

## “Improving Teacher Quality”

Testimony for March 9, 2004 to the House Committee on  
Appropriations, Subcommittee on Labor, Health and Human Services,  
Education and Related Agencies

Dr. Joan Ferrini-Mundy  
Director, Division of Science and Mathematics Education  
Associate Dean for Science and Mathematics Education, College of Natural Science  
Professor of Mathematics and Professor of Teacher Education  
Michigan State University  
jferrini@msu.edu

Good morning Chairman Regula, Ranking Member Obey and Members of the Subcommittee: It is a pleasure to appear before the Subcommittee and provide testimony on the Teachers for a New Era (TNE) project – currently in its second year at Michigan State University. At Michigan State University, Dr. Barbara Steidle, Robert Floden and I are the co-leaders of this effort.

Michigan State University has a long history of national leadership in the education of teachers, and a deep commitment to research-based efforts to improve the quality of teaching. I am pleased to have the opportunity today to tell you more about our efforts, with a particular focus on our work to improve the teaching and learning of science and mathematics through teacher preparation in MSU’s Teachers for a New Era initiative.

### History and Context

MSU’s mission as a land-grant university has meant being responsive to, and proactive about, the needs of the state of Michigan, and even the nation, concerning the preparation of teachers for K-12 schools. The involvement of MSU scientists and mathematicians in this arena dates back to the late 1800s<sup>1</sup>:

As far back as 1872 when MSU was the Michigan Agricultural College, Dr. Robert C. Kedzie taught a 3-week course in Chemical Manipulation to 74 public school teachers (Kedzie, 1872). The prominent botanist Dr. William J. Beal delivered an 1880 lecture before the Michigan State Teachers Association entitled “The New Botany: Best Method of Teaching the Science.” This lecture was published and named in 1891 as one of the best five books published in the world

---

<sup>1</sup> See Ferrini-Mundy, J., Suelter, C., & Eberhardt, J. (2003). *Shaping the future: The MSU College of Natural Science commitment to educating teachers of science and mathematics*. East Lansing MI: Unpublished manuscript.

for teaching botany (<sup>2</sup>Beal, 1910). Michigan State University scientists also provided resources to Michigan high schools, as early as 1902, when the Entomology Department distributed cases containing a total of more than 7,000 insects to each high school in Michigan (Houk, 1954), and in 1912 when the Botany Department sent 48 sets of seeds of Michigan weeds and cultivated plants to various high schools (Bessey, 1913). MSU scientists also provided the schools with curricular advice, such as the January 1923, 24-page outline of a course to be used in teaching Apiculture in Michigan high schools, published jointly by the Department of Entomology and the Teacher Training Department (Pettit, 1924).

This commitment of scientists and mathematicians to helping teachers with their preparation in science and mathematics continues strongly today at MSU. Their involvement is facilitated through the Division of Science and Mathematics Education, an administrative unit that is jointly overseen by the Colleges of Natural Science and Education.

MSU's College of Education was first created as a school of education in 1952 and its leaders were charged by President John Hannah to "Build the best school of education in the country." *U.S. News and World Report* rankings of 188 graduate schools of education for the past nine years have placed MSU's elementary and secondary education programs as the best in the United States, confirming that Hannah's directive has been realized. Catalyzed by the 1976 National Institute of Education's selection of MSU as the site of a \$3.6 million Institute for Research of Teaching, MSU became a center of ground-breaking research that involved collaborations among scholars from psychology, sociology, economics, and linguistics, and, perhaps most notably, K-12 teachers. The research produced through the IRT was influential in the ongoing shaping and development of MSU's teacher education programs. Building on that work, and in response to the 1983 release of *A Nation at Risk*, MSU Education Dean Judith Lanier played a key role in the formation of the Holmes Group, a consortium of deans of education who were concerned with promoting the importance of high quality teacher education in the nation's top universities.

I hope this brief historical sketch conveys the unique circumstances that have shaped, and continue to drive, MSU's integrated commitment to research-based, research-generating, and subject matter-rich preparation of teachers.

### **The Role of Research and Evidence in Supporting High Quality Teacher Education**

Because of MSU's history and ongoing commitment to research as a basis for high quality teacher education, our programs are influenced by several key efforts. MSU scholars have played leading roles in research about how formal teacher education bears on teacher learning, and teachers' subject matter knowledge for teaching. The National

---

<sup>2</sup> Beal, W. J. (1910). Report of the Department of Botany in the Annual Report of the Secretary of the State Board of Agriculture of the State of Michigan from July 1, 1909 to June 30, 1910, Volume 49, pages 84 to 99. Michigan State University Archives and Historical Collections

Center for Research on Teacher Education, later renamed the National Center for Research on Teacher Learning (NCRTL), was funded from 1985-1991 at MSU the US Department of Education's Office of Educational Research and Improvement. Results of this research indicated that

Substantial changes in teaching practice are most likely to occur when teachers have extended, ongoing assistance (a) that is grounded in classroom practice, so that teachers have both opportunities to try and adapt new practices in their own classrooms and (b) that enables them to learn concurrently about subject matter, how diverse students learn it, and how teachers can teach it.”<sup>3</sup>

Currently, a group of MSU faculty (Joan Ferrini-Mundy, Robert Floden, and Sharon Senk) are engaged in a study of secondary school teachers' knowledge of algebra for teaching. This effort builds on the work of Lee Shulman and Suzanne Wilson in the area of pedagogical content knowledge, and on the work of Deborah Ball and Hyman Bass about subject matter knowledge for teaching. The research group is developing assessment tasks and items that can help illuminate what mathematical knowledge is involved in the teaching of high school mathematics. Eventually, findings of this work may lead to proposal for the revision of the mathematical preparation of secondary school teachers. Colleagues at MSU are similarly involved in similar work in the area of secondary school science teacher knowledge.

MSU also is a center for research in the area of teacher induction; MSU faculty Lynn Paine, Suzanne Wilson, Steve Ryan, Ralph Putnam, and Randi Stanulis all are involved in various research activity aimed at better understanding the experiences of new teachers as they enter teaching practice. These researchers are looking at the impact of various kinds of programs and interventions, such as intensive mentoring or subject matter support, on new teachers' effectiveness in the classroom.

In 2000-2001, MSU faculty Suzanne Wilson, Robert Floden, and Joan Ferrini-Mundy prepared a synthesis of teacher education research<sup>4</sup> for OERI. We were asked to examine high quality research that had appeared in refereed journals and that clearly was empirical. The questions were:

- What kinds of subject matter preparation, and how much of it, do prospective teachers need?
- What kinds of pedagogical preparation, and how much of it, do prospective teachers need?

---

<sup>3</sup> From National Center for Research on Teacher Learning (1991). *Findings from the Teacher Education and Learning to Teach Study: Final Report, the National Center for Research on Teacher Education*. East Lansing, MI: Michigan State University (abstract).

<sup>4</sup>Wilson, S. M., Floden, R. E., & Ferrini-Mundy, J. (2001). *Teacher preparation research: Current knowledge, gaps, and recommendations*. East Lansing, MI: Center for Teaching Policy, Michigan State University. Available at <http://depts.washington.edu/ctpmail/>

- What kinds, timing, and amount of clinical training best equip prospective teachers for classroom practice?
- What policies and strategies have been used successfully by states, universities, school districts, and other organizations to improve and sustain the quality of preservice teacher education?
- What are the components and characteristics of high-quality alternative certification programs?

Our basic finding was that the research base, at least of the types of studies we were including, in these areas is inconclusive and thin. There are problems with methodology and tools for measuring teacher knowledge, for documenting and describing teacher education practice, and for conceptualizing how teacher background and experience relates to student learning. Several efforts at MSU are underway in these areas.

### **Teacher Education at MSU**

At MSU, students who choose to prepare for a career in teaching follow a five-year long internship that leads to a baccalaureate degree in a disciplinary major plus teaching certification. Students preparing to teach at the elementary level have the option of selecting either a disciplinary major or a major in the College of Education with two disciplinary minors. Students may select from more than 20 major and close to 30 minor fields. All candidates complete 12 graduate credits and a full-year internship after their baccalaureate degree before being recommended for teacher certification. The College also offers a Post-Baccalaureate program which leads to teacher certification and also provides opportunities for certified teachers to obtain additional endorsements and certificate renewals. The expectation that all teachers prepared at MSU will have very strong and authentic background in academic disciplines is a commitment that was strengthened by MSU's involvement in the Holmes Group, and has been enriched and refined through MSU-based research about teachers' subject matter knowledge.

MSU's Teacher Education Program is based in the College of Education, and is overseen by a Teacher Education Council with representatives from all of the colleges and schools involved in teacher education: the Colleges of Natural Science, Arts and Letters, Social Science, Human Ecology, Agriculture and Natural Resources, Communications Arts, Education, and the James Madison School.

Each year there are about 350 seniors in elementary education, and 350 elementary interns, and the program graduates about 550 students per year complete the program. Of these, about 100 have endorsements in mathematics, either elementary or secondary, and about 180 have science endorsements, either elementary or secondary. Faculty in the departments of Mathematics and Teacher Education work together to coordinate subject matter courses with teacher education courses and to undertake program planning in mathematics and the sciences.

MSU teachers are effectively placed, usually in the geographic regions of the state and nation that are their first choice. Although long-term tracking of graduates is extremely difficult, we hear informally from both alumni and their administrators and school colleagues that the majority of them are doing well in their teaching endeavors. Several MSU-prepared teachers of mathematics and science have won state and national awards and honors in recent years. Across the university, a number of programs for teachers' continuing education are available, including three masters degrees for teachers of science, located in DSME. These strong links to inservice teachers enable MSU faculty in the sciences access to ongoing feedback about the preservice preparation provided at MSU. Such connections as these are enhanced by other, related projects at MSU, including the NSF-supported Connected Mathematics Program, led by Glenda Lappan and Elizabeth Phillips in the MSU Mathematics Department, two NSF-funded Centers for Learning and Teaching (one focused on science curriculum, the other on mathematics), the Balanced Assessment Project, and the recently awarded NSF Math and Science Partnership, Project PROM/SE.

### **The Teachers for a New Era Initiative**

In the fall of 2002, MSU and three other institutions (Bank Street College of Education in New York, California State University at Northridge, and the University of Virginia) were invited to be the inaugural sites in the Carnegie Corporation of New York's Teachers for a New Era initiative.<sup>5</sup> Seven additional sites have been named in year two. With funding from the Carnegie Corporation, as well as the Ford, Rockefeller, and Annenberg Foundations, these institutions are charged to engage in catalytic reform of undergraduate education as a university-wide undertaking. This is a national effort to develop state-of-the-art schools of education, and to influence public policy relative to the quality of teaching and teachers. Three design principles guide the program:

- Decisions driven by evidence
- Engagement with the Arts and Sciences
- Teaching as an academically taught, clinical practice profession

TNE requires that each funded institution develop a two-year residency, or induction, program for its students that will be available after they complete certification, and as they enter their first two years of teaching. In addition, the TNE institutions are expected to develop plans, beginning this year, for examining the academic performance of the pupils of teachers prepared at the institution, as a means of creating focus on the outcomes of teacher education programs.

Michigan State University's Teachers for a New Era Initiative is built deliberately on the strong foundation of research and practice that has been the hallmark of our teacher education program for several decades. In MSU TNE, we view teacher education as a continuum that begins when a student elects to enter teaching, and continues through the

---

<sup>5</sup> See Carnegie website <http://carnegie.org/sub/program/teachers.html>

early years of teaching practice. The theme of our program is “Making Content and Context Central.” More than 70 faculty members have been selected by deans and chairs, and appointed by the Provost, to participate in the seven MSU TNE Working Groups. These include four subject matter groups (Mathematics; Literacy, Language, and Literature; Science; and Social Studies) as well as groups in Assessment, Induction, and Teachers for Urban Schools.

These groups are working on MSU Teacher Knowledge Standards, which articulate what teachers should know and be able to do at the time of entry to the internship, at the end of the internship, and then at the end of the first two years of teaching experience. In our standards work, we are drawing on research and experience about teachers’ subject matter knowledge and about pedagogical content knowledge. Faculties from across four colleges are grappling with a reformulation of our expectations for teachers’ preparation. The standards are arranged into the following categories:

- Subject Matter Knowledge
  - Literacy, Literature, and Language Studies
  - Mathematics
  - Social Studies
  - Science
- Knowledge of Students
- Classroom Knowledge
- Professional and Institutional Knowledge
- Self Knowledge
- Knowledge of Family and Community

The standards that have been developed by the Subject Matter Knowledge groups represent an advance over current lists of topics typically offered in various standards documents. For instance, the Mathematics Group is organizing its standards and teacher expectations around the notions of mathematical reasoning, mathematical representations, and mathematical applications. As these standards are implemented, this could lead to shifts of emphasis in the mainstream undergraduate mathematics courses taken by prospective secondary teachers as well as by all mathematics majors. A byproduct of MSU’s TNE activity may well be shifts in opportunities to learn for all students. Likewise in the Science Group, the concept of model-based reasoning may serve as a major organizing theme for their standards work.

Issues of content and context actually apply across the standards. Currently a draft of the full set of standards is under review by the MSU TNE faculty team, and will be discussed

by key governance groups on campus in the coming weeks. The next step is a “mapping” exercise in which faculty will examine our current program offerings against the standards, and make recommendations about program revision so as to better address these standards. Ideas have already emerged about co-teaching of education and science and mathematics courses, early, subject-specific field experiences, and other possible program innovations.

Underlying the MSU TNE effort is the use of evidence – in redesigning the program and in assessing its effectiveness. Ultimately we will design a systematic way of looking at the impact of MSU graduates on the learning of their pupils. To begin this process, TNE staff are collaborating with MSU staff involved in the recently funded NSF Math and Science Partnership, Project PROM/SE (Promoting Rigorous Outcomes in Mathematics and Science Education.) PROM/SE is co-directed by Joan Ferrini-Mundy and William Schmidt, and is a partnership of five consortia of school districts (three in Michigan, two in Ohio) all committed to the improvement of mathematics and science achievement for all students. More than 70 school districts, and about 400,000 students are involved. With the involvement of MSU scientists, mathematicians, and teacher educators, PROM/SE will administer assessments this spring, across our sites, for students and teachers. These tools, which are based on the work undertaken by Dr. Schmidt and his colleagues in the Third International Mathematics and Science Study, will measure student performance across the spectrum of mathematics and science topics. In addition, they will provide measures of curriculum emphasis and opportunity to learn, and information about teachers’ backgrounds, preparation in mathematics and science, and subject matter knowledge for teaching. From this baseline evidence-gathering process we expect to learn a great deal about the particular characteristics of MSU-prepared teachers, and teachers in their first two years of teaching, as a basis for our efforts both in TNE and in PROM/SE,

### **Conclusion**

Our experience in more than five decades of institutional commitment to the preparation of strong and effective teachers at MSU consistently confirms the importance of research and evidence in the ongoing improvement of teacher education. For the preparation of teachers of mathematics and science, directions that seem most promising demand a sophisticated integration of ideas in science and mathematics with teacher education knowledge, pedagogical content knowledge, and subject matter knowledge for teaching. Other essential elements in effective teacher preparation include: ongoing linkages between higher education institutions and the field of K-12 education; collaborative efforts between research universities that prepare teachers and national initiatives and funding mechanisms to study and improve mathematics and science education; and communication about evidence and issues among K-12 education, higher education, and state and national policymakers. We at Michigan State University feel fortunate to have been centrally engaged in all of these arenas in an effort to improve the quality of teaching and learning for all.

## Reference

Inzunza, V.M. (2002). *Years of Achievement: A Short History of the College of Education at Michigan State University*. East Lansing, MI: Michigan State University.