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# **Implementing the Texas Master Science Teacher Program**

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**Abstract:** in 2004 the State of Texas authorized the Texas Master Science Teacher certification. This post-baccalaureate certification provided a much-needed opportunity for experienced science teachers to be formally recognized for their leadership roles at a time in which science instruction was being impacted by a number of sometimes competing state and national initiatives. This article describes the steps and lessons learned by the team that implemented the first Master Science Teacher program in Texas.

## **Master Teacher Certification in Texas**

During the last decade, science teaching in Texas has been heavily influenced by a number of national and state initiatives that impact teachers, students, and educator preparation programs. In this article we describe one of these initiatives implemented in a large university to assist science teachers in becoming leaders and mentors in schools.

In August 2002, the Texas Governor, Rick Perry announced that Master Science Teacher certification would become a part of his "*Compact with Texas Teachers*." His press release stated that "...creation of a Master Science Teacher program [was] one step toward making science a top educational priority in Texas schools" (Perry, 2002). Legislation passed by the 78th Texas Legislature in 2003 (HB 411) required the creation of a Master Science Teacher (MST) certificate for the teaching of science at three levels (elementary, middle school, and high school). The Master Science Teacher standards were approved by the Texas State Board of Educator Certification in August 2004 and included the statutory requirements for the knowledge and skills for which the master teacher would be responsible. In August 2004, the Board also approved the Master Science Teacher Certificates, for grades EC-4, 4-8 and 8-12 (SBOE, 2005).

The establishment of a Master Science Teacher certification proved to be a valuable opportunity for the Department of Teacher Education at the University of Texas at El Paso (UTEP). We reviewed the guidelines for the program and found that they aligned with what is known about quality science education in diverse settings such as El Paso. The existing master's degree for science education was outdated with no real alignment to curriculum standards. Implementing the components of the program into UTEP's existing graduate program would enhance the graduate program as well as provide this valuable Master Science Teacher Certification opportunity to the surrounding community. During 2004 a team of UTEP science educators and other faculty members developed a set of courses that were fully aligned to the nascent MST standards. In December 2004 the Math, Science, and Technology division of the UTEP Teacher Education department applied for MST certification, and the Texas State Board of Educator Certification authorized UTEP's program in spring of 2004.

The following, we provide a short description of the El Paso community, the major components of the UTEP MST program design, and some lessons learned during the first year of the program.

### **The El Paso region**

The city of El Paso is a bustling urban area of 600,000 people, more than 70% of whom are Mexican in origin. Across the river from El Paso sits the Mexican City of Juarez, a city of more than 1.2 million people, and together El Paso and Juarez represent the largest metropolitan area along the 2,000 mile U.S./Mexico border. A significant factor in El Paso's population growth is the migration of residents from Mexico. Almost a quarter of El Paso's population is foreign born, and over 50 percent of El Paso's households speak Spanish as the language of preference. According to the 2000 Census data, this border region is one of the lowest socio-economic urban areas in the United States. Furthermore, just nine percent of the residents of the community have a college degree (UTEP CIERP, 2005).

### **Design elements: integrating the MST with UTEP's Masters of Education**

Students seeking a Masters in Education (M.Ed.) at UTEP have two main paths, the research-intensive thesis option, or the Instructional Specialization (which concludes with a comprehensive exam). Most students pursuing a M.Ed. at UTEP choose the Instructional Specialist path, which provides the candidate with a high degree of flexibility as well as a number of choices in specializations. The candidate chooses to focus in early childhood education, bilingual education, educational technology, reading education, science education, mathematics education, or a combination of these fields. The M.Ed. instructional specialist path has three main components: A teacher education core, a content specialization, and a set of electives. The Master Science Teacher program at UTEP was developed to take advantage of the existing course sequence for the Masters of Education, Instructional Specialist in Science Education, and is subsumed within that program of study. The curriculum consists of 15 hours of existing graduate level courses, all of which also counted towards the existing Master of Education and was structured to facilitate candidates continuing the program to receive the Certification plus a Masters Degree. In particular, the MST program designers recognized that MST candidates are drawn from teachers with extensive classroom experience, and the program is designed to support the role they would play as campus leaders. This was accomplished with courses that emphasize mentoring, science content and science content-pedagogies.

In UTEP's program the constructivist approach is foremost, allowing for experiences by the learner that address misconceptions and develop proper conceptual connections (Rutherford and Algren, 1990). Learners search for evidence and reason, recognize and reflect upon assumptions, discover implications and consequences and extrapolate from what is really known versus merely believed (Roth, 1989). This instructional approach allows the student to spend time exploring and explaining the process, with time for reflection and numerous experiences upon which to synthesize information. The UTEP program recognizes that each learner understands content and concepts differently based on their previous experiences, and it places a high value on multicultural approaches (Banks et al, 2005). It also places value on student concepts of their role in society and in their understanding of their subject matter. This carries forth the idea that both teachers and their students need opportunities to address their prior knowledge in order to address misconceptions and develop concepts in the manner of real scientists. In an effective

classroom, learning requires more than connecting new material to old ways of thinking, but far better, to new ways of understanding (Bybee, 1997).

Curriculum is most powerful when it is designed so that it reflects real-life situations, especially in the area of science. So much fascinating science is at the fingertips of learners everywhere, and with the increased affordability of technology, more and more science is present in students homes. Hofstein and Yager (1982, 1986) have promoted using social issues as an organizer for the science curriculum. In other words, no matter what the content area, students are more "ready to learn" when what they are learning has identifiable meaning for them (Yager & Weld, 1999). Research scientists cross over the barriers between disciplines all the time, and seldom operate solely on science content, but integrate the use of language, knowledge and process application. Research-based programs give students the ability to retain facts through critical thinking by working through problems logically and making connections to the real world. In *The Process of Education*, Jerome Bruner (1962) writes; "Students should know what it feels like to be completely absorbed in a problem. They seldom experience this feeling in school" (p. 50). Furthermore, at UTEP, in addition to multicultural approaches, multidisciplinary strategies are important since they build on learners' existing cultural frames and world-view with activities and approaches that involve learners with multiple modes of expression (Giza, 2005, p 129). This is all part of helping teachers develop and implement lessons that are grounded in the principles of equity, meaningful/purposeful learning, and active hands-on learning, principles that are of utmost importance when working with English Language learners (Hampton, Licona, & Izquierdo, 2005, p89).

Our previous degree plan for Master of Education Instructional Specialist in Science Education had three fundamental courses in science education which allowed for flexible curriculum design. These courses were used to pilot the new classes that we created to align with the standards for MST. After successful piloting, the science education faculty and faculty members in Biology and Chemistry created new courses to serve as the Master Science Teacher courses as well as updated courses for the Master of Instructional Specialist in Science Education. These new courses went through the approval processes at the Department, College, University, and State levels. They are now official courses in the Department of Teacher Education at UTEP.

The new course descriptions are:

SIED 5321 Science Tools, Standards, Technology, Safety, and Ethics--Integrated, science-technology thematic learning. Develops understanding of important science teacher resources, basic science education and lab tools, state and national standards for science teaching, curriculum alignment, laboratory and classroom safety, and professional ethics for science educators. This course is scheduled to be offered in a fully online modality beginning in fall 2006.

SIED 5323 Societal Context of Science Education--Develops and applies understanding of field, community, and cultural resources and develop family and community partnerships in a relevant science context. Students develop a learning unit based on instructional models such as the learning cycle lesson design and the 5-E model. Explores historical perspectives of science and

the role of science in societal decisions. Includes research-based principles in science learning and technology integration.

SIED 5325 Inquiry Science Education in Bilingual Settings--Provides a review of basic content in physical science, biology and chemistry. The content will be imbedded in activities that model the inquiry approach to teaching and learning with strategies to ensure content and language development in bilingual communities. Students learn to develop curriculum using instructional models such as sheltered instruction, the learning cycle, the 5-E model, and constructivism. Content directly relates to the essential elements in the elementary, middle, and high school science curricula in Texas.

SIED 5327 Chemistry Education in a Feminist and Multicultural Context--Chemistry learning experiences in a relevant cultural context. A conceptual understanding of basic chemistry content including the impact of chemistry in daily life. Develops competencies necessary to provide multicultural education instruction and inclusive pedagogy and the understanding of social, economic, and political influences on access issues in science education for all students. Includes environmental chemistry labs and an environmental action project.

SIED 5329 MST Leadership Practicum--Assessment and verification of the competencies in a practicum situation as required for MST Certificate. The students facilitate standards-based science instruction by: communicating and collaborating with educational stakeholders; exhibiting leadership, mentoring, coaching, and consulting with colleagues; facilitating professional development; and making decisions based on research. Includes a field practicum experience mentoring a new science teacher.

These and other courses in the sequence are intended to serve the needs of teachers preparing to serve as Master Science Teachers in the EC-4 classrooms as well as the 4-8 classrooms. The leadership and assessment experiences in the practicum class are specific to grade level. Upon admission to the program, some middle level teachers may be deficient in science content. If that is the case, leveling courses in the College of Science are recommended. The program also provides extensive opportunities for participants to be involved with action research and curriculum writing and alignment activities in research-based professional development approaches (Loucks-Horsley et al, 1998). Because the MST standards reflect a mastery of both content and content-pedagogy (the discipline-specific strategies that a skilled practitioner uses to ensure that learners clearly understand the content), UTEP's program was developed to provide a rich experience for its participants in both of these key areas.

### **The development of the MST Certification Exam**

National Evaluation Systems, Inc developed the Master Science Teacher certification exam under contract with state of Texas and the Texas Education Agency (NES 2006a, 2006b). Members of the MST development team participated in the design and validation of test items, and the first pilot test of the MST test was held in March 2006, with some UTEP MST candidates choosing to participate, even though the first cohort had not completed all of the coursework. The first offering of the MST certification exam is scheduled for summer 2006. A number of UTEP MST participants have expressed an interest in taking the exam at its first offering.

### **The first MST cohort**

Typically, teachers seeking a MST certificate at UTEP are students who have already been admitted to the Masters of Education, Instructional Specialist in Science Education degree. One of the main challenges has been simple communication, both in recruiting and advising students of the options available to them. UTEP's approach is comprehensive, with programs to address the needs of continuing teachers (two forms of Masters in addition to the MST certification), novice teachers with degrees, and those participating in the Alternative Certification program, and a related "Fifth Year Masters in Education" program for degree holders who seek certification in non-traditional ways.

Recently the 31 graduate students pursuing science-related degrees or certifications were surveyed about their involvement and understanding of the various options. Ten of these responded to the survey. Twenty percent of these students were not teaching while in graduate school, and seventy percent were teaching science in grades 5, 6, 7 or 8. Another important characteristic of teachers in the UTEP program was that fifty percent felt comfortable to some degree communicating with parents of students in Spanish.

The survey responses revealed a number of statements such as "I haven't heard very much about the MST...I hadn't thought about it until [my professor] brought it up in class;" "The classes that I need are not offered during the summer sessions. I would rather double-up on my classes during the summer so that I can devote my time to my students and the subject(s) that I teach during the school year;" and "There are too few classes offered in the fall and spring in Science Education. I could take more classes but they are not available".

As one might imagine from the comments, with success comes new problems. The department is moving to meet them through aggressive scheduling, online and hybrid courses, and with graduate advising specialists in charge of intake and faculty-directed graduate advising.

### **Suggestions for other programs seeking to offer the MST**

The experience at UTEP has led to four key recommendations for programs considering offering the MST:

1. Integrate the program with an existing Masters – this greatly reduces the burden in course development, maximizes staff resources, and builds a ready-made pool of potential applicants, although it can lead to some advising problems and initial confusion among the first participants.
2. Develop a course alignment matrix that ensures that each course in the plan addresses the MST standards without undue duplication.
3. Communicate with the community and the current and potential students, with frequent surveys, focus groups, and advising sessions. Work to ensure that the courses address local need and culture.
4. Work to develop a team ethic of shared leadership and "buy-in" among the faculty in the program. If one thing is paramount in UTEP's Teacher Education Department, it is that all of the participants are members of a team who support not just the students, but each other. It is this last point that bodes well for this program and others in the years to come,

and makes it a pleasure to take the added steps and responsibilities required to ensure success in this and many other programs.

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