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Annual Project Report

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MathVision Lab

LEQSF(2002-04)-ENH-TR-17

(LSU Proposal #14895)

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Abstract: The MathVision Lab is a collaboration between mathematicians, university researchers and education practitioners. The purpose is to produce researched-based solutions to problems in mathematics education, including strategies for making systemic improvements, training and professional development services for teachers, and instructional services and materials for many grade levels. Many of the projects that the Lab will undertake are designed to increase the number and the quality of mathematics teachers in Louisiana. Quoting the original proposal, we proposed that

by Fall 2003, the MathVision Lab will be an established unit, successfully fulfilling its mission:

- *to provide a structure that fosters mathematics education research and outreach,*
- *to address systematically the issues involved in training and supporting mathematics teachers and*
- *to participate actively in initiatives designed to improve mathematics instruction at all levels.*

To an extent exceeding our most optimistic expectations, these goals have been met.

Report

The most concrete benchmark set in the original proposal was to apply for a total of at least one million dollars in external funding by 12/31/03. The MathVision Lab directed the preparation of the LSU's STEMTP proposal to NSF, which resulted in a grant of \$1 million awarded in spring 2003. This supports the new Science, Technology Engineering and Math Majors with Concentration in Secondary Education program at LSU, in the design of which the MathVision Lab played a critical role. Other support already secured for MathVision projects totals at least an additional \$700,000 (under strict accounting—substantially more if liberal criteria for association are allowed). Thus, the amount of external funding *already obtained* approaches twice the figure for which we promised *merely to apply*, and we have reached this level eight months ahead of the targeted application date.

Looking in detail at the grant objectives, we acknowledge that in response to the configuration of opportunities that we actually met (as opposed to those we had projected), there were adjustments in how efforts were allocated. Some of the sub-projects identified in the original proposal moved ahead of their anticipated schedules. A few were simply maintained but not aggressively advanced. In some cases, projects that received decreased time allocations actually exceeded targets. (The new funding we secured is an example.)

In line with the general intent that MathVision should be an entrepreneurial unit, we undertook a number of initiatives that were not explicit in the original proposal because of their congruence with MathVision goals. For example, MathVision supported the design and delivery of several professional development programs for in-service teachers that were not specified in the original proposal, the conduct of research associated with these, design and creation of a resource library for mathematics teachers, outfitting of specially equipped classrooms and the institution of a monthly program for high school students. Additional detail is provided below.

In January 2003, the MathVision Lab established headquarters in Prescott Hall as a partner of the Gordon A. Cain Center. Facilities include offices for the directors and for instructors and graduate students working with the lab. The Lab has several classrooms, one of which is being outfitted with a computer technology purchased through a \$46K LSU Student Technology Fee grant. The Cain Center shares its secretarial staff with MathVision. A preliminary web site for the MathVisionLab is at <http://www.math.lsu.edu/~madden/mathvision>.

The most important general objectives of the proposal are listed below in italics. Following each objective, we briefly cite some of the ways in which it has been met:

1. *Support scholars and practitioners who will work together to improve our understanding of mathematics teaching and learning.*
 - a) Supported Professor of Curriculum and Instruction David Kirshner to assist in design of new Math Major with Concentration in Education.
 - b) Supported Mathematics Instructor C. Sullivan to collaborate with Madden developing course in data, probability, statistics and decisions for future K-8 teachers (currently listed as special sections of Math 1100). Five sections of this course were taught between August 2002 and May 2003, a website for the course was created (<http://www.math.lsu.edu/~madden/M1100>) and a set of lecture/activity notes was written.
 - c) Supported Math Instructors Kopcsó and Kurtz to review geometry course M1202 for pre-service teachers and assemble a curriculum survey. Acquired Annenberg video materials to support this.

2. *Develop and implement tested educational materials, services and strategies.*
 - a) We developed the LINC/S/LaSIP workshop "Assessing Standards-based Learning." See <http://www.math.lsu.edu/~madden/assess>.
 - b) Designed a plan to import Texas professional development systems to Louisiana, and secured funding from LaSIP for pilot.
 - c) Development of M1100. See 1.a), above.
 - d) MathVision helped to support development of a study of measurement in the secondary curriculum. (A 30-page manuscript by Madden is available on request.)
 - e) We developed together with Ms. Cherie Blanchard-Schlatre the workshop Praxis II, Mathematics 0060 Preparation for High School Educators which we offered at the Louisiana Resource Center for Educators (LRCE) in the Fall 2002 (Enrollment 12). This six-day workshop offers preparation and review for high school teachers planning to take the Praxis II Mathematics (0060) Specialty Area test for state certification. Presently, this course is again taught by Kevin Zito at LRCE. During the summer an internet-based practice system will be developed and course materials will be organized in a publishable form.
 - f) Taught by Neubrandner in spring 2003: **Math 6300 Topics in Mathematics for Secondary Teachers (1-3) V** *Prereq: 6 semester-hours of mathematics at or above the level of 2040 or equivalent. May be taken for a maximum of 6 semester-hours credit when topics vary. May be taken by M.N.S. students in mathematics with departmental approval.* Areas of current interest to teachers of secondary school mathematics.
 - g) Madden/McAnelly in spring 2003: **Math 6301 Implementing the NCTM Standards I (3)** *May be taken for a maximum of 9 semester-hours of credit when topics vary. Enrollment is restricted to participants in the teacher training and grant-supported programs.* Topics for mathematics teachers (K-5) to be selected from those in the Principles and Standards of School Mathematics of the National Council of Teachers of Mathematics.
 - h) To be taught in fall 2003: **Math 6302 Implementing the NCTM Standards II (3)** Grad Instructors: Brent Caldwell (Episcopal Middle School), Pamela Goodner (Episcopal Middle School) and Frank Neubrandner (LSU Department of Mathematics, Professor of Record). This course with 3 hours of graduate credit will provide participating teachers with a variety of ready-to-use classroom activities and problem sets. It reinforces the mathematical skills and understandings in all five NCTM content strands and prepares teachers to pass the PRAXIS exam. Teachers will exercise the five NCTM process strands (problem solving, reasoning and proving, making connections, communicating, and representing) and practice engaging middle school students in activities that will prepare them for the LEAP test. Prerequisite for enrollment is participation in all sessions of the ten-day Math Teachers for Louisiana (MTL) Workshop at the Louisiana Resource Center for Educators (LRCE), July 7-18, 2003. For further information about this workshop, please contact Haden Shirley at LRCE (225-924-7600; HaydenS@LRCE.org). In the fall semester 2003, participating teachers are required to (i) administer and submit pre-tests, (ii) complete and submit an intensive math portfolio including unit plans, student progression, student evaluation, and a journal, and (iii) participate in two follow-up workshop sessions. Participating teachers will receive an incomplete grade at the end of the fall semester 2003. The grade will be adjusted accordingly during the spring semester 2004 pending completion and submission of all required coursework, after participation in one additional follow-up workshop

and the administration/submission of post-tests. Clearly, in order to enroll you have to be accepted as non-matriculating graduate student if you are not currently a student in the LSU Graduate School.

- i) Created Saturday Math program for high school students. On the second Saturday of each month, a member of the LSU Mathematics Department presents a 2-hour program of lectures and activities to an audience of high-school students and teachers.
3. *Open up communications, coordinate resources and form collaborations between scholars and practitioners working in math education.*
 - a) Both directors spoke on MathVision activities at the AMS-MER Workshop on Excellence in Undergraduate Education: Diversification of Upper-Level Mathematics Programs Nov. 7-10, 2002, LSU, Baton Rouge, LA.
 - b) MathVision directors organized the special session on The Role of Mathematics Departments in K-12 Education during the regional meeting of the American Mathematical Society at Louisiana State University in March 2003.
 - c) On invitation, Madden joined a major high-school curriculum development project operated by the Education Development Center (Boston) as consultant on statistics.
 - d) Madden was invited speaker representing Louisiana at the National Teacher Preparation Symposium sponsored by the Florida A&M University and NSF, Orlando Florida, Sept. 2002. Madden was also invited speaker at conference "Mathematics Education and Mathematics in the 21st Century: The Roles of Outreach, Teacher Preparation, and Research on Teaching & Learning in a Research I Mathematics Department," University of Arizona, Tucson, on February 20, 2003. Madden attended TEXTEAMS Institutes at the Dana Center, Univ. Texas, Austin: *i*) "Workshop on Secondary School Math from an Advanced Standpoint," May, 2002 (3 days) and *ii*) "Statistical reasoning Across the TEKS," January 2003 (3 days).
 - e) Neubrandner spoke at THE Forum, Teaching in Higher Education, The Knowledge Enterprise: new Century Learning, Louisiana State University, Baton Rouge, April 2003. Neubrandner attended: *i*) Pass-Port Training, T.H.E./Quest, Baton Rouge, January 2003, *ii*) EPAS Collaborative Teaming, Louisiana Board of Regents, Baton Rouge, January 2003, *iii*) 6th Annual DOE EPSCoR and LS-LAMP Research Conference on "Opportunities Stem from STEM Research and Education", Baton Rouge, November, 2002, *iv*) NCATE CLINIC for Louisiana Institutions: A Partnership Approach to Enhancing Teacher Quality and Accountability, Baton Rouge, September, 2002.
 4. *Provide an infrastructure that will assist Lab personnel accomplish their specific project objectives.*
 - a) Established new headquarters in Prescott Hall, as described above.
 - b) Created several web sites for MathVision projects.
 - c) Built human capacity by involving instructors and graduate students.
 - d) Created a library for math teachers and math teacher-educators, the acquisitions for which were paid for by a grant of over \$40K from the College of Arts and Sciences.
 - e) Equipped classrooms with technology specifically designed to support teacher preparation; this was funded by grants from College of Arts and Sciences and LSU Student Tech Fee.
 - f) Installation of WeBWorKs at a server in our department. WeBWorKs is an internet based mathematics practice and homework system developed by the University of Rochester with support from NSF; see <http://www.math.lsu.edu/%7Etiger/webwork.html>. It will be used for PRAXIS II prep, GEE21 remediation, ACT prep, etc.
 5. *Bring together scholars and practitioners.*
 - a) *In-Schools Math Labs* project, a \$300K LEQSF Education Enhancement program (LEQSF(2002-04)-ENH-TR-16).
 - b) Initiated partnerships with math faculties at several elementary, middle and high schools.
 - c) Maintained partnerships with LSU College of Education, and worked collaboratively on designing secondary teacher education curricula.
 - d) Supported a visit and LSU colloquium talk by Professor Zalman Usiskin, University of Chicago.
 6. *Advance a research agenda that seeks a deep, fundamental understanding of mathematics learning*

- a) Pursued research on assessment methods following agenda proposed by NRC in book “Knowing What Students Know.” (Report will appear at <http://www.math.lsu.edu/~madden/assess.>)
 - b) Madden pursued a program of study in cognitive neuroscience, and is advising a Master’s thesis on related topics.
7. *Produce research-based solutions to real-world problems in math education, including: curriculum materials, learning media, professional development institutes, support networks for K-16 math educators, and design of programs that recruit secondary math teacher candidates through non-traditional paths.*
- a) Development of a curriculum for a Concentration in Secondary Education for our undergraduate majors leading to secondary certification.
 - b) We collaborated with the Louisiana Resource Center for Educators (LRCE) on all aspects of the preparation, delivery, and evaluation of the MTL Summer Institute for Middle School Mathematics Teachers in the summer of 2002. We provided financial support to LRCE to support master teachers and editors in the preparation and production of the MTL WorkBook (working title) which will be used in future statewide professional development seminars for middle school mathematics teachers. Another MTL workshop will be held at LRCE this summer, followed by a graduate credit bearing professional development follow-up course (Math 6001) at LSU to be delivered by MathVision personnel.

The proposal included the objective of forming an advisory council. This has not yet been formally established, but we have an effective *de facto* advisory council consisting of many of those persons whom we originally identified. **An important goal for the coming year** will be constitute the council officially.