, "Penny Ante Science," Mini-CAST, Richardson, TX.

Presenter, "MMSEC Summer In-Service Training," San Antonio, TX.

Presenter, "Penny Ante Science Revisited," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Convention, Ft. Worth, TX.

Presenter, "Penny Ante Science," Pre-Conference Workshop, National Science Teachers Association Regional Convention, Puerto Rico, PR.

Presenter, "Penny Ante Science," Pre-Conference Workshop, National Science Teachers Association Regional Convention, Vancouver, BC.

Presenter, "Penny Ante Science," Pre-Conference Workshop, National Science Teachers Association Annual Convention, Boston, MA.

Presenter, "Penny Ante Science," Victoria I.S.D., Victoria, TX.

Presenter, "Penny Ante Science," McAllen I.S.D., McAllen, TX.

Presenter, "FOSS Science," Irving I.S.D., Irving, TX.

Presenter, "Penny Ante Science," Mini-CAST, Garland, TX.

Presenter, "Problem Solving," Southwest Regional Association for Research in Education Annual Meeting, Tulsa, OK.

Presenter, "Performance Based Testing," Garland I.S.D., Garland, TX.

Presenter, "Penny Ante Science, White Settlement I.S.D., Ft. Worth, TX.

Presenter, "Hand's On Science Teaching," Texas Mining and Reclamation Association Meeting, Calvert, TX.

Presenter, "Performance Based Testing," Texas ASCD Workshop, Austin, TX.

Presenter, "Elementary Science Continuum Workshop," Highland Park I.S.D., Dallas, TX.

Presenter, "Middle School Science Continuum," Solomon Schechter Academy of Dallas, Dallas, TX.

Presenter, "Elementary Science," Mesquite ISD, Mesquite, TX.

Presenter, "USI Workshop," Dallas ISD, Dallas, TX.

Presenter, "FOSS Science," T. Jefferson High School, Dallas, ISD, Dallas, TX.

Presenter, "Science Activities," (Short Course), Conference for the Advancement of Science Teaching, Science Teachers Association of Texas, Corpus Christi, TX.

Presenter, Kaufman County Coop In-Service, Forney, Kemp, Crandall, Mabank, and Scurry-Rosser (9 one-day workshops).

Presenter, FOSS Science, Brownsville ISD, Brownsville, Texas.

Presenter, "Penny Ante Science," Region X & Xi Mini-CAST, Grapevine-Colleyville ISD.

Presenter, "Penny Ante Science," Conference for the Advancement of Science Teaching, Texas Science Teachers Association, El Paso, Texas.

Presenter, "Penny ante Science," International Conference on Education, Honolulu, Hawaii

Presenter, "Penny Ante Science for TEKS/TAKS," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Annual Conference, Houston, TX.

PUBLICATIONS - PAPERS

"The MOD Project - A Model for Cooperative Dissemination/Utilization of Promising Programs," American Research Association Convention, Washington, D.C.

"Science Teaching - An Approach for the 80's," National Science Teachers Association Regional Convention, Phoenix, AZ.

"Report of a Curriculum Evaluation for the First Baptist Academy," First Baptist Academy, Dallas, TX.

"Commendations and Recommendations for the Garland I.S.D. Middle School Science Curriculum," Texas Education Agency/Southern Association Evaluation, Garland, TX.

"Commendations and Recommendations for the Mesquite I.S.D. Middle School Science Curriculum," Texas Education Agency/Southern Association Evaluation, Mesquite, TX.

"Commendations and Recommendations for the Allen I.S.D. Middle School Science Curriculum," Texas Education Agency/Southern Association Evaluation, Allen, TX.

"Commendations and Recommendation for the Plano I.S.D. Senior High School Science Curriculum, Texas Education Agency/Southern Association Evaluation, Plano, TX.

"Classroom Management Strategies for Aiding the Student Teacher," Northeast Texas Suburban Teacher Education Council Spring Meeting, Dallas, TX.

"An Analysis of Middle Grade Science Teachers Questioning Behavior: Implications for Structuring Student Responses," National Middle Schools Association Annual Meeting, Nashville, TN.

"Classroom Management in Science Settings," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Annual Meeting, El Paso, TX.

"Penny Ante Labs," National Science Teachers Association Annual Convention, Seattle, WA.

"Penny Ante Labs," Conference for the Advancement of Science Teaching, Science Teachers Association of Texas Regional Mini-CAST, Richardson, TX.

"Penny Ante Lab Activities," International Conference for Science Education,, Ottawa, Canada.

"Teaching/Learning Styles: Compatibility Out of Chaos," International Conference for Science Education, Ottawa, Canada.

PUBLICATIONS - JOURNAL ARTICLES

"The New Science Framework - A Position for Support," Texas ASCD Journal, November, 1975.

"The MOD Project: A Model Project for Cooperative Dissemination/Utilization of Promising Products/Programs," Applying Systems Research in Education, T. AntoinetteRyan (ed.), University of Hawaii, October, 1975.

"Deviant Classroom Behavior: A Physical Arrangement Problem? Is There a Solution?," Texas ASCD Journal, Spring, 1977.

"An Organizational System for Field Trip Photographic Collections," Journal of Geologic Education, March, 1977.

"PAL Focus of WCCI Action Lab In Houston," Newsletter-World Council for Curriculum and Instruction, March, 1977.

"New Science Framework/Positive Active Leadership Program: A blending Of Innovative Curriculum With An Effective Instructional Process," Life Long Learning In A World Perspective, Journal of the World Conference on Education, University of Keele and University of Prince Edward Island, Canada, 1978.

"Student Teacher Observation; A Format for Systematic Evaluation," FORUM, Spring, 1980.

"Textbook Selection - A Recurring Dilemma!," The Texas Science Teacher, November, 1982.

"Correlation of H.B. 246 Objectives with LBAS Science Objectives: K-12," Region 10 Education Service Center, Richardson, TX. (mimeograph)

"Teacher Observation: A Format for Systematic Formative Evaluation," Baylor Educator, Winter, 1984.

"On a Necessary Requirement for Any Lasting Solution to Shortages of Science and Mathematics Teachers," Texas Education In Practice, Fall, 1985 (co-author).

"Science/Mathematics Education: A Two Pronged Problem, The Crisis Is Now!," The Texas Science Teacher, March, 1986.

"Effective Classroom Management," Academic Therapy, March, 1986. (Reprinted, "Teacher Mobility and Classroom Management," The Education Digest, September, 1986).

"On A Necessary requirement for Any Lasting Solution to Shortage of Science and Mathematics Teachers -Revisited," Texas Education In Practice, fall/Winter, 1992.

“Texas Essential Knowledge and Skills - Science, K-12,” The Texas Statewide Systemic Initiative, Texas Education Agency, 1997.

PUBLICATIONS -- BOOKS AND REPORTS

Geology Field Trip Photographic Log Book, UT-Dallas, Richardson, TX, 1975.

Dissemination - The MOD Way, (revised), Region 10 Education Service Center, Richardson, TX, 1976.

Getting It All Together, the JDRP Process, NDN/TAB, CAPLA Associates Publishing, Inc., Rochelle Park, New Jersey, 1980 (co-author).

Evaluation of State Facilitators - Developer/Demonstrator Roles In the Adoption Process - The Product, NDN/TAB, CAPLA Publishing, Inc., Rochelle Park, New Jersey, 1980 (co-author).

Classroom Applications of the Curriculum - A Systems Approach, Kendall Hunt Publishing Co., Toronto, Canada, 1981 (co-author).

Learner Based Accountability System - Science K-12, Region 10 Education Service Center, Richardson, TX,1983.

Administrators Handbook for Improving Faculty Morale, The Phi Delta Kappa Commission On Teacher/Faculty Morale, Phi Delta Kappa, Bloomington, IN, (case-study researcher).

Penny Ante Science Labs, SCE Associates, Dallas, TX, 1988. (co-author)

Do It Now, SCE Associates, Dallas, TX, 1989, (co-author).
Penny Ante Science Labs - Revisited, SCE Associates, Dallas, TX, 1990, (co-author).

That Was Then, This Is Now, SCE Associates, Dallas, Tx, 1990, (co-author).

Kinderscience, SCE Associates, Dallas, TX, 1990, (co-author).

Penny Ante Science - Physical Science, SCE Associates, Dallas, TX, 1990, (co-author).

Penny Ante Science - Earth Science, SCE Associates, Dallas, TX, 1990, (co-author).

Penny Ante Science - Life Science, SCE Associates, Dallas, TX, 1990, (co-author).

Penny Ante Science, 3rd Verse, SCE Associates, Dallas, TX, 1992, (co-author).

Five Minutes to Go, SCE Associates, Dallas, TX 1993, (co-author).

Design A Lab, SCE Associates, Dallas, TX, 1994 (co-author).

Crazy Mixed Up Words, SCE Associates, Dallas, TX, 1994 (co-author).

Kinderscience, Hands On Science for Primary Students, SCE Associates, Dallas, TX, 1994, (co-author).

Crazy Mixed Up Words, Volume II, SCE Associates, Dallas, TX, 1994, (co-author).

Crazy Mixed Up Words, Volume III, SCE Associates, Dallas, TX, 1996 (co-author).

Crazy Mixed Up Words, Volume IV, SCE Associates, Dallas, TX, 1997 (co-author).

The Answer Is..., SCE Associates, Dallas, TX, 1995 (co-author).

Penny Ante Science, Goes Fourth, SCE Associates, Dallas, TX, 1998 (co-author).

Maximizing Opportunities for All Children, Arrow Reprographics, Dallas, TX, 1999 (author).

GRANTS AND APPLICATIONS

"Proposal to Identify Excellence In Secondary Science/Mathematics - A Cadre of Scenarios for Pre- and In-Service Teacher Training."
Submitted to: National Science Foundation ($93,401).

"Project to Increase the Number of Secondary School Students Completing Four-Years of Mathematics Including Algebra II and Trigonometry to a Minimum of 60 Percent of Graduating Seniors In Each School-Texas."
Submitted to: Perot Foundation ($63,749).

"To Test the Hypothesis That a Major Portion of the Gap Between Minority/Majority Mathematics Scores Are Due To Differences In Their Respective Mathematics Curriculum."
Submitted to: National Science Foundation ($108,662).

"Physical Science/Life Science/Earth Science Portable Materials Centers."
Submitted to: ARCO Foundation ($84,563).

"Planning Proposal: A Field Trip for Area Secondary Earth and Life Science Teachers - Wyoming."
Submitted to: Henry Foundation ($3690).

"Planning Proposal: A Field Trip for Area Secondary Earth and Life Science Teachers - Alaska."
Submitted to: Rudman Foundation ($3,690).

"UT-Dallas Gem and Mineral Exposition - Texas Sesquicentennial Celebration."
Submitted to: National Science Foundation ($2000).

"Proposal for Development of Activities for Effective Teaching In Mathematics and Science Classrooms - A Mini-Grant Strategy."
Submitted to: James Collins Foundation ($75,940).

"Portable VCR/Video Camera for Use With Pre- and In-Service Teacher Training."
Submitted to: Vandeveer Foundation ($2920).

"Diagnostic Training Centers for Preparing Science and Mathematics Retirees for Precollege Teaching."
Submitted to: National Science Foundation ($1,865,466).

"Development of a Certification Program for Business/Industry Retirees Seeking Part- or Full-Time Secondary Level Teaching in Science and Mathematics."
Submitted to: National Science Foundation ($513,079).

"Oceanographic Field Trip for Middle School Teachers."
Submitted to: Texas A & M University Sea Grant College ($31,942).

"Minority Mathematics and Science Education Curriculum."
Submitted to and Funded: Texas Higher Education Coordinating Board. . . . . .$47600.

"Minority Mathematics and Science Education Project (Summer)
Submitted to and Funded: Texas Higher Education Coordinating Board. . . . . .$41702.

"Minority Mathematics and Science Education Project (2nd Year)
Submitted to and Funded: Texas Higher Education Coordinating Board. . . . . .$35760.

"Minority Mathematics and Science Education Project (Summer)
Submitted to and Funded: Texas Higher Education Coordinating Board. . . . . .$29416.

"Minority Mathematics and Science Education Project (3rd Year)
Submitted to and Funded: Texas Higher Education Coordinating Board . . . . . $ 36800.

"GLOBE Project . . . . . $17000.
Funded by NSF/NASA (Co-PI with John Hoffman) ($17000 time 3 sections/year)

REFERENCES

Dr. Don Rush, Principal
Ft. Campbell Kentucky Schools
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Major Professor, Peabody/Vanderbilt

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Dr. David Dunn, Dean
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The University of Texas at Dallas
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School of Education
Tarleton State University

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Dr. Lynn A. Melton Chemistry Program The University of Texas at Dallas MS, BE-26, Box 830688 Richardson, TX 75083-0688 (214) 690-2910	Former Program Head, Science Education
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Dr. Joseph J. Scherer, Exec. V.P. Prentice Hall Publishers Orlando, FL (407) 345-2010	Colleague

Russell Alan Hulse

Born November 28, 1950, New York, NY; U.S. citizen

Education

The Bronx High School of Science, New York, NY 1966
The Cooper Union, New York, NY; B.S., Physics, 1970
The University of Massachusetts, Amherst, MA, Ph.D., Physics, 1975

Professional Positions

1975 - 1977	National Radio Astronomy Observatory, Charlottesville, VA Research Associate
1977 -	Princeton University, Plasma Physics Laboratory, Princeton, NJ present rank: Principal Research Physicist
2004 -	University of Texas at Dallas, Richardson, TX Visiting Professor of Physics and of Science and Mathematics Education
2005 -	University of Texas at Dallas, Richardson, TX Associate Vice President for Research and Economic Development

Research History and Current Interests

Pulsar radio astronomy, including pulsar searches and discovery of the binary pulsar PSR1913+16; Computer modeling of transport and atomic processes in magnetically confined controlled thermonuclear fusion plasmas; Science education, with a special focus on enhanced university roles in community-based "informal" science education; Science policy & the interdisciplinary advancement of science and technology.

Current Additional Professional Activities

Engineering Advisory Council, Cooper Union School of Engineering
Program Advisory Committee, Plasma Science Advanced Computing Institute
Advisory Board, Institute of Biomedical Sciences and Technology, UT Dallas
Consultant, Institute for Defense Analyses
DoD DTRA Threat Reduction Advisory Committee S&T Task Force
DoD Missile Defense Advisory Committee
Various other advisory and consultant roles in research, education, and business

Professional Societies

American Association for the Advancement of Science
American Physical Society

American Astronomical Society
Institute of Physics

Honors

Nobel Prize in Physics
Fellow, American Physical Society
Fellow, Institute of Physics
Fellow, American Association for the Advancement of Science
Distinguished Research Fellow, Princeton Plasma Physics Laboratory
Gano Dunn Alumni Award for Achievement in Science, The Cooper Union
Doctor of Science, University of Massachusetts

Research Areas with Selected Bibliography

A high sensitivity search for new pulsars and discovery of the binary pulsar PSR 1913+16

- "Discovery of a Pulsar in a Binary System", R.A. Hulse and J.H. Taylor, Ap.J. 195, L51 (1975)
- "A Deep Sample of New Pulsars and Their Spatial Extent in the Galaxy", R.A. Hulse and J.H. Taylor, Ap.J. 201, L55 (1975)
- "The Discovery of the Binary Pulsar", Russell A. Hulse, Nobel Prize Lecture, Les Prix Nobel, Stockholm, Sweden (1993), also Rev. Mod. Phys. 66, 699 (1994).

Computational modeling of transport and atomic processes of impurity ions in magnetically confined controlled thermonuclear fusion plasmas

The codes developed for these investigations emphasize practical modeling of experimental data, and have been used at fusion research laboratories internationally.

- "Charge Exchange as a Recombination Mechanism in High Temperature Plasmas", R.A. Hulse, D.E. Post, and D.R. Mikkelsen, J. Phys. B 13, 3895 (1980). *(also invited talk, APS Topical Conference on Atomic Processes in High Temperature Plasmas, 1981)*
- "Numerical Studies of Impurities in Fusion Plasmas", R.A. Hulse, Nucl. Tech. / Fusion 3, 259 (1983). *(also invited talk, American Nuclear Society, 1982)*
- "He^{++} Transport in the PDX Tokamak", R.J. Fonck and R.A. Hulse, Phys. Rev. Lett. 52, 530 (1984). *(also featured in American Institute of Physics "Physics News in 1984" highlights)*
- "The ALADDIN Atomic Physics Database System", R.A. Hulse, American Institute of Physics Conference Proceedings #206, p 63, Kim and Elton, Eds. *(adopted as the standard system used by the International Atomic Energy Agency; also invited talk, APS Topical Conference on Atomic Processes in High Temperature Plasmas, 1989)*

- "Modeling of Impurity Transport in the Core Plasma", R.A. Hulse, in "Atomic and Plasma-Material Interaction Processes in Controlled Thermonuclear Fusion", Janev and Drawin, Eds., p 165, (Elsevier, 1993). *(also invited talk, International Atomic Energy Agency Technical Committee conference, Cadarache, France, 1992)*

Computational modeling of the transport of electrons in tokamak fusion plasmas

Code development and experimental investigation of electron transport, particularly as revealed by electron density profile relaxation after the injection of hydrogen pellets.

- "Particle Transport in Pellet-Fueled TFTR Plasmas", R.A. Hulse et.al., Proceedings of the International Atomic Energy Agency Technical Committee Meeting on Pellet Injection and Toroidal Confinement, Gut Ising, Germany (1988), p 99.
- "Nonlinear Transport Modeling of TFTR Pellet Density Relaxation", R.A. Hulse, invited talk, Transport Task Force Meeting, Austin, TX, 1991.

Computer Modeling Environments

- Computer modeling software systems addressing user interface and code development issues for large scale scientific computing.

Science Education

- Investigations into the use of computer modeling, computer-instrumented hands-on experiments, and other approaches to improved K-12 science and technology education.
- *Contact Science* initiative – the goal of the *Contact Science* program is to deliver hands-on science to local communities using small-scale traveling science exhibits hosted by public libraries. This approach to informal science education takes advantage of the broad socio-economic access afforded by libraries to provide an ongoing, readily accessible science education presence within a highly diverse range of communities. Associated books, group activities, take-home projects, and mentoring will support and extend the exhibit program. Successful prototyping in our local community library has the program poised to expand to regional and, ultimately, national scope.
- Development of an enhanced role for Universities in science outreach programs, with a special focus on improved community engagement with, and dissemination of, science exhibits and programs. This effort is based at the University of Texas at Dallas, and includes collaborative initiatives linking UTD students and faculty with local science museums and science centers in a range of exhibit and educational technology development projects.

- “Preparing K-12 Students for the New Interdisciplinary World of Science”, Russell Hulse, accepted for publication in Experimental Biology and Medicine (expected July 2006); Invited presentation, 2006 Annual Conference of the Association of Anatomy, Cell Biology, and Neurobiology Chairpersons, Jan 18-21, 2006

VITA

Cynthia E. Ledbetter, Ph.D.
University of Texas at Dallas

Educational Background

1987 Ph.D., Curriculum and Instruction/Science Education from Texas A&M University, College Station, TX
1983 M.A.T., Science Education (Earth and Environmental Sciences) from University of Texas at Dallas, Richardson, TX.
1974 B.S., Biology from University of Texas at Arlington, Arlington, TX.

Professional Experience

8/2004 to present: Director, Center for Science Education Research
2/2001 to present: Adjunct Associate Professor-Science and Mathematics Education Centre, Curtin University of Technology, Perth, Australia.
9/2000 to present: Department Head, Science/Mathematics Education at the University of Texas at Dallas.
9/1994 to present: Associate professor in science education at the University of Texas at Dallas, developing and teaching graduate level science, and science education courses.
9/1988 to 9/1994: Assistant professor in science education at the University of Texas at Dallas, developing and teaching graduate level science and science education courses, science methods, and supervising student teachers.
9/1986 to 1988: Senior lecturer in science education at the University of Texas at Dallas, teaching graduate level science and science education courses, science methods, and supervising student teachers.
9/1985 to 1986: Graduate assistant in science education at Texas A&M University teaching general methods, science methods, and placing student observers in schools.
9/1979 to 1985: Classroom teacher in Irving Independent School District, teaching earth and life science, and English. Co-sponsored seventh and eighth grade cheerleaders from 1982 to 1985. Co-sponsored the National Junior Honor Society from 1980 to 1985.

Publications

Nix, R.K., Fraser, B.J., & Ledbetter, C.E. (at press). Evaluating an integrated science learning environment using the Constructivist Learning Environment Survey (CLES). *Learning Environments Research.*

Ledbetter, C. and Nix, R. (2002). Evaluation of an integrated science learning environment that bridges university classes and field trips. *Australian Association for Research in Education*, CD.

Ledbetter, C. (2000). *TEKSing through Penny ante Science (6 volumes).* Dallas, TX: SCE Associates.

Ledbetter, C. and Nix, R. (2000). Bringing Back Big Bend: Teachers' Adventure to be Shared through Virtual Tour. Dallas Outdoors. Vol. 1, No. 5, pp. 9-11. August-September 2000.

Ledbetter, C**.** (1999). *TEXTEAMS kindergarten-grade 2 institute: Module 2-properties, patterns and models*. Austin, TX: Charles A. Dana Center.

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Ledbetter, C**.** (1999). *TEXTEAMS kindergarten-grade 2 institute: Module 1-systems*. Austin, TX: Charles A. Dana Center.
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(with Nix) Action-Interaction-Reaction: YOU are THE key! SCE 04-02. University of Texas at Dallas, 2004
(with Nix) Environmental Field Methods. SCE 04-01. University of Texas at Dallas, 2004
Doctorate of Philosophy in Science Education. SCE 03-3. University of Texas at Dallas, 2001-2003, 100pp.
(With Nix, R.) Characters and Characteristics. SCE 03-2. University of Texas at Dallas, 2003.
(With Nix, R.) Habits and Habitats. SCE 03-1. University of Texas at Dallas, 2003.
(With Nix, R.) MAT-SE Online! A distance learning strand of the Masters of Arts in Teaching degree in Science Education. February, 2002, UT-System TeleCampus, 1 year, $141,054.
Mathematics/Science Partnership. December, 2002, 5 years, $10,000,000. SCE 02-1, University of Texas at Dallas, 2002, 20pp.
Continuing Education for Leadership and Life-long Learning. NSF, March 15, 2002, 5 years, $10, 000,000. SCE 02-2, University of Texas at Dallas, 2002, 40pp.
Research and Methodology for Science Educators (WebCT). SCE 02-1, University of Texas at Dallas, 2001
Evaluating Research in Science Education (WebCT) SCE 01-3, University of Texas at Dallas, 2001
(With Nix, R.). Science Education Research Website SCE 01-3, University of Texas at Dallas, 2001.
Robotics and Young Society. SCE 01-2, University of Texas at Dallas, 2001, 10pp.
(With Nix, R.) Field Ecology. SCE 01-1, University of Texas at Dallas, 2001.
Global Environmental Change. SCE 00-1, University of Texas at Dallas, 2000
Ecology of the West from Dallas to Yellowstone. SCE 99-1, University of Texas at Dallas, 1999, 30pp.
Plant Physiology of the Big Bend. SCE 98-1, University of Texas at Dallas, 1998 30pp.
Ecology of Puerto Rico. SCE 98-2, University of Texas at Dallas, 1998, 30pp.
(with R. Jones and B. Crocker) Integrated physical sciences. SCE 97-1, University of Texas at Dallas, 1997, 50pp.
(with H. Montgomery) Integrated marine science. SCE 96-5, University of Texas at Dallas, 1997, 90pp.
Coordinated thematic science for Region 10 secondary science teachers (Part 2). SCE 96-4, University of Texas at Dallas, 1996, 40pp.

Coordinated thematic science for Kaufman county high school teachers. SCE 96-3, University of Texas at Dallas, 1996, 56pp.
Ecology of the Big Bend area of the Sonoran Desert. SCE 96-2, University of Texas at Dallas, 1996, 78pp.
Marine science of the Caribbean. SCE 96-1, University of Texas at Dallas, 1996, 50pp.
Coordinated thematic science for Kaufman county elementary teachers. SCE 95-6, University of Texas at Dallas, 1995, 53pp.
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Coordinated thematic science for Kaufman county middle school teachers. SCE 95-4, University of Texas at Dallas, 1995, 60pp.
Life/earth science for Dallas teachers. SCE 95-3, University of Texas at Dallas, 1995 150pp.
Hands-on science test for pre-kindergarten through 4th grades. SCE 95-2, University of Texas at Dallas, 1995 40pp.
Ecology: Energy. SCE 95-1, University of Texas at Dallas, 1995 50pp.
Ecology: Systems and Structures. SCE 94-4, University of Texas at Dallas, 1994 50pp.
Ecology of the British Virgin Islands. SCE 94-3, University of Texas at Dallas, 1994 23pp.
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Ecology: Changes over time. SCE 94-1, University of Texas at Dallas, 1994 65pp.
(with J. Funkhouser and M. Fields) Science I: An integrated science curriculum (part 4). SCE 93-1, University of Texas at Dallas, 1993, 50pp.
Testing and evaluation in secondary science. SCE 93-2, University of Texas at Dallas, 1993, 10pp.
The chemistry of Yellowstone. SCE 93-3, University of Texas at Dallas, 1993, 10pp.
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Physical science for elementary teachers. SCE 93-5, University of Texas at Dallas, 1993, 5pp.
Science I manipulative test for process skills. SCE 92-1, University of Texas at Dallas, 1992, 2 pp.
(with J. Hoffman and M. Fields) Science I: An integrated science curriculum (part 1). SCE 92-2, University of Texas at Dallas, 1992, 100pp.
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North Texas Consortium for Education and Technology. SCE 92-4, University of Texas at Dallas, 1992, 30pp.
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Promoting Process Skills through Penny Ante Science. SCE 92-6, University of Texas at Dallas, 1992, 10pp.
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(with Cale, W.) Science, science teachers and the natural world: An interdisciplinary approach to teacher education in science. SCE 90-9, University of Texas at Dallas, 1990, 18pp.
(with A. Carter) Sliding into science. SCE 89-1, University of Texas, Dallas, 1989, 5pp.
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Flying Fuzzies and Bouncing Balls. SCE 88-2, University of Texas, Dallas, 1988, 5 pp.
Students' Misconceptions: What Teachers Can Do. SCE 88-3, University of Texas, Dallas, 1988, 4 pp.
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Process skills for sixth grade science classes. SCE 87-4, University of Texas, Dallas, 1987, 10pp.

Juried Presentations

Ledbetter, C. & Fifer, F. (2005, April). *Problem solving with Penny Ante Science*. Paper presented at the National Science Teachers Association annual conference, Dallas, TX.

Nix, R. & Ledbetter, C. (2005, February). *Probeware in the air.* Paper presented at the Mini-Conference for the Advancement of Science Teaching, in Hurst-Euless-Bedford, TX.

Fifer, F. & Ledbetter, C. (2005, January). *Problem solving with Penny Ante Science*. Paper presented at the International Science Education Conference, Honolulu, Hawaii.

Nix, R., Ledbetter, C., & Fraser, B. (2004, April). *Designing, delivering and evaluating a field-based science course for teachers using the Constructivist Learning Environment Survey (CLES).* Paper presented at the annual meeting of the National Association for Research in Science Teaching in Vancouver, BC.

Nix, R., Ledbetter, C., & Fraser, B. (2004, April). *Use of the Constructivist Learning Environment Survey (CLES) to inform design, guide delivery, and enable multi-level evaluation of a field-based science course for teachers.* Paper presented at the annual meeting of American Education Research Association, San Diego, CA.

Pujana, I., Stern, R. J., & Ledbetter, C. (2004, March). *Developing a new undergraduate science course focused on Hispanic students at the University of Texas at Dallas: Geography, resources, and environment of Latin America.* South-Central - 38th Annual Meeting of the Geological Society of America, College Station, TX.

Ledbetter, C. & Fifer, F. (2004, January). *Tackling the TAKS with Penny Ante Science.* Paper presented at the Mini-Conference for the Advancement of Science Teaching, Castleberry, TX.

Houston, Linda S., Fraser, B., & Ledbetter, C. (2003, April). *An evaluation of elementary school science kits in terms of classroom environment and student attitudes.* Paper presented at the annual meeting of American Education Research Association, Chicago, IL.

Nix, R., Fraser, B., & Ledbetter, C. (2003, April). *Evaluating an integrated science learning environment using a new form of the Constructivist Learning Environment Survey.* Paper presented at the annual meeting of American Education Research Association, Chicago, IL.

Nix, R. & Ledbetter, C. (2003, February). *Mountain Climbing 101.* Paper presented at the Mini-Conference for the Advancement of Science Teaching, Mansfield, TX.

Ledbetter, C. & Fifer, F. (2002, November). *Tackling the TAKS with Penny Ante Science.* Paper presented at the Conference for the Advancement of Science Teaching, El Paso, TX.

Nix, R. & Ledbetter, C. (2002, November). *Bringing back Big Bend.* Paper presented at the Conference for the Advancement of Science Teaching, El Paso, TX.

Montgomery, H. & Ledbetter, C. (2002, October). *A constructivist approach to field geology for science teachers.* Paper presented at the annual meeting of the Geological Society of America, Denver, CO.

Nix, R. & Ledbetter, C. (2002, April) *Drawing conclusions: A quick assessment of student understanding through concept map evaluation*. Paper presented at the annual meeting of the National Association for Research in Science Teaching in New Orleans, LA.

Nix, R. & Ledbetter, C. (2001, December). *Evaluation of an integrated science learning environment that bridges university classes and field trips*. Paper presented at the annual meeting of Australian Association for Research in Education, Fremantle, Western Australia.

Ledbetter, C. & Fifer, F. (2001, October). *Penny Ante Science and the TEKS*. Paper presented at the Conference for the Advancement of Science Teaching, Austin, TX.

Nix, R. & Ledbetter, C. (March 2001). *A web (page) that works: What a concept (map)!* Paper presented at the National Association for Research in Science Teaching annual meeting, St. Louis, Missouri.

Nix, R. & Ledbetter, C. (February 2001). Global environmental change: A virtual field trip. Paper presented at Mini-CAST: Local Conference for the Advancement of Science Teaching, Mansfield, Texas.

Ledbetter, C. & Fifer, F. (2000, October). *Penny Ante Science and the TEKS*. Paper presented at the Conference for the Advancement of Science Teaching, College Station, TX.

Nix, R. & Ledbetter, C. (2000, October). *Integrating technology into science teaching*. Paper presented at the Conference for the Advancement of Science Teaching, College Station, TX.

Ledbetter, C. & Fifer, F. (1999, October). *Penny Ante Science using the TEKS*. Paper presented at the Conference for the Advancement of Science Teaching, Lubbock, TX.

Ledbetter, C. & Fifer, F. (1998, November). *Penny Ante Science Meets the TEKS*. Paper presented at the Conference for the Advancement of Science Teaching, Corpus Christi, TX.

Ledbetter C. & Barjon, G. (1998, March). *Science curriculum for early childhood.* Paper presented at the Independent Schools Association Convention, Houston, TX.

Ledbetter C. & Barjon, G. (1998, March). *Science curriculum for elementary students.* Paper presented at the Independent Schools Association Convention, Houston, TX.

Ledbetter, C. & Fifer, F. (1997, October). *Penny Ante Science, Back Again*. Paper presented at the Conference for the Advancement of Science Teaching, Austin, TX.

Ledbetter C. (1997, September). *Integrated science: An assessment of outcomes.* Paper presented at the Southwest Association for the Educators of Teachers in Science, Denton, TX.

Ledbetter, C. & Fifer, F. (1996, October). *Having fun with Penny Ante Science*. Paper presented at the Conference for the Advancement of Science Teaching, Austin, TX.

Ledbetter, C. & Fifer, F. (1996, January). *Making science relevant: Penny ante science*. Paper presented at the Conference for the Advancement of Science Teaching (local), Duncanville, TX.

Ledbetter, C. (1996, January). *Teach as I teach*. Paper presented at the Association for the Educators of Teachers in Science National Meeting, Seattle, WA.

Ledbetter, C., Fifer, F., & Sinclair, B. (1995, November). *Integrated penny ante science*. Paper presented at the Conference for the Advancement of Science Teaching, Corpus Christi, TX.

Ledbetter, C., & Jenkins, T. (1995, October). *Safety and elementary science teachers*. Paper presented at the Southwest Association of Educators of Teachers in Science Annual Meeting, Tulsa, OK.

Ledbetter, C. (1995, February). *Process skills for elementary teachers*. Paper presented at the Annual Meeting of the Southwest Association of Educators of Teachers in Science, Hot Springs, AK.

Ledbetter, C., Fifer, F., & Sinclair, B. (1994, November). *Penny ante problem solving*. Paper presented at the Conference for the Advancement of Science Teaching, Beaumont, TX.

Ledbetter, C. (1994, April). *Penny ante science*. Paper presented at the National Science Teachers Association Convention, Anaheim, CA.

Ledbetter, C., & Sinclair, B. (1994, March). *Penny ante science assessment*. Paper presented at the South Texas Regional Conference for the Advancement of Science Teaching, Harlingen, TX.

Ledbetter, C. (1994, February). *Methods of teaching coordinated thematic science*. Paper presented at the Texas Science Summit, El Paso, TX.

Ledbetter, C., & Fifer, F. (1994, February). *Penny ante earth science.* Paper presented at the Texas Earth Science Teachers Association Annual Meeting, Richardson, TX.

Ledbetter, C., & Fifer, F. (1993, December). *Penny ante science and higher level questioning*. Paper presented at the National Science Teachers Association Regional Conference, Orlando, FL.

Ledbetter, C., & Fifer, F. (1993, November). *Coordinated thematic science, penny ante style*. Paper presented at the Conference for the Advancement of Science Teaching, Austin, TX.

Ledbetter, C., Barufaldi, J., & James, R. (1993, April). *Evaluation of coordinated thematic science in Texas*. Paper presented at the National Association of Research in Science Teaching national convention, Atlanta, GA.

Ledbetter, C., & Fifer, F. (1993, April). *Science equipment for teaching thinking skills*. Paper presented at the National Science Teachers Association national convention, Kansas City, KS.

Ledbetter, C., Barufaldi, J., Lewis, M., West, S., & Rakow, S. (1993, April). *Coordinated thematic science courses developed at Texas universities*. Paper presented at the National Science Teachers Association national convention, Kansas City, KS.

Ledbetter, C., & Fifer, F. (1993, February). *Make and take science experiments for scientific thinking*. Paper presented at the Garland Mini-Conference for the Advancement of Science Teaching, Garland, TX.

Ledbetter, C. (1993, January). *Authentic assessment in science*. Paper presented at the Southwest Region Association for the Educators of Teachers of Science, Regional Meeting, Corpus Christi, TX.

Ledbetter, C., & Fifer, F. (1992, October). *Critical thinking using penny ante science*. Featured speakers, National Science Teachers Association Regional Conference, Ft. Worth.

Ledbetter, C., Barufaldi, J., West, S., Lein, V., & Chippetta, G. (1992, October). *Science I courses in Texas: An overview and analysis*. Paper presented at the National Science Teachers Association Regional Conference, Ft. Worth.

Ledbetter, C., Barufaldi, J., Rakow, S., James, R., & Leeth, D. (1992, October). *Science I: Evaluation of the first year of implementation*. Paper presented at the National Science Teachers Association Regional Conference, Ft. Worth.

Fifer, S., Fifer, F., & Ledbetter, C. (1992, August). *Kinderscience*. Paper presented at the National Early Childhood Education Symposium, Dallas.

Ledbetter, C., & Fifer, F. (1992, March). *Penny ante science for the future*. Featured speakers, National Science Teachers Association, Boston.

Ledbetter, C., & Fifer, F. (1992, February). *Penny ante science in South Texas*. Paper presented at the Rio Grande Valley Science Teachers Regional Conference, Harlingen, TX.

Ledbetter, C. (1992, January). *Minority mathematics and science education cooperative*. Paper presented at the Southwest Region Association for the Educators of Teachers of Science, Regional Meeting, St. Louis, MO.

Ledbetter, C., and Fifer, F. (1991, November). *Penny Ante Science--Texas Style*. Featured speakers at the National Science Teachers Regional Convention, Vancouver, British Columbia.

Ledbetter, C., and Fifer, F. (1991, October). *Penny Ante Science--Texas Style*. Paper presented at the Conference for the Advancement of Science, College Station, TX.

Ledbetter, C., and Fifer, F. (1991, March). *Energize with Penny Ante Science*. Paper presented at the National Science Teachers National Convention, Houston, TX.

Ledbetter, C., and Jones, R. (1991, March). *Science--The Far Side*. Paper presented at the National Science Teachers National Convention, Houston, TX.

Ledbetter, C., & Fifer, F. (1991, February). *Penny ante science, again*. Paper presented at the El Paso Mini-Conference for the Advancement of Science Teaching, El Paso, TX.

Ledbetter, C. (1991, January). *Students' perceptions of secondary science*. Paper presented at the annual meeting of the Southwest Region Association of Educators of Teachers of Science, Colorado Springs, CO.

Ledbetter, C., and Fifer, F. (1990, December). *Science and learning styles*. Featured speakers at the National Science Teachers Association Regional Convention, San Juan, Puerto Rico.

Ledbetter, C., and Fifer, F. (1990, December). *More penny ante science*. Paper presented at the National Science Teachers Association Regional Convention, San Juan, Puerto Rico.

Ledbetter, C., and Fifer, F. (1990, October). *More penny ante science*. Paper presented at the Conference for the Advancement of Science Teaching, Ft. Worth, TX.

Ledbetter, C. (1990, September). *Penny ante physical science*. Paper presented at the Texas Teachers of Physical Science Convention, Richardson, TX.

Jones, R., & Ledbetter, C. (1990, April). *Teaching is a contact sport*. Paper presented at the National Science Teachers Association National Convention, Atlanta, GA.

Ledbetter, C., & Fifer, F. (1990, April). *Penny ante science, revisited*. Paper presented at the National Science Teachers Association Convention, Atlanta, GA.

Ledbetter, C., & Cale, W. (1990, February). *Science, science teachers and the natural world: An interdisciplinary approach to teacher education in science*. Paper presented at the Sixth Annual Conference of the National University Continuing Education Association, Baltimore, MD.

Ledbetter, C. (1990, January). *Slides and teachers: A pilot study*. Paper presented at the Annual Meeting of the Southwest Regional Association of Educators of Teachers of Science, Overton Park, KS.

Carter, A., & Ledbetter, C. (1989, December). *Sliding into science*. Paper presented at the Regional Convention of the National Science Teachers Association, Phoenix, AZ.

Jones, R., & Ledbetter, C. (1989, December). *Teaching is a contact sport*. Paper presented at the Regional Convention of the National Science Teachers Association, Phoenix, AZ.

Ledbetter, C. (1989, December). *Scientists, teachers and misconceptions*. Paper presented at the Regional Convention of the National Science Teachers Association, Phoenix, AZ.

Jones, R., & Ledbetter, C. (1989, October). *Teaching is a contact sport*. Paper presented at the Conference for the Advancement of Science Teaching, Waco, TX.

Ledbetter, C., & Fifer, F. (1989, October). *Penny ante science, revisited*. Paper presented at the Conference for the Advancement of Science Teaching, Waco, TX.

Ledbetter, C. (1989, October). *Scientists, teachers and misconceptions*. Paper presented at the Conference for the Advancement of Science Teaching, Waco, TX.

Fifer, F., & Ledbetter, C. (1989, October). *Penny ante science, revisited*. Paper presented at the Regional Convention of the National Science Teachers Association, Tulsa, OK.

Ledbetter, C., & Fifer, F. (1989, April). *Penny ante science, revisited*. Paper presented at the Regional Conference for the Advancement of Science Teaching, Richardson, TX.

Carter, A., & Ledbetter, C. (1989, February). *Sliding into science: Using teacher made slides in the classroom*. Paper presented at the National AECT Showcase of Achievement, Dallas, TX.

Ledbetter, C. (1989, January). *"At-risk" students and pre-service teachers: Results of the first term*. Paper presented at the Annual Meeting of the Southwest Region Association for the Education of Teachers of Science, Wichita, KS.

Ledbetter, C. (1988, December). *Musings, meanderings, and misconceptions*. Paper presented at the National Science Teachers Regional Convention, Charleston, SC.

Ledbetter, C. (1988, December). *Flying fuzzies and bouncing balls*. Paper presented at the National Science Teachers Regional Convention, Charleston, SC.

Ledbetter, C. (1988, October). *Musings, meanderings, and misconceptions*. Paper presented at the National Science Teachers Regional Convention, Portland, Maine.

Brigham, T., & Ledbetter, C. (1988, October). *Trippin' out*. Paper presented at the Conference for the Advancement of Science Teaching, Galveston, TX.

Bull, E., & Ledbetter, C. (1988, October). *Enrichment for all: Field trips*. Paper presented at the Conference for the Advancement of Science Teaching, Galveston, TX.

Jones, R., & Ledbetter, C. (1988, October). *Photography and science--A winning combination*. Paper presented at the Conference for the Advancement of Science Teaching, Galveston, TX.

Ledbetter, C. (1988, October). *Flying fuzzies and bouncing balls*. Paper presented at the National Science Teachers Regional Convention, Portland, Maine.

Ledbetter, C. (1988, October). *Musings, meanderings, and misconceptions*. Paper presented at the meeting of the Conference for the Advancement of Science Teaching, Galveston, TX.

Ledbetter, C. (1988, October). *Flying fuzzies and bouncing balls.* Paper presented at the Conference for the Advancement of Science Teaching, Galveston, TX.

Fifer, F., & Ledbetter, C. (1988, April). *Penny ante labs*. Paper presented at the National Science Teachers Association Convention, St. Louis, MO.

Ledbetter, C., & Jones, R. (1988, April). *Soviet agriculture and other models of American education*. Paper presented at the National Science Teachers Association Convention, St. Louis, MO.

Ledbetter, C. (1988, April). *Students' misconceptions: What teachers can do*. Paper presented at the National Science Teachers Association Convention, St. Louis, MO.

Bull, E., & Ledbetter, C. (1988, January). *Teacher enrichment: Field trips*. Paper presented at the Southwest Regional Association for the Education of Teachers of Science, Oklahoma City, OK.

Fifer, F., & Ledbetter, C. (1987, November). *Penny ante labs*. Paper presented at the Regional Conference for the Advancement of Science Teachers/National Science Teachers Association Convention, San Antonio, TX.

Ledbetter, C. (1987, November). *Students' misconceptions: What teachers can do*. Paper presented at the Regional Conference for the Advancement of Science Teachers/National Science Teachers Association Convention, San Antonio, TX.

Ledbetter, C. (1987, November). *Inexpensive labs for valuable results*. Paper presented at the Regional Conference for the Advancement of Science Teachers/National Science Teachers Association Convention, San Antonio, TX.

Ledbetter, C. (1987, November). *Students' misconceptions: What teachers can do*. Paper presented at the Regional Conference for the Advancement of Science Teachers, Pittsburgh, PA.

Ledbetter, C., & Jones, R. (1987, November). *Photography and science--A winning combination*. Paper presented at the Regional Conference for the Advancement of Science Teachers, Pittsburgh, PA.

Ledbetter, C. (1987, November). *Students' misconceptions: What teachers can do*. Paper presented at the Instructional and Professional Development Convention, Billings, MN.

Ledbetter, C. (1987, October). *Have Camera--We'll travel*. Paper presented at the Instructional and Professional Development Convention, Billings, MN.

Ledbetter, C. (1987, October). *A formative evaluation instrument for secondary science instruction.* Paper presented at the Instructional and Professional Development Convention, Billings, MN.

Ledbetter, C., & Zuhn, J. (1987, March). *The video-microscope connection*. Paper presented at the National Science Teachers Association Convention, Washington, DC.

Ledbetter, C. (1987, October). *A formative evaluation instrument for secondary science instruction*. Paper presented at the Southwest Regional Association for the Educators of Science Teachers, Colorado Springs, CO.

Brandhorst, T., & Ledbetter, C. (1986, October). *A formative evaluation instrument for secondary science instruction in Texas*. Paper presented at the Conference for the Advancement of Science Teaching, College Station, TX.

Ledbetter, C. (1986, October). *Have Camera--We'll travel*. Paper presented at the Conference for the Advancement of Science Teaching, College Station, TX.

Brandhorst, T., & Ledbetter, C. (1986, April). *A formative evaluation instrument for secondary science instruction in Texas*. Paper presented at the Conference for the Advancement of Science Teaching, College Station, TX.

Ledbetter, C. (1981, March). *Time today for tomorrow's future*. Paper presented at the National Science Teachers Association Convention, Dallas, TX.

Professional Presentations

Ledbetter, C. (1999, December). *Soil solutions.* Presented to Tarver-Rendon Elementary, Rendon, TX.

Ledbetter, C. (1999, December). *Ice and water—solid and liquid.* Presented to Tarver-Rendon Elementary, Rendon, TX.

Ledbetter, C., et al (1999, February). *TEXTEAMS institute: Module 1—systems.* Presented to Texas Science Specialists, Austin, TX.

Ledbetter, C., et al (1999, February). *TEXTEAMS institute: Module 1—systems.* Presented to Texas Science Specialists, Houston, TX.

Ledbetter, C., et al (1999, January). *TEXTEAMS institute: Module 1—systems.* Presented to Texas Science Specialists, Richardson, TX.

Ledbetter, C. (1998, September). *Planting ideas.* Presented to Tarver-Rendon Elementary, Rendon, TX.

Ledbetter, C. (1998, September). *You're a good egg.* Presented to Tarver-Rendon Elementary, Rendon, TX.

Ledbetter, C. (1997, December). *What does it weigh?* Presented to Tarver-Rendon Elementary, Rendon, TX.

Ledbetter, C. (1997, November). *How science and science teaching have changed.* Presented to the MENSA of Texas Conference, Dallas, TX.

Ledbetter, C. (1994, February). *Science education and scientific thought*. Presented to Plano ISD science fair participants.

Ledbetter, C. (1993, January). *Revitalizing science teacher education*. Presented to the Association of Educators of Teachers of Science, Charleston, SC.

Ledbetter, C. (1991, October). *Science in Texas--UTD Responds*. Paper presented to the Richardson Chamber of Commerce, Richardson, TX

Brandhorst, T., & Ledbetter, C. (1986, April). *A formative evaluation instrument for secondary science instruction in Texas*. Paper presented to the Houston Area Science Consultants, Houston, TX.

Ledbetter, C. (1986, March). *dBase: An information retrieval system.* Paper presented to the Naturalistic Research Group, College Station, TX.

Inservice Presentations

Ledbetter, C. (2003, September). *Using hands-on activities to prepare K-5th grade children the tackle the TAKS.* Presented to University of Texas at Pan American, McAllen, TX.

Ledbetter. C. & Nix, R. (2003, June). *Characters and Characteristics*. Presented at an invited workshop, Dallas Zoo, Dallas, TX.

Ledbetter. C. & Nix, R. (2003, July). *Characters and Characteristics*. Presented at an invited workshop, Dallas Zoo, Dallas, TX.

Ledbetter. C. & Nix, R. (2003, March). *Habits and habitats*. Presented at an invited workshop, Heard Museum of Natural History, McKinney, TX.

Ledbetter, C. (2003, January). *Using hands-on activities to prepare K-2nd grade children the tackle the TAKS.* Presented to Pharr-San Juan-Alamo ISD, Pharr, TX.

Ledbetter, C. (2003, January). *Using hands-on activities to prepare K-5th grade children the tackle the TAKS.* Presented to Pharr-San Juan-Alamo ISD, Pharr, TX.

Ledbetter, C. (2002, September). *Using hands-on activities to prepare K-5th grade children the tackle the TAKS.* Presented to University of Texas at Pan American, McAllen, TX.

Ledbetter, C. (2002, February). *Using hands-on activities to prepare K-5th grade children the tackle the TAKS.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (2002, February). *Using hands-on activities to prepare 10th and 11th grade children the tackle the TAKS.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (2001, June). *Make and take science materials to teach the TEKS for K-5th grade children.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (2000, June). *Make and take science materials to teach the TEKS for 6th-12th grade students.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (2000, November). *Penny ante science and the physical science TEKS for K-5th grade children.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (2000, November). *Penny ante science and the earth science TEKS for 6th-12th grade students.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. and Curry, B. (2000, November). *Using toys to teach physics.* Presented to Mesquite ISD.

Ledbetter, C. (2000, July). *Penny ante science and the physical science TEKS for K-5th grade children.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (2000, July). *Penny ante science and the earth science TEKS for 6th-12th grade students.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. and Curry, B. (2000, April). *Penny ante science and the 2nd-3rd grade TEKS (life science--part 2).* Presented to Mesquite ISD.

Ledbetter, C. and Curry, B. (2000, March). *Penny ante science and the 2nd-3rd grade TEKS (life science--part 1).* Presented to Mesquite ISD.

Ledbetter, C. and Curry, B. (2000, February). *Penny ante science and the K-5th grade TEKS (life science).* Presented to Mesquite ISD.

Ledbetter, C. (2000, January). *Penny ante science make and take science equipment.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (2000, January). *Penny ante science and the TEKS for K-5 children.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (1999, November). *Penny ante science and the 2nd-3rd grade TEKS (earth science).* Presented to Mesquite ISD.

Ledbetter, C. (1999, November). *Penny ante science and the 6th through 8thgrade TEKS (models).* Presented to Irving ISD.

Ledbetter, C. (1999, October). *Penny ante science and the TEKS for middle school.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (1999, October). *Penny ante science and the TEKS for elementary through high school.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (1999, October). *Penny ante science and the TEKS for secondary students.* Presented to Enis ISD.

Ledbetter, C. (1999, September). *Penny ante science and the 2nd-3rd grade TEKS (systems).* Presented to Mesquite ISD.

Ledbetter, C. (1999, September). *Penny ante science and the 6th through 8thgrade TEKS (systems).* Presented to Irving ISD.

Ledbetter, C. (1999, June). *Penny ante science and the TEKS for elementary school.* Presented to Education Service Center Region III, Victoria, TX.

Ledbetter, C. (1999, March). *Penny ante science and the 2nd-3rd grade TEKS (biological science).* Presented to Mesquite ISD.

Ledbetter, C. (1999, February). *Penny ante science and the Kindergarten through 2nd grade TEKS.* Presented to Irving ISD.

Ledbetter, C. (1999, February). *Penny ante science and the 3rd through 5thgrade TEKS.* Presented to Irving ISD.

Ledbetter, C. (1999, February). *Penny ante science and the 6th through 8thgrade TEKS.* Presented to Irving ISD.

Ledbetter, C. (1999, February). *Penny ante science, assessment, and the TEKS.* Presented to Irving ISD.

Ledbetter, C. (1999, February). *Penny ante science and the 2nd-3rd grade TEKS (physical science).* Presented to Mesquite ISD.

Ledbetter, C. (1999, January). *FOSS and the TEKS (K-3).* Presented to Allen ISD.
Ledbetter, C. (1999, January). *FOSS and the TEKS (4-6).* Presented to Allen ISD.
Ledbetter, C. (1999, January). *Penny ante science and the 6th grade TEKS.* Presented to Mesquite ISD.
Ledbetter, C. (1999, January). *Penny ante science and the 2nd-3rd grade TEKS (life science).* Presented to Mesquite ISD.
Ledbetter, C. (1999, January). *Penny ante science and the 2nd-3rd grade TEKS (earth science).* Presented to Mesquite ISD.
Ledbetter, C. (1999, January). *Penny ante science and the TEKS for elementary school.* Presented to Education Service Center Region III, Victoria, TX.
Ledbetter, C. (1999, January). *Penny ante science and the TEKS for middle school.* Presented to Education Service Center Region III, Victoria, TX.
Ledbetter, C. (1998, October). *Penny ante physical science and the TEKS.* Presented to Mesquite ISD.
Ledbetter, C. (1998, October). *Penny ante science and the TEKS for high school.* Presented to Education Service Center Region III, Victoria, TX.
Ledbetter, C. (1998, August). *Penny ante science and the TEKS for elementary and middle school.* Presented to Education Service Center Region III, Victoria, TX.
Ledbetter, C. (1998, July). *Penny ante physical science.* Presented to Dallas ISD.
Ledbetter, C. (1998, June). *Penny ante physical science.* Presented to National City ISD.
Ledbetter, C. (1998, April). *Penny ante physical science and the TEKS.* Presented to Education Service Center Region III, Victoria, TX.
Ledbetter, C. (1997, November). *Penny ante science until the holidays.* Presented to Mesquite ISD.
Ledbetter, C. (1997, November). *Elementary reading and penny ante science.* Presented to Irving ISD.
Ledbetter, C. (1997, September). *Secondary penny ante science.* Presented to Irving ISD.
Ledbetter, C. (1997, September). *Elementary penny ante science.* Presented to Irving ISD.
Ledbetter, C. (1997, August). *FOSS for early childhood teachers.* Presented to Dallas ISD.
Ledbetter, C. (1997, July). *Penny ante science.* Presented to Curtin University of Technology graduate students, Perth, Australia.
Ledbetter, C. (1997, June). *Penny ante physical science.* Presented to National City ISD.
Ledbetter, C. (1997, April). *CHEM: Chemistry for elementary teachers.* Presented to Clear Creek ISD.
Ledbetter, C. (1997, April). *Penny ante science: A baker's dozen.* Presented to Mesquite ISD.
Ledbetter, C. (1997, February). *Using science to teach reading.* Presented to Irving ISD.
Ledbetter, C. (1997, February). *Penny ante surface tension.* Presented to Solomon Schecter School.
Ledbetter, C. (1997, January). *Penny ante plate tectonics and penny ante cell biology.* Presented to Dallas ISD.
Ledbetter, C. (1997, January-December). *Restructuring and addressing the science curriculum.* Presented to the St. Philips School.
Ledbetter, C. (1997, January-May). *Integrating the elementary and secondary sciences.* Presented to the Region 10 Rural School Consortium.
Ledbetter, C. (1997, January-May). *Integrating the secondary sciences.* Presented to the Kaufman County Rural School Consortium.
Ledbetter, C. (1996, November). *Integrating writing and science teaching.* Presented to Mesquite ISD.

Ledbetter, C. (1996, October). *Teaching science to 3 and 4 year-old children*. Presented to St. Philips School, Dallas, TX.

Ledbetter, C. (1996, September). *Using FOSS with verbally challenged students.* Presented to Region 11 Educational Service Center.

Ledbetter, C. (1996, September). *Integrating works of fiction and science teaching.* Presented to Mesquite ISD.

Ledbetter, C. (1996, August). *FOSS for early childhood education.* Presented to New York City Public Schools, Brooklyn, NY.

Ledbetter, C. (1996, August-1997, May). *Assessing a science curriculum for grades K-4 with penny ante science*. Presented to St. Philips School, Dallas, TX.

Ledbetter, C. (1996, June-July). *Penny ante earth science*. Presented to the Local Systemic Initiative of National City School System, University of California-San Diego.

Ledbetter, C. (1996, July). *A week's worth of penny ante science*. Five papers presented at the Frontiers in Science Workshop, University of California--San Diego.

Ledbetter, C. (1996, June-July). *Penny ante life science*. Presented to the Urban Systemic Initiative of the San Diego School System, University of California-San Diego.

Ledbetter, C. (1996, July). *Constructing knowledge with penny ante science*. Paper presented to the California Science Project, University of California--San Diego

Ledbetter, C. (1996, February). *Integrating life and earth science: Penny ante science*. Presented to Mesquite ISD, Mesquite, TX.

Ledbetter, C. (1996, February). *CHEM and Island Factory*. Presented to Dallas ISD, Dallas, TX.

Ledbetter, C. (1995, December). *Penny ante science for pre-kindergarten children*. Presented to Region 14, Abilene, TX.

Ledbetter, C. (1995, November). *CHEM and Fruitdale*. Presented to Brownsville ISD, Brownsville, TX.

Ledbetter, C. (1995, November). *FOSS and physics: Part 2*. Presented to New York City Public Schools, Bronx, NY.

Ledbetter, C. and Fifer, F. (1995, November-1996, August). *Coordinated thematic science: Rural schools*. Presented to Region 10 Rural Schools, Princeton, TX.

Ledbetter, C. and Fifer, F. (1995, November-1996, August). *Coordinated thematic science: Elementary level*. Presented to Crandall/Terrill/Scurry-Rosser/Forney ISDs, Crandall, TX.

Ledbetter, C., & Fifer, F. (1995, October). *FOSS measuring*. Presented to Grapevine ISD, Grapevine, TX.

Ledbetter, C., & Fifer, F. (1995, October). *Penny ante measuring*. Presented to Hurst-Euless-Bedford ISD, Bedford, TX.

Ledbetter, C. (1995, October). *Alternative assessment*. Presented to Dallas ISD, Dallas, TX.

Ledbetter, C. (1995, September). *Penny ante science for early elementary*. Presented to Region 3, Victoria, TX.

Ledbetter, C. (1995, August). *FOSS and physics: Part 1*. Presented to New York City Public Schools, Bronx, NY.

Ledbetter, C. (1995, August-1996, May). *Minority Math, and Science Education Consortium (MMSEC): Life and earth science*. Presented to Dallas ISD, Dallas, TX.

Ledbetter, C. (1995, August-1996 May). *Developing a science curriculum for grades K-4 with penny ante science*. Presented to St. Philips School, Dallas, TX.

Ledbetter, C. (1995, June-July). *Penny ante life science*. Presented to the Local Systemic Initiative for National City School System, University of California-San Diego.

Ledbetter, C. (1995, July). *A week's worth of penny ante science*. Five papers presented at the Frontiers in Science Workshop, University of California--San Diego.
Ledbetter, C. and Fifer, F. (1994, November-1995, August). *Coordinated thematic science*. Presented to Crandall/Terrill/Scurry-Rosser/Forney ISDs, Crandall, TX.
Ledbetter, C. (1994, September). *Penny ante science and biology end of course testing*. Presented to Joshua ISD, Joshua, TX.
Ledbetter, C. and Fifer, F. (1994, September). *Penny ante science and TAAS testing*. Presented to Region 3 Educational Service Center, Victoria, TX.
Ledbetter, C. (1994, September). *Penny ante science and biology end of course testing*. Presented to Region 3 Educational Service Center, Victoria, TX.
Ledbetter, C. (1994, August-1995 May). *Developing a science curriculum for grades K-4 with penny ante science.* Presented to St. Philips School, Dallas, TX.
Ledbetter, C. (1994, August). *Penny ante problem solving*. Presented to Irving ISD, Irving, TX.
Ledbetter, C. (1994, August). *Penny ante graphing*. Presented to Irving ISD, Irving, TX.
Ledbetter, C. (1994, August). *Penny ante science and test writing*. Presented to Irving ISD, Irving, TX.
Ledbetter, C. (1994, August). *Cooperative groups in science*. Presented to McKinney ISD, McKinney, TX.
Ledbetter, C. (1994, June-July). *Penny ante physical science*. Presented to the Urban Systemic Initiative and San Diego School System, University of California-San Diego.
Ledbetter, C. (1994, July). *A week's worth of penny ante science*. Five papers presented at the Frontiers in Science Workshop, University of California--San Diego.
Ledbetter, C. (1994, June). *Developing coordinated thematic science units*. Presented to Crowley ISD, Crowley, TX.
Ledbetter, C. (1994, June). *Penny ante science for integrated learning*. Presented to Mansfield ISD, Mansfield, TX.
Ledbetter, C. (1994, May). *Penny ante science for integrated learning in biology*. Presented to McKinney ISD, McKinney, TX.
Ledbetter, C. (1994, May). *Penny ante physical science*. Presented to McKinney ISD, McKinney, TX.
Ledbetter, C. (1994, April). *FOSS: An overview*. Presented to Paradise ISD, Paradise, TX.
Ledbetter, C., & Sinclair, B. (1994, April). *Penny ante science for integrated learning*. Presented to Irving ISD, Irving, TX.
Ledbetter, C. (1994, March). *Penny ante science for intermediate elementary students*. Presented to Irving ISD, Irving, TX.
Ledbetter, C. (1994, March). *Penny ante science for primary students*. Presented to Irving ISD, Irving, TX.
Ledbetter, C. (1994, March). *Writing coordinated thematic science curriculum*. Presented to Crowley ISD, Crowley, TX.
Ledbetter, C., & Fifer, F. (1994, February). *FOSS for early childhood*. Presented to Irving ISD Elementary Teachers, Irving, TX.
Ledbetter, C. (1993, December). *Penny ante physical science; Part 2.* Presented to Bethany Elementary, Plano, TX.
Ledbetter, C. (1993, December). *Penny ante physical science; Part 1.* Presented to Bethany Elementary, Plano, TX.
Ledbetter, C. (1993, November). *Penny ante critical thinking*. Presented to Castleberry ISD, Ft. Worth, TX.

Ledbetter, C. (1993, November). *Penny ante problem solving*. Presented to Castleberry ISD, Ft. Worth, TX.
Ledbetter, C. (1993, November). *TAAS performance and written tests: A penny ante approach*. Presented to Region 3, Victoria, TX.
Ledbetter, C. (1993, November). *TAAS and penny ante science*. Presented to McKinney ISD, McKinney, TX.
Ledbetter, C., & Fifer, F. (1993, November). *Using penny ante science to test in a TAAS format*. Presented to Mansfield ISD, Mansfield, TX.
Ledbetter, C., & Fifer, F. (1993, October). *Writing science TAAS questions (Parts 1 & 2).* Presented to Region 3 Service Center, Victoria, TX.
Ledbetter, C., & Fifer, F. (1993, October). *Writing science TAAS questions (Part 2).* Presented to Arlington ISD, Arlington, TX.
Ledbetter, C., & Fifer, F. (1993, October). *Writing science TAAS questions (Part 1).* Presented to Arlington ISD, Arlington, TX.
Ledbetter, C., & Fifer, F. (1993, October). *Writing science TAAS questions (Part 2).* Presented to Plano ISD, Plano, TX.
Ledbetter, C., & Fifer, F. (1993, October). *Writing science TAAS questions (Part 1).* Presented to Plano ISD, Plano, TX.
Ledbetter, C. (1993, September). *Long range science projects*. Presented to Hurst-Euless-Bedford ISD, Bedford, TX.
Ledbetter, C. (1993, August). *Using popular literature to teach science*. Presented to Irving ISD, Irving, TX.
Ledbetter, C., & Fifer, F. (1993, August). *Using the newspaper to write TAAS questions for grades 4 and 8*. Presented to Austin ISD, Austin, TX.
Ledbetter, C. (1993, August). *Teaching and assessing coordinated thematic science.* Presented to Richardson ISD, Richardson, TX.
Ledbetter, C. (1993, August). *CEPUP: The chemistry of water pollution*. Presented to Garland ISD, Garland, TX.
Ledbetter, C. (1993, August). *Using FOSS kits to teach chemistry and geology*. Presented to Texas Area FOSS Teachers, Arlington, TX.
Ledbetter, C. & Fifer, F. (1993, August). *Authentic assessment and TAAS test writing*. Presented to Region 13 Educational Service Center, Austin, TX.
Ledbetter, C. & Fifer, F. (1993, July). *Teaching critical thinking in physics with hands-on activities*. Presented to the Universities Research Association of the Superconducting Super Collider, Dallas, TX.
Ledbetter, C. & Fifer, F. (1993, June). *Building inexpensive physics equipment*. Presented to Texas Energy Science Symposium for High Schools, Austin, TX.
Ledbetter, C. (1993, May). *FOSS for pre-K teachers*. Presented to Grapevine ISD, Grapevine, TX.
Ledbetter, C. (1993, May). *Coordinated thematic science in the middle school (part 2).* Presented to Garland ISD, Garland, TX.
Ledbetter, C. (1993, April). *Coordinated thematic science in the middle school (part 1).* Presented to Garland ISD, Garland, TX.
Ledbetter, C. (1993, February). *Authentic assessment*. Presented to Austin ISD, Austin, TX.
Ledbetter, C. (1993, February). *Authentic assessment*. Presented to Lockhart ISD, Lockhart, TX.
Ledbetter, C. (1993, February). *FOSS for pre-K teachers*. Presented to Irving ISD, Irving, TX.
Ledbetter, C. (1993, January). *Science I/II curriculum writing*. Presented to Irving ISD, Irving, TX.

Ledbetter, C. (1993, January). *Penny Ante Science*. Presented to Irving ISD, Irving, TX.
Ledbetter, C. (1993, January). *Authentic assessment*. Presented to Grapevine ISD, Grapevine, TX.
Ledbetter, C. (1993, January). *Authentic assessment*. Presented to Dallas ISD, Dallas, TX.
Ledbetter, C. (1992, December). *FOSS for teaching water and electricity*. Presented to Ft. Worth ISD, Ft. Worth, TX.
Ledbetter, C. (1992, December). *Penny ante science*. Inservice presented to Irving ISD, Irving, TX.
Ledbetter, C. (1992, December). *Writing science I and II curriculum, part 2.* Inservice presented to Irving, ISD, Irving, TX.
Ledbetter, C. (1992, November). *FOSS for teaching measurement*. Inservice presented to Ft. Worth, ISD, Ft. Worth, TX.
Ledbetter, C. (1992, November). *Penny ante science, revisited*. Inservice presented to Irving ISD, Irving, TX.
Ledbetter, C. (1992, November). *Kinderscience*. Inservice presented to Irving ISD, Irving, TX.
Ledbetter, C. (1992, November). *Writing science I and II curriculum, part 1*. Inservice presented to Irving ISD, Irving, TX.
Ledbetter, C., & Fifer, F. (1992, October). *This ol' house*. Inservice presented to the Texas Utilities Advisory Committee, Ft. Worth, TX.
Ledbetter, C. (1992, September). *Writing science I curriculum*. Inservice presented to Garland ISD, Garland, TX.
Ledbetter, C. (1992, September). *TAAS and alternative testing methods*. Inservice presented to Carrollton-Farmers Branch ISD, Carrollton, TX.
Ledbetter, C. (1992, August). *FOSS, an overview*. Inservice presented for elementary teachers, University of Texas at Dallas, Richardson, TX.
Ledbetter, C. (1992, June). *Alternative assessment and critical thinking skills*. Inservice presented to Plano ISD, Plano, TX.
Ledbetter, C. (1992, June). *Science I curriculum and laboratory activities*. Inservice presented to Science I teachers, Texas Education Agency, Austin.
Ledbetter, C. (1992, May). *FOSS for elementary teachers*. Inservice presented to Grapevine/Colleyville ISD, Colleyville, TX.
Ledbetter, C. (1992, May). *Alternative assessment methods through hands-on tests.* Inservice presented for Allen ISD, Allen, TX.
Ledbetter, C. (1992, May). *Writing science II curriculum, part 2*. Inservice presented for Allen ISD, Allen, TX.
Ledbetter, C. (1992, May). *Writing science II curriculum, part 1*. Inservice presented for Allen ISD, Allen, TX.
Ledbetter, C. (1992, May). *Writing science I curriculum, part 2*. Inservice presented for Allen ISD, Allen, TX.
Ledbetter, C. (1992, April). *Writing science I curriculum, part 1*. Inservice presented for Allen ISD, Allen, TX.
Ledbetter, C. (1992, April) *Penny ante physical science*. Inservice presented for Region 11 Educational Service Center, Bridgeport, TX.
Ledbetter, C. (1992, April) *FOSS for teaching about nutrition and energy*. Inservice presented for Irving ISD, Irving, TX.
Ledbetter, C. (1992, April) *FOSS for teaching about water and the human body*. Inservice presented to Irving ISD, Irving, TX.

Ledbetter, C. (1992, April) *Writing science I curriculum*. Inservice presented for Plano ISD, Plano, TX.

Ledbetter, C. (1992, January). *Penny ante physical science*. Inservice presented for Region 11 Service Center, Cleburne, TX.

Ledbetter, C. (1992, January). *Penny ante science*. Inservice presented to the Clear Lake ISD, Galveston, TX.

Ledbetter, C. (1991, December). *Penny ante physical science*. Inservice presented for Region 11 Service Center, Dublin, TX.

Ledbetter, C. (1991, November). *Penny ante physical science*. Inservice presented for Region 11 Service Center, Sanger, TX.

Ledbetter, C. & Fifer, F. (1991, September). *FOSS for elementary teachers*. Inservice presented for Irving Independent School District, Irving, TX.

Ledbetter, C. & Fifer, F. (1991, September). *Penny ante physical science*. Inservice presented for Region 11 Service Center, Ft. Worth, TX.

Ledbetter, C. (1991, August). *Penny ante science for upper elementary teachers*. Inservice presented for Highland Park Independent School District, Highland Park, TX.

Ledbetter, C. & Fifer, F. (1991, May). *FOSS for elementary teachers*. Inservice presented for Irving Independent School District, Irving, TX.

Ledbetter, C. (1991, January). *Discrepant events in life science*. Inservice presented for Ft. Worth Independent School District, Ft. Worth, TX.

Ledbetter, C. (1991, January). *Discrepant events in earth science*. Inservice presented for Ft. Worth Independent School District, Ft. Worth, TX.

Ledbetter, C. (1991, January). *Discrepant events in biology*. Inservice presented for Ft. Worth Independent School District, Ft. Worth, TX.

Ledbetter, C. (1990, August). *Penny ante science, revisited!* Inservice presented for Irving Independent School District, Irving, TX.

Ledbetter, C. (1990, August). *Science and higher order thinking skills: Integrated learning*. Inservice presented for Carrollton/Farmers Branch Independent School District, Dallas, TX.

Ledbetter, C., and Fifer, F. (1990, February). *FOSS training*. Inservice presented to the Dallas Diocese, Dallas, TX.

Ledbetter, C. (1989, October). *Penny ante science for elementary students*. Inservice presented for CONOCO, Ponca City, OK.

Ledbetter, C. (1989, October). *Penny ante science for secondary students*. Inservice presented for CONOCO, Ponca City, OK.

Ledbetter, C., & Fifer, F. (1989, September). *Penny ante science has energy*. Inservice presented for Irving Independent School District, Irving, TX.

Ledbetter, C. (1989, September). *Hands-on energy labs*. Inservice presented for Dallas Independent School District, Dallas, TX

Ledbetter, C. (1989, January). *Outdoor activities for elementary teachers*. Inservice presented for Plano Independent School District, Plano, TX.

Ledbetter, C. (1989, January). *Go fly a kite*. Inservice presented for Dallas Independent School District, Dallas, TX.

Ledbetter, C. (1988, June). *Inexpensive labs*. Inservice presented for Regional Service Center, Austin, TX.

Ledbetter, C. (1987, October). *Science process skills for elementary students*. Inservice presented for Dallas Independent School District, Dallas, TX.

Ledbetter, C. (1987, October). *Cooperative groups for laboratory instruction*. Inservice presented for Dallas Independent School District, Dallas, TX.

Ledbetter, C. (1987, September). *Life science labs*. Inservice presented for Ft. Worth Independent School District, Ft. Worth, TX.

Ledbetter, C. (1987, January). *Process skills for sixth grade science classes*. Inservice presented for Ft. Worth Independent School District, Ft. Worth, TX.

Ledbetter, C. (1983, October). *BASIC for teachers*. Inservice presented for Irving Independent School District, Irving, TX.

Grants and Contracts

- 2005-2008: MAT-SE Online (UTTC): Co-PI (May—April, $142,468; Awarded $59,468, but declined by PI due to lack of sufficient funding)
- 2005-2006: Teacher Quality Grant (THECB): PI (June – May, $82,000; pending)
- 2004-2005: UTD-DISD-NSF LABoratory Enhancement Program (NSF): PI (June—May, $98,700)
- 2004: North Texas Clean Air Coalition: Co-PI (June – August, $5,400)
- 2004-2005: Teacher Quality Grant (THECB): PI (June – May, $80,000)
- 2003: Geography, Resources and Environment of Hispanic America (NSF): Co-PI (August – July, $50,000)
- 2002: MT SCIENCE: Mobile Technology for teaching and learning SCIENCE in the real world: Co-PI (August – August, $50,000)
- 2002: Course Development for Online Instruction: PI (June – August, $3,500)
- 1999-2000: Illumination of the TEKS; PI (April – March, $30,000)
- 1998-1999: Illumination of the TEKS; PI (April – March, $30,000)
- 1997-1998: Preservice Elementary Science Project; PI (January-August, $30,000)
- 1994-1995: Coordinated Thematic Science; PI (12 month contract, $18,000).
- 1993: Coordinated Thematic Science Statewide Evaluation; PI (August, $5,000)
- 1993: Science I Teacher Training; PI (January, $3,600; June, $6,000)
- 1992: Coordinated Thematic Science Statewide Evaluation; PI ($6,000)
- 1992: Science I Evaluation--Senior Member; Steve Rakow PI (January)
- 1992: Professional Development Center for Education and Technology; PI ($60,000)
- 1992: Science I Teacher Training; PI (January, $18,000; June, $36,000; September, $19,000)
- 1990-1991: MMSEC--Senior member; Fred Fifer PI

Current Research

- Learning Environments and Digital Data Collection Techniques for Teachers
- Pre-Kindergarten Science Skills Hands-on Testing
- Basic Science Skills Diagnostic Tests
- Teaching Science to Elementary Teachers: Pedagogy and Content
- Pre-Kindergarten Science Teaching

Professional Activities

- 2004: NSTA National Conference Evaluation Committee Chair
- 2004: NSF ITEST Panel Member, Dr. Julia Clark Program Chair
- 2003-2005: Manuscript Reviewer, *The Texas Science Teacher*
- 2003-2004: Secretary, Science Teachers Association of Texas

- 2002-2005: External Evaluator, UNTHSC Project SCORE (NSF), Rusty Reeves, PI
- 2001-present: Treasurer, Sigma Xi
- 2000: Manuscript Reviewer, *Journal of Geomorphology*
- 1999, December: Outside Evaluator, TWU Physical Science for Elementary Teachers: Carleton Wendel, PI
- 1999, January: Director, Kindergarten through 2nd Grade TEXTEAMS Institutes
- 1998, May: Guest Speaker, MENSA of Fort Worth—The Physics of Star Trek
- 1996-1999: Children's Garden Committee Member, Dallas Arboretum
- 1996-1997: Chair, Short Courses Committee, Conference for the Advancement of Science Teaching (Science Teachers Association of Texas)
- 1996-1997: Chair, Vendor Acquisition Committee, MiniCAST
- 1996-1997: Chair, Publication Committee, AETS
- 1995-1996: Co-chair, Publication Committee, AETS
- 1995-1996: Chair, Liaisons Committee, AETS
- 1995-1998: Education Committee Member, Dallas Arboretum
- 1995: Guest Science Teacher (4th grade), Bethany Elementary, Plano, TX.
- 1994-2000: Guest Science Teacher (3 year-olds through 6th grade), St. Philips School, Dallas, TX.
- 1994-1995: Representative, UTD faculty senate
- 1994-1995: SWAETS past president
- 1993-1996: AETS Board of Directors, Senior Representative at Large.
- 1991-1996: *STATellite* Editor (Newsletter of the Science Teachers Association of Texas)
- 1993-1994: Program Chair, Association of Educators of Teachers of Science, National Meeting, El Paso, TX.
- 1993: Texas State Science Supervisors Committee to Review the 2061 Benchmarks.
- 1992, March: Guest Speaker, Regional Science Fair--Experiments of the Mind.
- 1992, February: Guest Speaker, Plano Independent School District Science Fair--Expanding Your Horizons.
- 1992, February: Science Fair Judge, Junior High Division--Richardson Independent School District
- 1992-1994: SW-AETS--Director; Board of Directors--President
- 1991-1992: Science I State Evaluation Team--Member
- 1991-1993: AETS Board of Directors--Member
- 1991: SW-AETS--Director Elect; Board of Directors--Member
- 1991, April: Guest Speaker, Regional Science Fair--Science Fair Projects and the Future.
- 1991, March: Guest Speaker, Plano Independent School District Science Fair--An Experiment Is Never a Failure.
- 1991, March: Science Fair Judge, Senior Division--Mesquite Independent School District
- 1990-1991: Senior Associate, Minority Mathematics and Science Education Cooperative, Eisenhower grant.
- 1990-1992: Sigma Xi--Secretary
- 1990, April: Southern Association School Accreditation Visiting Committee for Dallas Independent School District--Chairperson of Science Curriculum Committee
- 1990, March: Plano Independent School District Science Fair--Guest Speaker, "Everyone Wins with Science Fair"

- 1990, February: Dallas Independent School District--Kramer Elementary PTA Guest Speaker, "Helping Is Not Doing--Elementary Science Fair"
- 1989: Regional Conference for the Advancement of Science Teaching--Entertainment Committee Chairman; Planning Committee Member
- 1989-1990: Sigma Xi--Treasurer
- 1989, March: Plano Independent School District Elementary Science Fair, District Level--Judge
- 1989, February: Irving Independent School District Science Fair--Guest Speaker, "Science Fair and Critical Thinking"
- 1988: Regional Conference for the Advancement of Science Teaching--Entertainment Committee Chairman; Planning Committee Member
- 1988: National Earth Science Teachers Association--Earth Science Laboratory Manual Evaluator
- 1988-1990: Southwest Association of Educators of Teachers of Science-- Board of Directors Member; Editor of the Semi-annual Newsletter; Secretary/Treasurer
- 1988, April: Southern Association School Accreditation Visiting Committee for Mesquite Independent School District--Philosophy and Objectives Committee Chairman;
- Plans and Priorities Committee Chairman
- 1988, March: Irving Independent School District Science Fair--Guest Speaker, "Everyone Wins with Science Fair"
- 1988, February: Southern Association School Accreditation Visiting Committee for Irving Independent School District--Science Curriculum Committee Member
- 1987, April: Southern Association School Accreditation Visiting Committee for the Fairhill School--Science Curriculum Committee Chairman; Math Curriculum Committee Member; Curriculum Overview Committee Member
- 1987, March: Science Fair Judge--Wilson Middle School, Plano Independent School District
- 1987, March: Science Fair Judge--Dartmouth Elementary School, Plano Independent School District
- 1986, April: Bryan Independent School District Teachers' Meeting--Guest Speaker, "Leaves, Stems and Roots."

University Committees

- 2004: TI-UTD-Plano ISD Outreach Committee
- 2004: Member, Health Professions Advisory Committee for Askari, Johnson, Richards, Rhy
- 2004-2005: Chair, NATS Courses Planning Committee
- 2004: Member, Kusch Auditorium Renovation Grant Team (Award of $116,000)
- 2004: Member, Distance Learning Committee
- 2003: Chair, Doctoral Examining Committee of Michele Marshall, *The Soule That Things in Their Nature Frame: Katherine Philips and the Poetics of Cultural Engagement*
- 2002: Outside Evaluator of Dr. Steven Marks for promotion to Full Professor Oklahoma State University
- 2002: Committee Third-Year Review of Dr. Ryan, UTD
- 2002: Academic Search Committee Chair, Science/Mathematics Education, UTD

- 2002: Member, Biotechnology Task Force, UTD
- 2002-2004: Member, Graduation Committee, UTD
- 2002-2003: Member, Committee for Teaching Awards, UTD
- 2001-2004: Member, Doctoral Committee, Curtin University of Technology, Australia—Kathryn Skinner.
- 2001-2004: Member, Doctoral Committee, Curtin University of Technology, Australia—Richard Plott.
- 2000-2004: Member, Doctoral Committee, Curtin University of Technology, Science Mathematics Center, Perth, Australia—Linda Scott Houston
- 1999-2002: Member, Doctoral Committee, Curtin University of Technology, Science Mathematics Center, Perth, Australia —Rebekah Nix.
- 1996-99: Member, Doctoral Committee, Curtin University of Technology, Science Mathematics Center, Perth, Australia —Becky Sinclair.
- 1998: Chair, Environmental Science Committee, UTD
- 1998: Member, Committee to Examine Censorship, UTD
- 1996-98: Member, Committee on Educational Practice, UTD
- 1996: Member, University Appraisal Committee, UTD
- 1996-98: Member, Doctoral Examining Committee, Curtin University of Technology, Australia-- Susan Barkdoll.
- 1995: 4 X 4 Committee, Faculty Leave, UTD
- 1995: Member, Excellence in Teaching, UTD
- 1995: Co-chair, Student Life, UTD
- 1994: Co-chair, Faculty Handbook Committee, UTD
- 1994: Member, Excellence in Teaching, UTD
- 1994: Committee Member, Student Life, UTD
- 1992: Co-chair, Faculty Handbook Committee, UTD
- 1992: Member, Excellence in Teaching Committee, UTD
- 1991: Co-chair, Faculty Handbook Committee, UTD
- 1991: Member, Medical School Interview Committee, UTD
- 1991: Chairman, Doctoral Examining Committee, UTD
- 1988: Chairman, Doctoral Examining Committee, UTD
- 1986: Committee Member, Naturalistic Inquiry Group, TAMU
- 1986: Co-chairman, Entertainment Committee of the Graduate Student Association, TAMU
- 1986: Graduate Student Representative, Doctoral Student Screening Committee, TAMU
- 1985: Member, Committee for the Expansion of the Department of Educational Curriculum and Instruction, TAMU

Professional Membership

- American Educational Research Association
- Association of Educators of Teachers of Science
- Metroplex Area Science Supervisors Association
- National Association for Research in Science Teaching
- National Association of Underwater Instructors
- Science Teachers Association of Texas
- Sigma Xi--Charter Member

- Southwest Association of Educators of Teachers of Science
- Texas Association of Teacher Educators
- Texas Environmental Education Association
- Texas Marine Educators Association
- Texas Faculty Association
- Texas Science Supervisors Association

Professional Development

2004, February: Project Wild Leadership Training, SW-AETS, Georgetown, TX
2003, February: Academic Chairperson's Conference, Orlando, FL
2002, February: Academic Chairperson's Conference, Orlando, FL.
2001, December: WebCT Training, UT-Dallas
1998, February: TEXTEAMS Institute, Dallas
1994, September: FOSS Trainers Institute, Arlington
1993, October: FOSS Trainers Institute, Garland
1993, February: Nominated for UTD Teacher of the Year
1993, January: Excellence in Teaching Award Nominee
1992, September: FOSS Trainers Institute, Garland
1992, January: Excellence in Teaching Award Nominee
1991, May: Chataqua Marine Science Institute, Corpus Christi
1991, October: FOSS Trainers Institute, Dallas
1991, December: PageMaker Training, Dallas

Honors

2004, October: Nancy Dillard-Lyon Outstanding Volunteer Award from St. Philips School for work with children in science.
2004, August: Member, SciTech Advisory Board
2004, February: Coordinator (with Nix, R.) A visit from Dr. Barry Fraser to begin an international alliance with Curtin University of Technology and the Science-Mathematics Education Centre.
2004, January: Invited Speaker (with Nix, R.) Texas Aquarium and Zoo Association. *Measuring the Invisible . . . effective and practical evaluation for environmental education programs.*
2003, September: Honorary Member of Graduation Ceremony, Curtin University of Technology Science Mathematics Education Centre, Perth, Australia
2003, March: Secretary, Science Teachers Association of Texas
2001, February: Adjunct Associate Professor at Curtin University of Technology, Science Mathematics Education Centre, Perth, Australia
1999, October: Chosen Lifetime Member of the Science Teachers Association of Texas

Homer Montgomery, Ph.D.

Science and Mathematics Education
Assistant Professor, Department of Science Education
Associated Professor, Department of Geosciences
Founders North 3.308A
University of Texas at Dallas, FN33, Box 830688, Richardson, TX 75083
Phone: 972.883.2480; Admin. Assist.: 972.883.2496; Fax: 972.883.6796

Educational History:
B.S., Geology, University of Texas at Austin, 1982
Ph.D., Geology, University of Texas at Dallas, 1988; Dissertation topic: Paleozoic paleogeography of
Northern Mexico

Principal positions since bachelor's degree:
Teaching and Research Assistant, 1983-1988, University of Texas at Dallas
Assistant Professor, geology, 1988-1991, University of Puerto Rico
Research Scientist/Senior Lecturer in Geosciences and Senior Lecturer in Science Education,1991-2000, University of Texas at Dallas
Director, 1995-1998, University of Texas at Dallas Eisenhower Collaborative for Excellence in Science Teaching
Director, 2002-present, UTD Collaborative for Excellence in Science Teaching
Director, 2003-2004, UTD/Mesquite ISD Integrated Physics and Chemistry Program
Director, 2004-2005, UTD/Mesquite ISD Cambridge Physics Program
Director, 2004-2005, UTD/Richardson ISD Eighth Grade Program
Director, 2004-present, UTD/Texas Commission on Environmental Quality summer Teacher Program

Appointments, consultantships:
Consultant, 1998-present, FOSS (Full Option Science System) Lawrence Hall of Science, University of California, Berkeley
Editor, 1999-present, *The Texas Science Teacher* (biannual circulation approx. 5,000)
Board member, 1999-present, Science Teacher Association of Texas
Vice President, 2000-2001, National Association of Geoscience Teachers, Texas
Adjunct Professor, 2001, Our Lady of the Lake University, San Antonio
President, 2002-2003, National Association of Geoscience Teachers, Texas

Books edited or co-edited (content reviews):
Biggs, A., et al., 2002, Texas Science, Grade 7: Glencoe/McGraw Hill, 918 p.
Scotchmoor, J., Breithaupt, B., Springer, D., and Fiorillo, A., 2002, Dinosaurs, The science behind the Stories: Society of Vertebrate Paleontology, American Geological Institute, 186 p.

Articles in refereed journals:
Montgomery, H., 1987, Microfacies and paleogeographic significance of the Permian patch reefs at Sierra Plomosa, Chihuahua. Gaceta Geologica, Excursion Geologica No. 2, Geological Society of Mexico, Chihuahua Section, 1, 70-81.

Montgomery, H., 1990, Abnormal terminal Cretaceous foraminifera of east-central Texas: Texas Journal of Science. v. 42, p. 37-44.
Larue, D. K., Montgomery, H., Anderson, R. N., Robinson, E. T. , Saunders, J., and others, 1990, Initial Reports on Drilling at Toa Baja, Puerto Rico: Proprietary report on petroleum potential and scientific drilling results for Commonwealth of Puerto Rico Power Authority. 54 p.
Schellekens, J., Montgomery H., Joyce, J., Smith, A., 1990, Late Jurassic to Late Cretaceous development of island arc crust in southwestern Puerto Rico: Transactions of the Caribbean Geological Conference, v 12, p. 268-281.
Montgomery, H., Robinson, E., Saunders, J., and Van den Bold, V., 1991, Paleontology of the Toa Baja Well, Puerto Rico: Geophysical Research Letters. v. 18, p. 509-512.
Larue, D. K., Montgomery, H., Anderson, R. N., 1991, Drilling at Toa Baja, Puerto Rico: preliminary results of drilling into a non-volcanic island arc massif: Scientific Drilling. 1, p. 283-295.
Montgomery, H., 1992, Late Jurassic radiolarian-based paleogeography of Sierra Bermeja, southwestern Puerto Rico: Regional Stratigraphic Correlations in the Caribbean. I.U.G.S., UNESCO Project 165.
Montgomery, H. A., Pessagno, E. A., Jr., and Munoz, I., 1992, Jurassic (Tithonian) Radiolaria from La Desirade (Lesser Antilles): Preliminary Paleontological and Tectonic Implications: Tectonics. v. 11(6) p. 1426-1432.
Montgomery, H., Pessagno, Jr., E. A., Soegaard, K., Smith, C., Munoz, I., and Pessagno, J., 1992, Misconceptions concerning the Cretaceous/Tertiary boundary at the Brazos River, Falls County, Texas: Earth and Planetary Science Letters. v. 109, p. 593-600.
Montgomery, H., Pessagno, E. A., Jr., and Lewis, J. A., Schellekens, J. H., 1994, Paleogeography of the Jurassic fragments in the Caribbean: Tectonics. v. 13, p. 725-732.
Montgomery, H., Pessagno, E. A., Jr., and Pindell, J. L., 1994, A 195 Ma terrane in a 165 Ma ocean: Pacific origin of the Caribbean Plate: GSA Today. v. 4, p. 1-6.
Montgomery, H., 1998, Paleogene stratigraphy and sedimentology of the North Coast, Puerto Rico: in Lidiak, E., and Larue, D. K., eds., Tectonics of the Northeastern Caribbean, Special Publication of the Geological Society of America Special Paper 322, p. 177-192.
Pessagno, E., Cantu-Chapa, A., Hull, D., Kelldorf, M., Longoria, J., Martin, C., Meng, X., Montgomery, H., Fucugauchi, J., Ogg, J., 1999, Stratigraphic evidence for northwest to southeast tectonic transport of Jurassic terranes in Central Mexico and the Caribbean (western Cuba): in Mann, P., ed., Caribbean Basins. Sedimentary Basins of the World, 4, Elsevier Science, Amsterdam, p. 123-150.
Fiorillo, A, Main, D., Bhattacharya, J., and Montgomery, H., 2000, Paleoecological analysis of a Juvenile Titanosaurid locality with the Javelina Formation of Big Bend National Park: National Park Service Research: v. 4.
Montgomery, H., 2001, How fast did dinosaurs run?: The Texas Science Teacher. v. 30(1), p. 16-19.
Montgomery, H., 2002, Analysis of a science education field trip to the Rocky Mountains, what have we learned?: The Texas Science Teacher. v. 31(2), p. 28-31.
Montgomery, H., 2002, Weird science - voodoo in the Caribbean: The Texas Science Teacher. v. 31(2), p. 10-11.
Montgomery, H., 2003, The evolution of an undergraduate service course – How to Cope with Success of an Age of Dinosaurs Course: Journal of Geological Education. V. 51(3), p. 299-303.
Montgomery, H., 2004, Effective geological fieldwork as part of a graduate program for practicing science teachers: The Texas Science Teacher, v. 33(1), p. 16-23.

Montgomery, H., 2004, Deposition and emplacement of Permian reefs in Sierra Plomosa, Chihuahua, Mexico. Revista Mexicana de Ciencias Geologicas: V. 21(2), p. 236-246.
Montgomery, H., 2005, Constructivist Pedagogical Preferences of Undergraduate Students in Geoscience Service Courses at the University of Texas at Dallas. v. 34(1), p. 25-30.
Montgomery, H., 2005, When Humans Interact with a Volcano - Tragedy of Historic Proportions. v. 34(2), p. 30-37.

Editorials in peer-reviewed journal:

Montgomery, H., 2000, Condemnation of 1277: The Texas Science Teacher. v. 29(1), p. 4.
Montgomery, H., 2000, Checking the Polls: The Texas Science Teacher. v. 29(2), p. 5-6.
Montgomery, H., 2001, Scientists through the eyes of children: The Texas Science Teacher. v. 30(1), p. 5-9.
Montgomery, H., 2001, Who needs a geological education, anyway?: The Texas Science Teacher. v. 30(2), p. 7-8.
Montgomery, H., 2002, Evolution's dark side: The Texas Science Teacher. v. 31(1), p. 5-6.
Montgomery, H., 2002, Sex, natural selection, and evolutionary implications: The Texas Science Teacher. v. 31(2), p. 5-6.
Montgomery, H., 2003, Primitive medical science: The Texas Science Teacher. v. 32(1), p. 5-9.
Montgomery, H., 2004, Educational administration gone awry: A cautionary tale: The Texas Science Teacher. v. 33(1), p. 5-6.
Montgomery, H., 2004, Evolution and the inevitable social quicksand of sexual selection: The Texas Science Teacher. v. 33(2), p. 5-7.
Montgomery, H., 2005, What I Have Learned While Teaching Science to Undergraduates. v. 34(1), p. 5-7.
Montgomery, H., 2005, What Does a Field Scientist Do? v. 34(2), p. 5-6.

Articles appearing as chapters in edited volumes:

Montgomery, H., and Pessagno, E. A., Jr., 1999, Cretaceous microfaunas of the Blue Mountains, Jamaica, and of the Northern and Central Basement Complexes of Hispaniola: in Mann, P., ed., Caribbean Basins. Sedimentary Basins of the World, 4, Chapter 10, Elsevier Science, Amsterdam, p. 237-246.

Invited Lectures

2001

1. Texas dinosaurs, Sigma Xi, UTD.
2. **Texas dinosaurs, UTD Program in Geosciences, Lecture Series.**
3. Texas dinosaurs, Richardson Rotary.
4. Caribbean paleogeography, Egyptian Geological Survey, Cairo.

2002

1. Paleoecological significance of a new sauropod bonebed in the Javelina Formation of Big Bend National Park, University of Puerto Rico at Mayaguez, Nov. 15.

2003

1. National Science Teachers Association Annual Meeting, Philadelphia, Presentation to the editors of state association science journals, March 29
2. Juvenile dinosaurs of the Big Bend, Grace Museum, Abilene, TX, September 25.

2004

1. Using dinosaurs to teach science, Our Lady of the Lake University, San Antonio, February 14.
2. Constructive in the classroom, assessment issues, University of Paris, October 20.

2005

1. Cottle Lecture Series, The life, death, and preservation of juvenile sauropod dinosaurs of Big Bend, Sul Ross Univeristy, March 17.
2. Taphonomy and the juvenile dinosaurs of Big Bend, University of Texas at Arlington, Geology Department Lecture Series, April 7.

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Academics

- PhD in Astrophysical, Planetary, and Atmospheric Sciences, August '99, University of Colorado at Boulder

Thesis: Thermal Properties of Airless Planetary Regoliths

- MS in Astrophysical, Planetary, and Atmospheric Sciences, August '95, University of Colorado at Boulder
- BS in Physics with Astrophysics Option, May '92, with Honors, New Mexico Institute of Mining and Technology
- BS in Geophysics, May '92, with Honors, New Mexico Institute of Mining and Technology

Employment History

- **Assistant Professor** @ Department of Science/Mathematics Education, School of Natural Sciences and Mathematics, University of Texas at Dallas (September '02 –present)
- **National Research Council Postdoctoral Associate** @ NASA Ames Research Center, Center for Mars Exploration (September '00 –September '02)
- *Advisor: Dr. Virginia Gulick.*
- **Caltech Postdoctoral Scholar** @ Jet Propulsion Laboratory (June '99 - September '00) Thermal modeler for the 1999 Mars Microprobe Mission
  Advisor: Dr. Sue Smrekar.
- **Research Assistant** @ Laboratory for Atmospheric and Space Physics, University of Colorado at Boulder (August '95–May '99) *Advisor: Dr. Bruce Jakosky*
- **Instructor** @Science Discovery, Boulder, Colorado (Summer '97) Developed and taught middle school program *Destination Mars*
- **Instructor** @ Astrophysical, Planetary, and Atmospheric Sciences Dept., University of Colorado at Boulder (Summer '95), *Introductory Astronomy*
- **Research Assistant** @ Laboratory for Atmospheric and Space Physics, University of Colorado at Boulder (May '93 –January '94) Advisor: *Dr. Larry Esposito*
- **Teaching Assistant** @ Astrophysical, Planetary, and Atmospheric Sciences Dept., University of Colorado at Boulder (August '92 –May '93, January '94–May '95)
- **NASA PGGURP Intern** @ U.S. Geological Survey, Menlo Park, California (Summer '91) *Advisor: Dr. Henry Moore*

Selected Awards

- 2005 Outstanding Faculty Instructor Award for the School of Natural Sciences and Mathematics, University of Texas at Dallas

- 2000–2002 National Research Council Postdoctoral Research Award
- August 1997, *Reaching for the Red Planet* was selected by NetTech (funded by the U.S. Department of Education) to be "abstracted and cataloged as an exemplary educational resource."
- April 1997, Selection of *Reaching for the Red Planet* as a member of the Digital Dozen by the Eisenhower National Clearinghouse for Mathematics and Science Education
- 1992, 1994, 1995, 1996 University Fellowships, University of Colorado at Boulder
- 1991 Planetary Society Fellowship
- 1987–1991 Competitive Scholarship, New Mexico Institute of Mining and Technology
- 1987–1988 Engineer's Club of Dallas Scholarship
- 1987 Congressional Scholar

Professional Affiliations

American Geophysical Union, member, 1994–present
American Astronomical Society, affiliate member, Division of Planetary Science, 1994–present
Astronomical Society of the Pacific, member, 1997–present
American Association of Physics Teachers, member, 2003 –present
National Science Teachers Association, member, 2003-present
Texas Science Teachers Association, member, 2002-present

Selected Publications and Abstracts

Hairston. M R., and M. L. Urquhart, Cindi en el Espacio, a Spanish-language comic book web published January, 2006.

Hairston, M. and M.L. Urquhart, *Cindi in Space,* web published, 2005.

Urquhart, M.L., and M.R. Hairston, Space Science for Middle School Teachers: Integrating CINDI E/PO into a Long-Term Professional Development Program *American Geophysical Union*, abstract # ED11C-1109, Fall Meeting 2005.

Urquhart, M.L., Weather in Space?!?, What's That? Let CINDI Be Your Guide, *Conference for the Advancement of Science Teaching*, Houston, November, 2005.

Urquhart, M.L., Voyage Through Astronomy with Stars and Planets, *Conference for the Advancement of Science Teaching*, Houston, November, 2005.

Urquhart, M.L., Teachers as Students, in *Cosmos in the Classroom 2004: A Hands-On Symposium on Teaching Introductory Astronomy*, Ed. A. Fraknoi and W. Waller, ASP, 2005.

Urquhart, M.L. Adapting Pre-College Activities on Scale to Astronomy 101*, in Cosmos in the Classroom 2004: A Hands-On Symposium on Teaching Introductory Astronomy*, Ed. A. Fraknoi and W. Waller, ASP, 2005.

Urquhart, M.L. and K. M. Bober, The Impact of Teacher Quality Grants on the Long-Term Professional Development of Science Teachers, *Proceedings of the 2005 Physics Education Research Conference* (in press).

Urquhart, M. L., and K. M. Bober, Early Childhood Ideas of Science and Scientists, NARST Proceedings, 2005.

Urquhart, Explore Earth's Ionosphere with CINDI (a short course). *National Science Teachers Association Annual Meeting*, Dallas, Texas, April 2005

Urquhart, M.L., A Scientist in a Preschool Classroom. *National Science Teachers Association Annual Meeting*, Dallas, Texas, April 2005

Urquhart, M.L., Impact of Low Thermal Conductivity Layers on the Bulk Conductivity of a Martian Crustal Column, *Lunar Planet. Sci*., *XXXVII*, 2337, 2005.

Urquhart, M.L. and K. M. Bober, Impacting Classroom Teachers Through Long-Term Professional Development, *Lunar Planet. Sci*., *XXXVII*, 1480, 2005.

Urquhart, M. L., and K. M. Bober, Early Childhood Ideas of Science and Students, *Proceedings of the National Association for Research in Science Teaching*, 2005.

Lucey, P.G, K.R. Blasius,, B. Bussey, R.L. Hoelter, J.J. Gillis, S.L. Lawson, M.T. Mellon, J,, Spenser, M.L. Urquhart, A.R. Vasavada, and A.T. Wang. An Imaging Radiometer for Measurement of Lunar Cold Trap Temperatures, in *Applications with Weather Satellites II,* ed. Menzel et al., **5660**, pp. 98-106 (December 2004).

Urquhart, M.L., From Mars to the Classroom, *Texas Science Teacher, 33*, 38-41, 2004.

Urquhart, M.L., The Cassini Spacecraft Approaches Saturn, *Texas Science Teacher, 33*, 41, 2004.

Urquhart, M.L., How classroom techniques from a successful graduate astronomy course for pre-college teachers can apply to the undergraduate classroom, *Quad Annual Cosmos in the Classroom Conference on Undergraduate Astronomy Education*, ASP, 2004.

Urquhart, M.L., and N. Turner, Developing a sense of scale (Invited Workshop), *Quad Annual Cosmos in the Classroom Conference on Undergraduate Astronomy Education*, ASP, 2004.

Urquhart, M.L., Bringing Mars Exploration into the Classroom, *Mini-Conference for the Advancement of Science Teaching*, session 3, 2004.

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APPENDIX C – 2005-2006 GRADUATE CATALOG – SCE SECTION

Please see the following pages.

Department of Science Education and Mathematics Education

http://www.utdallas.edu/dept/sci_ed/

Faculty

Professors: Thomas R. Butts, Frederick L. Fifer, Jr., Russell Hulse
Associate Professors: Cynthia E. Ledbetter (Head), Titu Andreescu
Assistant Professors: Homer Montgomery, Mary L. Urquhart
Science Education Specialist: Barbara A. Curry
Affiliate Faculty: John Burr, John Hoffman, Scherry Johnson, Lynn Melton, Robert Stern
Disciplinary science and mathematics courses are taught by faculty members in that discipline.

Objectives

The Master of Arts in Teaching (M.A.T.) degree in Science Education stresses training in the art of teaching and advanced knowledge in the science selected for major specialization. Designed for individuals with significant ability in a discipline and a serious commitment to teaching, the program offers an opportunity for professional development of experienced teachers.

The M.A.T. degree in Mathematics Education is aimed at mathematics and computer science teachers in grades 8 - 12 and the community college level. [For mathematics teachers in grades 4 - 8, there is a comparable degree in the MAIS program.] It is a content-oriented program that strives to achieve a balance between increasing subject-matter knowledge and investigating relevant pedagogical and content issues of the mathematics curriculum with an emphasis on linking collegiate mathematics with secondary mathematics.

Facilities

Scientific equipment which supports the various programs at the university is available to students in the M.A.T. program. Facilities in biology, chemistry, computer science, geoscience, mathematics and physics are briefly described in the respective disciplinary sections of the catalog.

Admission Requirements

See the University's general admission requirements here.

Special permission from the Department Head is required for admission.

Science Education

Admission to the Graduate Program in Science Education requires, in addition to general University requirements, at least 24 hours in science. Students with strong backgrounds in an area of specialization are encouraged to discuss alternate plans with the Science Education Graduate Adviser. Students without the required science content backgrounds will be required to correct the deficiencies prior to admission.

Mathematics Education

Admission to the Graduate Program in Mathematics Education requires, in addition to the general University requirements, includes at least one year of calculus, linear algebra and a junior-level course involving mathematical proof. Those teaching mathematics in grades 4 - 8 may wish to consider the option "The Teaching of Mathematics in Grades 4 - 8" in the Master of Arts in Interdisciplinary Studies [MAIS] program. Consult the Graduate Adviser for details.

Degree Requirements

The University's general degree requirements are discussed here. Additional requirements for each M.A.T. degree are described below.

Science Education (Thesis Option; both online and traditional**)**

All students seeking the Master of Arts in Teaching (M.A.T.) Science Education degree (thesis option) must satisfactorily complete the following requirements (minimum of 36 graduate semester hours):

- SCE 5301, SCE 5305, SCE 5308 and STAT 5353 (or acceptable equivalent as a prerequisite to enrolling in research hours),
- A minimum of four courses (minimum of 12 semester hours) in a chosen specialization related to the student's major area of study. Specialty areas include biology, chemistry, geosciences and physics,
- A minimum of three courses (minimum nine semester hours) in one specialty other than the chosen specialization.
- A minimum of six semester hours in thesis research, SCE 8398, and
- Submission an acceptable thesis which warrants publication in peer reviewed journals, scholarly books, monographs or the equivalent.

In addition to the above requirements, students must submit, no later than the second semester of enrollment, an acceptable research proposal to the supervising committee. Upon completion of the thesis research, the candidate will publicly defend the thesis. The thesis is directed by a Supervising Professor and must be approved by the Head of the Science/Mathematics Education Department.

Science Education (Non-Thesis)

The M.A.T. degree in Science Education requires 36 semester hours, distributed as follows:

Science Education Courses (9 hours)

SCE 5301 Critical Issues in Science Education
SCE 5305 Evaluating Research in Science Education
SCE 5308 Research Design and Methodology for Science Education

Science Content Courses (18-24 hours)

Primary Area: 12-16 hours in biology, chemistry, geosciences, or physics.

Secondary Area: 6-8 hours in biology, chemistry, geosciences, or physics.

Electives (3-12 hours)

Three to twelve hours of electives are taken to complete the required minimum of 36 hours. These elective hours, chosen with the Graduate Advisor, may include additional science, mathematics, education and science education courses.

No more than two of the four courses required for a primary area may be taken during a summer field trip. No more than 15 hours will be accepted for transfer credit. Under appropriate circumstances, the Department Head may make substitutions for portions of these requirements.

Mathematics Education

The M.A.T. degree in Mathematics Education requires 36 semester hours, distributed as follows:

Mathematics Education Core Courses (15 hours)

Five approved courses chosen from:
Analysis: MATH 5301, 5302;
Algebra and Discrete Mathematics: CS 5333, MATH 6311;
Geometry: MATH 5305, 5306;
Probability and Statistics: STAT 5351, 5352
Other relevant courses approved by the Graduate Adviser
Students wishing to emphasize computer science may substitute appropriate courses for those in the Mathematics Education Core as approved by the Graduate Adviser.

Professional Course (3 hours)

MATH 5310 (ED 5306) Seminar: The Teaching of Mathematics and Computer Science.

Guided Electives (18 hours)

Six courses in mathematics, computer science or other area involving applications of mathematics or pedagogy (approval by Graduate Adviser required). MATH 5320 (which may be repeated up to six times) is highly recommended.

Science Education Course Descriptions

SCE 5301 Critical Issues in Science Education *(3 semester hours) Examination of classic issues in science and technology and the relationships developed between them. Topics include population and population growth, food and food sources, energy and energy sources, water needs/solutions, diseases and cures, housing – safe and adequate, environmental issues – personal and political, and security – local and global.* Also offered through the MAT-SE online strand. (3-0) Y

SCE 5302 Photographic Field Collection Techniques *(3 semester hours)* The use of a camera as a field collection instrument. Included topics are basic camera techniques, logging system for in-field use, coding system and cataloging procedure for access to stored slides. Field trip. (1-6)

Y
SCE 5305 Evaluating Research in Science Education *(3 semester hours) Examination of selected topics in the methodological and philosophical foundations of science education as applied to contemporary issues affecting today's students. Topics include current research on hands-on/inquiry teaching, concept mapping, student misconceptions, learning/teaching styles, alternative assessment, gender differences, learning environments, action research, and knowledge transfer to provide a context for the history of science literacy and educational literacy; quantitative and qualitative research methods; and professional writing techniques.* Prerequisite: one semester teaching experience in science or consent of instructor. Also offered through the MAT-SE online strand. (3-0) Y
SCE 5308 Research Design and Methodology *(3 semester hours) Application of the methodological and philosophical foundations of research in science education pertaining to an individual research question. Topics include educational research ethics and design, measuring instruments and data manipulation, methodological rigor, evidence-based conclusions, and publication genres to support the development of a professional presentation and formal research paper.* Also offered through the MAT-SE online strand. Prerequisite: SCE 5305 (3-0) Y
SCE 5309 Critical Thinking *(3 semester hours)* Study of critical issues, problem-solving techniques and reasoning abilities as they relate to science/mathematics education in today's classrooms. (3-0) Y
SCE 8398 Thesis Research (*3 hours credit)* May be repeated. (3-0) Y
SCI 5320 Astrobiology *(3 hours credit)* The ultimate integrated science, astrobiology brings together from the fields of astrophysics, planetary science, terrestrial geosciences, and of course, biology, an understanding how the history and diversity of life on our own planet relates to the possibilities for life on other worlds. (2-3) T
SCI 5321 Science for Elementary School Teachers *(3 semester hours)* Fundamental concepts in chemistry, physics, life and earth sciences, with particular emphasis on their applicability to the elementary science curriculum, including laboratory activities. (May be repeated to a maximum of 9 hours.) (2-3) Y
SCI 5322 Basis of Evolution *(3 hours credit)* Through discussions of the nature of science, Charles Darwin's travels, natural selection, the geologic record, and other topics, students will be acquainted with the scientific data that supports evolutionary theory. (2-3) T
SCI 5324 Ecology *(3 semester hours)* General ecological principles as related to productivity, population diversity, communities and ecosystem functions. Field data collection techniques included. (2-3) Y
SCI 5325 Integrated Science for Teachers *(3 semester hours)* Investigation of science standards using pedagogical models of best practice applicable to a variety of learners in diverse contexts. Inquiry-based investigations feature various topics in physical, earth and life sciences – with a hands-on emphasis on the latest scientific research and educational application. Courses are offered online only. (May be repeated to a maximum of 9 hours as topics cycle through earth, life and physical sciences.) (3-0) Y
SCI 5326 Astronomy: Our Place in Space *(3 hours credit)* This course focuses on developing student understanding of our planet fits within a larger astronomical context. Topics will include common misconceptions in astronomy, scale in the solar system and beyond, phases of the moon, seasons, navigating the night sky, our sun as a star, properties and lifecycles of stars, galaxies, and cosmology. (2-3) T
SCI 5327 Comparative Planetology *(3 hours credit)* Every world in our solar system is unique, but none more so than our own planet Earth. In this course we will explore the astrophysical, chemical, and geological processes that have shaped each planet, moons and the myriad of rocky

and icy bodies in our solar system. We will also investigate what discoveries of worlds orbiting other stars may tell use about our own solar system and home world. (2-3) T

SCI 5328 Marine Science *(3 hours credit)* The purpose of this class is to acquaint students with issues surrounding our use of the oceans and their resources. Students will also gain skills in writing an on-line lesson plan and in preparing a research report. (2-3) Y

SCI 5331 Physics in the Classroom I: Force and Motion *(3 hours credit)* The primary focus of the class will be deepening the participants' conceptual understanding of physics, always with the added component of applicability to the pre-college classroom. We will use a hands-on approach, and will utilize FOSS, Cambridge Physics (CPO), and examples of physics in the everyday world. (2-3) T

SCI 5332 Physics in the Classroom II: Energy in Motion *(3 hours credit)* The physics content topics will be covered in workshop style, with hands-on materials available in local districts or demonstrations and experiments that can be done with inexpensive or common materials. Students will also be expected to think critically about how topics discussed in the course can relate to their own classrooms. (2-3) T

SCI 5333 Physics in the Classroom III: Physics in the Modern World *(3 hours credit)* The physics content topics covered in this course will deepen the participants' conceptual understanding of physics, using hands-on materials available in local districts or demonstrations and experiments that can be done with inexpensive or common materials. (2-3) T

SCI 5334 Instructional Strategies in Science *(3 hours credit)* Designed for the master teacher/department leader, strategies for fostering an integrated science program based on national and Texas curriculum and assessment standards are presented through hands-on activities. (3-0) T

SCI 5335 Environmental Field Methods *(3 hours credit)* Hands-on activities explore the properties and qualities of water through traditional and digital sampling methods. Designed for teachers, this inquiry-based course addresses information technology and environmental science standards in the context of real-world constructivist practice. May be repeated for credit as topics change. (2-3) T

SCI 5330 Special Topics *(3 semester hours)* May repeat for credit to a maximum of 9 hours. (3-0) Y

SCE 5V06 Special Topics in Science Education *(1-3 semester hours)* (May be repeated for credit to a maximum of 9 hours.) ([1-3]-0) S

SCI 5V06 Special Topics in Science (*1-3 semester hours*) (May be repeated for credit to a maximum of 9 hours) ([1-3]-0) S

Mathematics Education Course Descriptions

MATH 5310 (ED 5306) Seminar: The Teaching of Mathematics and Computer Science *(3 semester hours)* A forum for sharing ideas on current issues in the teaching of mathematics and computer science, grades 8-14, through participant presentations and discussions. Some work on mathematics history is included. Prerequisite: One year of teaching experience in mathematics or computer science. (May not be counted as credits toward the M.S. or Ph.D. degrees in Mathematical Sciences.) (3-0) Y

MATH 5320 Usual and Unusual Problems Using Secondary Mathematics *(3 semester hours)* For teachers only.

Emphasis on (1) problem solving, (2) linking 'college mathematics' and 'secondary mathematics', and (3) using technology. Content varies from term to term with courses in algebra, geometry, precalculus, calculus, probability/statistics, discrete mathematics, mathematical modeling. (May be repeated to a maximum of 15 semester hours.) (May not be

counted as credits toward the M.S. or Ph.D. degrees in Mathematical Sciences.) (3-0) Y
MATH 5330 Topics in Mathematics *(3 semester hours)* Special topics for mathematics teachers. (May be repeated for credit to a maximum of 9 hours.) (May not be counted as credits toward the M.S. or Ph.D. degrees in Mathematical Sciences.) (3-0) Y
MATH 5V06 Special Topics in Mathematics (1-3 semester hours) (May be repeated for credit to a maximum of 9 hours) (May not be counted as credits toward the M.S. or Ph.D. degrees in Mathematical Sciences.) ([1-3]-0)S

Other Graduate Degree Programs in Department of Natural Sciences and Mathematics

Biology
Chemistry
Geosciences
Physics
Mathematical Sciences