

# Changing Teaching Practices in Rural Schools

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*This article describes the approach of a five-year initiative, funded by the National Science Foundation, to improve the teaching of mathematics and science in 10 rural school districts of Missouri. Traditional challenges of improving the professional practice of teachers are addressed through a regional partnership. External project evaluation results reveal specific teacher challenges, the change strategy of the Ozark Rural Systemic Initiative (ORSI), and what teachers value most. Continuous, regional content-specific professional development; follow-up technical assistance to schools; administrative walk-throughs; assistance of lead teachers; and external evaluation reinforce that what counts most are effective teaching practices in classrooms with students. School district leadership and regional partners will be the key to continued success and long-term sustainability of the evolving learning communities and new teaching practices in schools.*

Leaders in rural school districts know the importance of improving the professional practice of teachers—high quality teachers get great results from students. Then why don't more school districts in rural communities do it well? We believe math and science teachers in 10 rural schools districts in Missouri now have reason for optimism. A five-year initiative funded by the National Science Foundation (NSF) is enabling long-standing challenges to be addressed in ways that help teachers acquire skills relevant to teaching all students to higher standards. A new regional partnership effort is providing a promising foundation for improving the professional practice of teachers.

## **Challenges of Rural Areas**

Small rural school districts may have similar student achievement problems as urban and suburban districts, but finding a feasible solution to improving the professional practice of teachers require actions that address the unique context and conditions in rural schools (Chalker, 1999; DeYoung, 1991; Harmon, 2003; Haas & Nachtigal, 1998; Howley and Harmon, 2000; Stern, 1994).

Compared to suburban and urban districts, Stephens (1998) notes that common weaknesses in the institutional capacity of rural districts limit their ability to mount and maintain a school improvement process. These include low fiscal capacity, fewer management support services, greater per pupil costs, higher numbers of teachers teaching outside

their specialty area, less competitive salaries and benefits, less specialized space and equipment, less availability of planning support services, and fewer evaluation support services.

Improving teacher practices is little more than rhetoric, unless realities surrounding these challenges are addressed. District leaders and teachers in the Missouri Ozarks know these challenges well. All 10 school districts in the Ozark Rural Systemic Initiative (ORSI), funded by NSF, have proportions of student eligibility for the free and reduced price lunch program that exceed the state average of 40.7 percent. Two districts had 72.5 and 73.4 percent, respectively. District size ranges from about 200 students in the smallest district (K-8) to almost 3,500 students in the largest district.

Residents over 25 years-of-age with less than a high school education ranges from 20 to 33 percent, compared to the state average of about 19 percent. College degree attainment rates for the over 25 age group are even more discouraging in counties of ORSI school districts. The state average is about 22 percent. In one ORSI school district, only seven percent of the residents in the county have a college degree. Approximately 10 percent of county residents have a college degree in five ORSI school districts. In the best educated county of the 10, approximately 16 percent of the residents over the age of 25 have a college degree.

Changing attitudes of educators and community leaders is a critical challenge. Educators and others can easily rationalize low student educational and career aspirations as the accepted norm in a rural culture that seldom rewards high academic achievement of graduates in the local and regional economy. Need for an educated workforce, however, is evolving as community leaders connect future educational demands of citizens with economic prosperity of the Ozark region. Once predominate agricultural and manufacturing economies are in decline, as communities strive to survive in a global economy.

Decreasing populations and tax bases in rural areas reduce the fiscal resources available to the schools. One school district also faced enormous fiscal challenges when a tornado destroyed almost all buildings in the downtown area in 2003. And high prices for gasoline and diesel fuel can devastate school district budgets where transporting students for long distances is the norm.

### **Teacher Challenges**

We asked teachers to explain their greatest challenges prior to the ORSI effort to obtaining opportunities that would help them improve their teaching practices in math and /or science. Circumstances made it convenient for teachers in most ORSI schools to teach the way they had always taught, rather than to improve professional practice. One challenge was time. A third-grade teacher explained, "I hate to leave the classroom and I don't want to take up more time from my family."

A second challenge, related to the time issue, is the long distance teachers had to travel for professional development opportunities. With few teachers in a particular content area, delivering content-specific professional development at the rural school or district was usually viewed as impractical and uneconomical. A 10-year veteran teacher said: "Driving long distances to attend workshops were great challenges before ORSI."

Third, teachers frequently indicated that workshops available did not offer them content appropriate for their teaching assignments. A veteran teacher of 21 years experience said "seldom could I find a workshop that fit my individual teaching needs." Another teacher said, "Too little was accomplished in the professional development available to me." A second-grade teacher in her 15<sup>th</sup> year said, "Knowing whether or not a workshop offered quality research-based information has been a great challenge." One kindergarten teacher said her greatest challenge was "finding workshops that were more than fluff."

Another teacher explained the curriculum issue before ORSI this way: "Each person always does their own thing. There is no continuity in our programs. Lower grades (K-2) use one program, third grade uses another program, and the fourth grade uses a little of both programs plus something else. When we go to a math workshop, it does not specifically apply to our programs. As a result, the

professional development counts for teachers, but not for students."

Fourth, finding money for quality professional development and the related problem of locating qualified substitutes can be major challenges in small rural school districts. Teacher salaries and transportation costs can make up 80-90 percent of the budget, leaving few dollars to meet other needs such as promoting professional development of teachers. Unavailability of qualified substitutes that can meet the educational requirements of NCLB limits the desire of many administrators to release teachers from classrooms. A fifth-grade teacher with 12 years of experience noted, "Professional development isn't especially suggested, encouraged, or easy to find."

### **One Solution: A Regional Partnership**

In Fall 2000, the momentum for change accelerated. NSF provided a one-year planning grant to the Southwest Center for Educational Excellence (SCEE) to identify eligible school districts committed to implementing standards-based reform strategies in math and science. With financial support of the Missouri Department of Elementary and Secondary Education (DESE) and the Department of Higher Education (DHE), SCEE strategically organized teams of teachers and administrators to attend national institutes to identify high quality curricula and related teaching practices. Also significant, as an opportunity to advance the educational philosophy and life success of its namesake and local Missouri native, George Washington Carver, a national park joined the ORSI effort to advocate the region's need for excellence in math and science.

The planning paid off. In April 2002, NSF awarded \$3.5 million to implement math/science reform in the 10 qualifying school districts and partners to implement the Ozark Rural Systemic Initiative. SCEE serves as the host and fiscal agent for ORSI. In addition to the George Washington Carver National Monument, a unit of the National Park Service, other partners include three institutions of higher education: Crowder College, Missouri State University, and Missouri Southern State University. A Leadership Council, representative of partners and the Missouri Department of Elementary and Secondary Education, guides implementation of the initiative in the 10 districts and 32 schools. Changing teaching practices is a key focus of ORSI leadership.

### **Change Strategy**

Review of curricula and exposure to national experts during the planning phase enabled school district leadership and teachers to adopt standards-based curricula. Teams of teachers searched for a curriculum that they believed would improve student achievement. Figure 1 reveals the curricula selected by the teams of teachers for adoption in the ORSI school districts.

<b>Mathematics Curricula</b>		
Elementary	Middle School	High School
<ul style="list-style-type: none"> <li>• Growing With Mathematics</li> <li>• Everyday Mathematics</li> </ul>	<ul style="list-style-type: none"> <li>• MATH THEMATICS</li> <li>• Connected Mathematics</li> </ul>	<ul style="list-style-type: none"> <li>• Contemporary Mathematics In Context (CORE-PLUS)</li> <li>• Math Connections</li> </ul>
<b>Science Curricula</b>		
Elementary	Middle School	High School
<ul style="list-style-type: none"> <li>• Science Technology for Children (STC)</li> <li>• Science Companion</li> </ul>	<ul style="list-style-type: none"> <li>• Science Technology for Children (STC)</li> <li>• Full Option Science Systems (FOSS)</li> </ul>	<ul style="list-style-type: none"> <li>• CPO Science Materials</li> </ul>

Figure 1. Mathematics and Science Curricula Adopted by Schools

Adopting a standards-based curriculum was a critical decision by schools. Need to implement new curricula served as a catalyst for all teachers to examine their teaching practices. It also allowed all professional development opportunities and assessment strategies to focus intensely on effectively teaching all students to achieve the higher level of content and conceptual understanding that are critical elements of the new curricula.

Consistent with policy recommendations for high quality professional development (AERA, 2005), ORSI provides extensive, long-term professional development that focuses directly on the classroom work of teachers, the curriculum actually taught, instructional materials to be used with students, and desired assessments. Professional development follows the Concerned-Based Adoption Model (Hall, 1974) change process.

ORSI math and science specialists help teachers move from lower levels of changing beliefs and the mechanics of using the curriculum to higher levels of examining the effect of the curriculum and new pedagogy on student learning. Math and science teachers strive to implement a standards-based curriculum and inquiry-based instruction practices, the Hannel (2003) model of higher order questioning, and new ways of assessing students. Science teachers also acquire skills using science kits in instruction using the Leadership and Assistance for Science Education Reform (LASER, 2006) model developed at the National Science Resources Center.

Instead of a “train the trainer” model, all teachers were offered extensive professional development. Teachers most interested and committed to the new innovations received further training as leaders of study groups and facilitators of change. All school districts now have lead teachers that assist and facilitate networking among other teachers.

Math and science professors at Missouri Southern State University are helping teachers have a deeper knowledge of content, which allows them to raise the content level of their instruction. Teachers are beginning to ask: What will students think? What will they ask? How should I respond? Student notebooking that requires students to explain their

thinking and illustrate their learning is a key practice as the focus moves from “What should the teacher do?” to “What knowledge and understanding does each student have?”

### **Reinforcing New Practices**

Change is not easy. All school districts have not yet adopted a new curriculum at all grade levels; all elementary schools have adopted a new curriculum. External evaluation results for year one of ORSI revealed that the anxiety level among teachers was high. Anxiety levels reduced as regional professional development enabled teachers to share success stories, highlight difficulties in implementing new practices, and strengthen skills for effectively teaching math and science content. District teams met regularly with ORSI staff to self-assess progress in implementation of the new practices and to plan additional technical assistance for schools.

ORSI staff track the attendance of teachers in professional development opportunities, provide on-site technical assistance, and use e-conferencing technology to follow-up with lead teachers. ORSI also trains school-level administrators to conduct meaningful walk-throughs of classrooms. Teachers are now beginning to report that for the first time their administrators are offering suggestions during walk-throughs that actually relate to how they could improve the practice of teaching math and or science, rather than making general comments about effective teaching practices.

An external evaluator for the ORSI project also analyzes pre- and post-tests and conducts site visits to schools to record information from teachers and administrators that help ORSI staff know if the professional development is having an impact on teaching practices. All of these activities—continuous, regional content-specific professional development; follow-up technical assistance to schools; administrative walk-throughs; assistance of lead teachers; and external evaluation—reinforce that what counts most are effective teaching practices in classrooms with students.

## What Teachers Value

As part of the third-year evaluation activities, lead teachers were asked what they valued most in the ORSI effort. “Teachers value informative professional development that they can take back and incorporate into their classrooms,” notes a teacher with 13 years of experience. A lead teacher adds, “Being treated like a professional is helping teachers change practices in classrooms.”

Teachers value being able to network with other professionals to discuss practices that improve student learning. A 25-year veteran teacher of first-grade students explains, “The interaction with other teachers has been helpful. I can see the changes will help students gain a better understanding of math concepts.” A sixth-grade teacher with 19 years experience explains, “I value the support groups and workshops on the many aspects of how to effectively teach from others that are doing the same things I am trying to do.” Another teacher mentions, “In-depth study of important math and science topics and use of nationally-recognized trainers also seems to make an incredible difference in the willingness of teachers to accept the new curriculum and make the difficult changes in instruction.”

Regional networking and direct assistance to schools removes the isolation and access issues to learning new teaching practices. As one teacher notes, “I believe surrounding yourself with positive teachers creates positive, passionate teachers.” Teachers value a convenient way to get information that is truly helpful. Another teacher explains, “ORSI gives me access to hands-on materials, the teaching strategies on advanced content, and an opportunity to work with other teachers on my grade level.” A teacher adds, “I acquired better questioning skills and a better understanding of math and science content. Finally, I was able to implement science in my classroom without feeling that I was only hitting ‘high points.’”

Teachers value administrative support of principals and superintendents who learn about research-based programs that can get results. By the end of ORSI’s third year, most school administrators strongly support requests of teachers to attend regional trainings that promise to improve skills in raising student achievement in math and science. A third-grade teacher explains, “ORSI professional development targets specifically the programs we use and recommends practices for teaching more effectively within those programs.” A fifth-grade teacher with 12 years of experience notes, “Professional development opportunities now are convenient and well-publicized within our school. We are now encouraged to attend professional development.” Another said, “ORSI puts everyone on the same page.”

Teachers’ roles are changing. A teacher notes: “Students now are the center of instruction. I no longer use a teacher-directed approach. I guide students.” A sixth-grade teacher reveals: “With more background knowledge in content and

how to help students discover science, I now know how to stand back and let the students go.” She adds, “I use inquiry to help my students learn. I use the notebooking in science on a daily basis. It is my most valuable tool.”

A fifth-grade teacher with 18 years of experience seems to sum up what teachers value in the ORSI effort to improve their professional practice: “I now implement practices that enhance and fine tune my teaching of the child instead of the class.”

## Sustaining the Change

We believe commitments of school district leadership and regional partners will be the key to continued success and long-term sustainability of the evolving learning community and new teaching practices. For example, NSF funds could not be used to purchase curriculum materials. Consequently, some districts found ways to leverage existing resources or involve local businesses and parent-teacher organizations (PTOs) to buy necessary instructional materials. Others shared materials among districts (e.g., science kits).

School and district leaders also gave teachers time to examine curricula, learn new teaching practices, and network with colleagues. Some districts raised graduation requirements in math and science or assigned math/science specialists at the elementary level. Support of lead teachers also helped districts build capacity for changing teacher practices in classrooms. Time issues and cultures in some districts and schools, however, such as one teacher being labeled an “expert”, created resentment that limited effectiveness of lead teachers. ORSI-trained lead teachers have been most successful in motivating other teachers to change practices through leadership by example. Persistent district and school leadership, along with external technical assistance support, appear essential for sustaining the new teaching practices.

School district leaders are revising improvement plans and budgets to support implementation of the new teaching practices. ORSI staff and college faculty at Missouri Southern State University are collaborating to identify strategies to improve teacher education. What better way for a national park to pay tribute to the legacy of its namesake—the scientist and educator Dr. George Washington Carver—than to further the philosophy of inquiry and hands-on learning in math and science education for all students.

Rangers at the George Washington Carver National Monument have been trained on science kits used in the ORSI school districts. Serving as trainers and mentors, rangers help teachers and students better connect classroom learning in science to real-life applications. A Discovery Center is under construction at the national park. It will provide exhibits and teaching aids to reinforce research-based hands-on science curricula, thus providing valuable instructional resources for area teachers and others. Small

rural schools like those in the Ozarks may not have access to big companies that can support teacher change, but many usually have access to national and state parks.

We believe there are more future scientists, like Dr. Carver, who require the best teachers possible to help them reach their full potential. Thanks to NSF funding and caring partners in the region, a promising foundation is evolving for improving the professional practice of rural teachers in the Ozarks.

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