



Proceedings of the Forum on Leveraging a Legacy of Leadership in Rural Mathematics and Science Education

Convened July 16, 2008

sponsored by the
National Science Foundation

Edvantia, Inc.
February 2009

Hobart L. Harmon, Ph.D.
Professional Consulting and Research Services

Keith Smith, Ph.D.
Edvantia, Inc.

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 National Science Foundation
WHERE DISCOVERIES BEGIN

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Contents

Preface.....	vii
Acknowledgments.....	viii
Executive Summary	x
Welcome and Recognitions	
<i>Dr. Keith Smith</i> , Forum Director.....	1
<i>The Honorable Alan B. Mollohan</i> , Chair of the Subcommittee on Commerce, Justice, Science, and Related Agencies, House Appropriations Committee	2
<i>Dr. Sandra Angius</i> , Vice President of Programs at Edvantia, Inc.....	4
Setting the Context for Leveraging the Legacy of Leadership in Mathematics and Science Education	
<i>Dr. Wimberly Royster</i> , Principal Investigator, Appalachian Rural Systemic Initiative, Lexington, Kentucky.....	5
Presentations by RSI Panel of Practitioners	
<i>Dr. Hobart Harmon</i> , Forum Project Consultant, Introduction of Panel	12
<i>Jonathan Escue</i> , Science Teacher, Lincoln County High School, Hamlin, West Virginia.....	13
<i>Angela Winters</i> , Principal, James C. Rosser Elementary, Moorhead, Mississippi	17
<i>Teresa Schneider</i> , Coordinator, Native and Rural Education Support, Kodiak Island Borough School District, Kodiak, Alaska	22
<i>Gene Meier</i> , Superintendent, Fort Washakie Charter High School, Fort Washakie, Wyoming	29
<i>Kim Zeidler</i> , Director, University of Kentucky Resource Collaborative, Lexington, Kentucky	38

<i>Irma Mondragon</i> , Administrator for Curriculum and Instruction, Lyford Consolidated Independent School District, Lyford, Texas*	45
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Presentations and Remarks by Federal Agency Representatives

<i>Dr. Keith Smith</i> , Introduction of Presenters	57
---	----

<i>Dr. Brian O'Donnell</i> , Program Manager, Office of Science, U.S. Department of Energy	58
--	----

<i>Dr. Carl S. Person</i> , Manager, Minority University and Education Program, National Aeronautical and Space Administration	60
--	----

<i>Miriam Lund</i> , Program Officer for Mathematics and Science Partnerships, U.S. Department of Education.....	65
--	----

<i>Dr. Jody Chase</i> , Program Director, Division of Human Resource Development, National Science Foundation.....	70
--	----

Commentary and Observations About the Forum

<i>Dr. James Rubillo</i> , Executive Director, National Council of Teachers of Mathematics.....	72
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Appendix: Forum Agenda.....	75
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* Prepared but not presented during forum.



List of Tables

Table 1	SES Conditions in 1990: Data Supporting ARSI Involvement	6
Table 2	Enrollment at Rosser Elementary School, by Grade Level	18
Table 3	Wind River School District Characteristics	29
Table 4	Mathematics and Science Academic Index Scores, McKinney County, LC Elementary, Kentucky	41
Table 5	Demographics for Colonias in Lyford CISD	46
Table 6	Lyford CISD Demographics, 2007-2008.....	46
Table 7	LCISD District and State Comparisons in Mathematics and Science Achievement.....	54
Table 8	LCISD 3-Year AEIS Longitudinal Data Profile (Title I), 2006-2008	55
Table 9	Types and Duration of MSP Project Professional Development Activities, FY 2005	67
Table 10	Types of Evaluation Designs Used by MSP Projects	67
Table 11	Number and Percentage of MSP K-5 Teachers Assessed for Content Knowledge Who Showed Significant Gains.....	68
Table 12	MSP Project-Reported Percentages of Students who Scored at or Above Proficient in State Mathematics Assessments.....	68
Table 13	MSP Project-Reported Percentages of Students who Scored at or Above Proficient in State Science Assessments.....	68



List of Figures

Figure 1	Counties in the Appalachian Rural Systemic Initiative and Other Counties in the Appalachian Regional Commission.....	7
Figure 2	The ARSI Improvement Community.....	8
Figure 3	Main Street in Moorhead, Mississippi.....	18
Figure 4	James C. Rosser Elementary School.....	18
Figure 5	A Family Night Activity at Rosser Elementary School.....	19
Figure 6	Students Display Their Project at an Annual Science Fair.....	25
Figure 7	AKRSI Curriculum Product.....	26
Figure 8	AKRSI Science Guide.....	26
Figure 9	AKRSI Teacher Resource.....	27
Figure 10	Wind River Rural Systemic Initiative Partners in Education.....	31
Figure 11	Closing Mathematics Achievement Gap in WRRSI Districts.....	35
Figure 12	Reductions in Percentages of Students Scoring at the Novice Level in WRRSI Districts, by Grade Level.....	35
Figure 13	Science Achievement for ARSI Districts in the UK Resource Collaborative.....	41
Figure 14	Mathematics Achievement for ARSI Districts in the UK Resource Collaborative.....	42
Figure 15	Promotoras Connected Colonias Families to School Family Nights.....	50
Figure 16	Family Nights Integrated Mathematics and Science Literacy with Reading Through Literature.....	51
Figure 17	The Education Portfolio Strategic Framework.....	61
Figure 18	The ED Math/Science Partnership Program Concept.....	66



Preface

Since 1994, the National Science Foundation (NSF) has generously supported 28 Rural Systemic Initiatives (RSIs) in some of the most impoverished areas of rural America—and there is clear evidence that children in these areas will be left behind in a global, knowledge-oriented economy unless local and state leaders improve educational opportunities and student performance in mathematics and science. The work of the RSIs provided public school teachers and administrators with unparalleled access to high-quality professional development opportunities; leveraged resources from numerous private and public sources; and advanced a vision that all students can and must achieve as states enact rigorous, standards-based curricula.

While internal documents reveal that all RSIs reported significant progress in achieving their intended goals, this massive reform effort in America’s rural schools is seldom acknowledged in the literature, in public media, or in key education reform policy-making circles. This untold story was profiled in a 2007 report written by Hobart Harmon and Keith Smith and published by Edvantia, Inc., with support from NSF: *A Legacy of Leadership and Lessons Learned: Results of the Rural Systemic Initiatives for Improving Mathematics and Science Education*.

The report stimulated significant attention, including an article in *Education Week* and postings of the report on numerous Web sites around the country. Subsequently, Edvantia sought and received support from the National Science Foundation to hold a forum in the nation’s capital that would profile how practitioners in local school districts leveraged the leadership legacy of the RSIs to continue improvements in mathematics and science education.

Our procedures included the following:

1. Solicitation of nominations (from previous directors of the Rural Systemic Initiatives) of school districts that made exceptional use of the RSI legacy of practitioner leadership in implementing successful strategies to improve mathematics and science education
2. Arrangement of a forum in the Rayburn House Office Building in Washington, DC, for practitioners to profile their leveraging of RSI leadership capacity to support the exemplary teaching and learning of mathematics and science in high-poverty rural areas
3. Production of a proceedings document that highlights major forum presentations

These proceedings capture the results of the forum, which was held on July 16, 2008. We offer the document as a tribute to the practitioners who tirelessly worked to make the RSIs a huge success.

Hobart Harmon, Ph.D.
Keith Smith, Ph.D.



Acknowledgments

Funding by the National Science Foundation (NSF) made possible the 2008 Forum on Leveraging a Legacy of Leadership in Mathematics and Science Education, an event that enabled a select group of educators to share their unique experiences in creating and leveraging the legacy of the Rural Systemic Initiatives (RSIs) for improving mathematics and science education in impoverished places in rural America.

Two individuals deserve special recognition for their critical roles in establishing and fostering the RSIs: Dr. Wimberly Royster and Dr. Jody Chase. Several years ago, Dr. Royster, at the request of NSF, organized a national conference that brought attention to the need for better mathematics and science education in poor rural areas. He consequently served as the Principal Investigator for the Appalachian Rural Systemic Initiative. Dr. Jody Chase provided continuity of leadership and support for the RSIs within NSF for the duration of the initiative, more than 14 years.

Key support for the RSIs was also provided by The Honorable Alan Mollohan, West Virginia Representative from the First Congressional District. Representative Mollohan highlighted the need for the RSIs at the national conference in 1993, and at the 2008 forum reiterated his support for the improvement of mathematics and science education in rural areas. Thanks also are extended to West Virginia's additional congressional representatives, The Honorable Shelley Moore-Capito and The Honorable Nick Rahall, for taking the time to share comments at the forum.

Appreciation is also extended to the House Standing Committee on Science and Technology's Subcommittee on Research and Science Education for facilitating conduct of the forum in the Committee's conference room. A special thank-you is given to Majority Staff Director Dr. James Wilson and staff for technical and logistical arrangements that made the forum a huge success.

We are particularly grateful for the six practitioners on the forum panel who shared their RSI experiences. These individuals represented hundreds of their peers who have staffed or participated in one of the 28 RSIs:

- 1) Jonathan Escue, Science Teacher, Lincoln County High School, Hamlin, WV
- 2) Gene Meier, Superintendent, Fort Washakie Charter High School, Fort Washakie, WY
- 3) Irma Mondragon, Administrator, Lyford Consolidated Independent School District, Lyford, Texas (who prepared a presentation but was unable to attend the forum due to circumstances beyond her control; her prepared remarks are included in this document)
- 4) Teresa Schneider, Coordinator, Kodiak Island Borough School District, Kodiak, AK
- 5) Angela Winters, Principal, James Rosser Elementary, Moorhead, MS
- 6) Kim Zeidler, Director, University of Kentucky Resource Collaborative, Lexington, KY

In addition to Dr. Chase, who represented NSF, special thanks go to three representatives of federal agencies who have a high commitment to supporting the improvement of mathematics and science education in K-12 public schools:

1. Dr. Brian O'Donnell, Program Manager, Office of Science, U.S. Department of Energy
2. Dr. Carl S. Person, Manager, Minority University and Education Program, National Aeronautical and Space Administration
3. Miriam Lund, Program Officer for Mathematics and Science Partnerships, U.S. Department of Education

Lastly, special recognition and thanks is extended to Dr. James Rubillo, Executive Director, National Council of Teachers of Mathematics, for lending exceptional expertise and insight in providing his commentary and observations about the forum.



Executive Summary

Between 1994 and 2008, the National Science Foundation (NSF) invested more than \$100 million in the Rural Systemic Initiative (RSI) to improve K-12 mathematics and science education in rural America. High poverty and enormous challenge characterized the places where highly committed educators worked, with the support of the RSIs, to create meaningful change in educational opportunities and student achievement. The cumulative accomplishments of the RSIs are highlighted in a 2007 report, *A Legacy of Leadership and Lessons Learned: Results from the Rural Systemic Initiatives for Improving Mathematics and Science Education* (www.edvantia.org/products/pdf/rsi_Report_0706.pdf). On July 16, 2008, NSF funding made possible the Forum on Leveraging a Legacy of Leadership in Mathematics and Science Education. The forum was held in Washington, DC, in the conference room of the House of Representatives Standing Committee on Science and Technology. These proceedings provide highlights of the forum.

The forum profiled the ways practitioners in local school districts have leveraged the RSI's legacy of leadership to continue improvements in mathematics and science education. Representative of hundreds of their peers who staffed or participated in one of the 28 RSIs, six practitioners participated in a panel and shared their experiences. These panelists were from Alaska, Kentucky, Mississippi, Texas, West Virginia, and Wyoming.

Representatives of NSF and three other federal agencies (the U.S. Department of Energy, the National Aeronautical and Space Administration, and the U.S. Department of Education) gave presentations that illustrated their support for improving mathematics and science education in K-12 public schools. These agency representatives shared information about programs and opportunities that school districts and states can use in leveraging the RSI legacy.

Much of the RSI legacy lies in the capacity created in the educators who strived to implement innovative and important changes in rural schools and their communities. The NSF-sponsored RSIs also garnered national recognition of the unique needs and challenges faced by rural schools as the nation zealously sought to improve mathematics and science education. The resulting legacy of exceptional expertise among rural educators potentially enables continued improvements in educational opportunities and student performance in rural America—if this expertise is put to good use.

In his welcoming remarks at the forum, Congressman Alan B. Mollohan (D-WV) clearly articulated the need to leverage the RSI's legacy of leadership:

Your mission is extremely important. We will be looking forward to your success. The nation needs these youngsters. We cannot afford to leave this talent from rural areas behind. Shame on us if we do! It would be a real indictment of educational and political leadership if we do leave them behind.



Welcome and Recognitions

Dr. Keith Smith
Project Director, Coalfield Rural Systemic Initiative
Edvantia, Inc.

The Rural Systemic Initiatives have been in place for roughly 14 years. But they weren't part of the original plan. When the National Science Foundation (NSF) began funding systemic initiatives around the country, they started with state systemic initiatives and then urban systemic initiatives. Many of us who lived in rural places cajoled and wrangled NSF leaders into considering the needs of children in rural schools, particularly in impoverished places.

NSF leaders listened, and in 1993 they held a meeting near Huntington, West Virginia. The meeting was attended by NSF leadership and by individuals and groups interested in improving mathematics and science in rural schools attended the meeting. We were very fortunate to have a congressman in West Virginia, The Honorable Alan B. Mollohan, who was on the House Appropriations Committee. Congressman Mollohan had a strong interest in ensuring that rural areas received assistance in improving mathematics and science education. At the time, West Virginia was the second most rural state in the United States, as defined by the percentage of the population residing in rural areas of a state.

Congressman Mollahan encouraged the NSF leadership to start the Rural Systemic Initiatives (RSIs), and he spoke at the seminal 1993 event organized by Dr. Wimberly Royster. Dr. Royster had a positive history with NSF, and he had been encouraged to organize the meeting. It was a very successful event and, shortly thereafter, NSF began funding the RSIs.

In 2007, when most of the RSI projects had ended, those involved in the RSIs recognized that vast amounts of knowledge about these initiatives and their influence would soon be lost to the nation at large—and at a time when improving student opportunities and achievement in mathematics and science had never been more critical to the nation's future economic prosperity and security. Consequently, we approached NSF and asked for support in organizing this forum. Its purpose is to share how the RSIs created capacity in people and to discuss how this capacity should be leveraged to continue the improvement of mathematics and science education in impoverished areas of rural America.

The forum brings together a select group of people who were on the front lines of RSI projects. Their presentations help us understand what happened from the perspectives of teachers, principals, district coordinators, and others. Remarks by The Honorable Alan B. Mollohan help to set the stage for these presentations.

The Honorable Alan B. Mollohan
U.S. House of Representatives
First Congressional District, West Virginia

This forum is the culmination of an effort that is important to the nation and to rural parts of the nation in particular. One of the speakers, Dr. Wimberly Royster, is a person who really understands the challenges of rural America with regard to mathematics and science education. He understands the potential of rural youngsters. Years ago, he saw that this potential wasn't being realized, and he wanted to do something about it by looking extensively at how it could be approached. The National Science Foundation (NSF) became involved, and the result was the Rural Systemic Initiatives, or RSIs.

Congratulations! Fourteen years and \$140 million are a lot of effort. Also, congratulations on producing the RSI *Legacy* document in 2007.

One thing I don't have to do for this audience is to suggest how important it is to consider the way mathematics and science is taught in this nation. For 23 years, I served on the House of Representatives Appropriations Committee, the committee that has funded the National Science Foundation. I have been in Congress for 26 years. Every single year the National Science Foundation, the president's science advisor, or some of the NASA folks, come and testify about the importance of this subject. It is critical for this country to develop future mathematicians, scientists, and engineers—and for students with aptitudes in these areas to be aligned with those kinds of disciplines. We have all this potential, but at the same time we are falling behind because we are doing an inadequate job of bringing youngsters in and teaching them mathematics and science.

There have been initiatives to address this issue every single year. Every year it is the same thing. This year it was the same story: "We are not doing it well." So, it is mind boggling for members of Congress, who at their very best are good generalists, to hear that this kind of report exists and for the experts not to come forward and say this is part of the solution. The solution has been extremely elusive.

Because I represent a predominantly rural area, I am obviously focused on the rural aspects of the issue. I visit the colleges and the high schools. The high schools are resource starved. When we talk to colleges and ask them how they supply a teacher to a rural school who can teach mathematics and science, and do it in an environment with the limited resources that are available, we don't get an answer from our colleges today.

I know one college particularly in my congressional district that was really going to focus on how to teach mathematics and science in rural areas. We are still working with them on that, and maybe some of the lessons learned here will be applicable, both there and elsewhere.

The Mollohan family has a foundation (the Robert H. Mollohan Family Charitable Foundation), and one thing it does is to give high-technology scholarships. When we solicit applications for these scholarships, we may receive 110 applications. The first cut of applicants is made based on aptitude test or standardized test scores. We usually award about 35 or 40

scholarships. Then we give an internship to connect scholarship recipients with high-technology companies so that these youngsters from predominantly rural counties understand there are these kinds of career opportunities in West Virginia. This helps them know that they do not necessarily have to go outside the state to have a vocation that matches up with their abilities.

It has been extremely enlightening to identify these kids that score high ACT and SAT tests. You get them all in the room and they look at each other like “Wow! There are other people in the world with these same interests!” We have been successful in keeping some of them in West Virginia. This is fundamentally important for several reasons. One reason is the economy. Another reason is for the social fabric, to have that kind of talent in the community.

Your mission is extremely important. We will be looking forward to your success. The nation needs these youngsters. We cannot afford to leave this talent from rural areas behind. Shame on us if we do! It would be a real indictment of educational and political leadership if we do leave them behind.

Dr. Sandra Angius
Vice President of Programs
Edvantia, Inc., Charleston, West Virginia

This forum is all about continuing the RSI's legacy of leadership. It is not about the end of an initiative. Rather, it marks the beginning of new ways of thinking and new ways to harness the capacity that will be revealed by the panel of practitioners. The leaders in the federal agencies working in mathematics and science will help us think about the next steps. What should be the next iteration of the work of the RSIs?

Rural education has long been an area of interest to Edvantia. In fact, we recently launched an exciting new initiative, the Rural Education Center at Edvantia. The center concentrates on Edvantia's core services of research, evaluation, professional development, and technical assistance, but with rural contexts in mind.

Context matters. Leadership and resources also matter. Schools sometimes have the leadership capacity and not the resources. At other times, they have the resources and not the leadership capacity. The work of the RSIs has helped to ensure that rural schools have the leadership capacity they need. We don't want to lose the knowledge and the momentum that the RSIs have created, to simply tie up the RSI program in a bow and move on. We want to showcase for the country the leaders and practitioners who, through the work of the RSIs, are now equipped with the capacity to lead change.

Through our networks and colleagues, we can help one another think about how to harness additional resources to begin the next phase of work in rural education, particularly in mathematics and science.



Setting the Context for Leveraging the Legacy of Leadership in Mathematics and Science Education

Dr. Wimberly Royster
Principal Investigator, Appalachian Rural Systemic Initiative

In 1983, a blue-ribbon commission appointed by the Reagan administration issued a report called *A Nation at Risk*. It fired a shot heard across the country and brought national attention to the performance of the nation's schools. By 1990, scholastic achievement was stagnating so that the National Science Foundation (NSF), through the leadership of Luther Williams, then Assistant Director of Education and Human Resources at NSF and now Provost at Tuskegee University, instituted a new unit solely to promote the health and vitality of science and mathematics education. This directorate launched an ambitious effort called the Systemic Initiatives (SI) program to improve mathematics and science education throughout the nation's school systems.

NSF's first move was to institute the Statewide Systemic Initiatives (SSI), which supported state-level reform in 25 states and Puerto Rico. Noting that this was not having the desired effect on students (especially African American and Latino students), NSF launched the Urban Systemic Initiatives (USI) to bring about reform in about 30 of the nation's largest and poorest inner cities.

Need for NSF Support

In the summer of 1993, NSF staff, including program officer Dr. Jody Chase, visited Kentucky, whereupon discussions began concerning the need for similar initiatives for economically disadvantaged and geographically isolated rural counties. NSF had noted disparities between the performance of students in these areas and that of counterparts living in more affluent areas. NSF was informed that some of the most poverty-stricken counties were in central Appalachia (see Table 1).

A question was raised as to how reform should be approached. The response was for NSF to fund a conference to explore the issues. So, in October 1993, NSF funded a conference, "The Appalachian Rural Conference," in Huntington, West Virginia, to look at the barriers to teaching and learning mathematics, science, and technology in high-poverty rural regions. Participants included educators from K-12 and higher education; community members; business people from the central Appalachian states of Kentucky, Ohio, North Carolina, Tennessee, Virginia, and West Virginia; and nationally prominent education leaders, members of Congress, and policymakers. The conference outlined the parameters for reform efforts in the central Appalachian region and assisted NSF in developing criteria and guidelines for an initiative for rural systemic reform.

At the conclusion of the conference, NSF announced it would issue a request for proposals for funding Rural Systemic Initiatives (RSIs) and suggested that the Appalachian Consortium, which had conducted the conference, submit a proposal for a planning grant.

The RSI was launched in 1994 with the goal of promoting systemic improvements in mathematics and science for students in remotely located and impoverished locales, especially those underserved by the previous systemic initiatives (SIs).

Table 1. Socioeconomic Conditions in 1990: Data Supporting the Need for ARSI Involvement

	U.S. (All persons) <i>N</i> = all citizens	Appalachia (All counties) <i>N</i> = 399	6 ARSI States (All Appalachian counties) <i>N</i> = 233	Counties Eligible for Inclusion in ARSI (using NSF guidelines) <i>N</i> = 66
1990 poverty rate (general population)	12.4%	18.9%	21.5%	32.1%
1991 per capita income (dollars)	\$19,091	\$13,720	\$13,030	\$11,156
1992 unemployment rate (1980-1990)	7.3%	9.3%	10.0%	12.6%
Net rate of population change (1980-1990)	+2.3%	-1.3%	-4.3%	-9.1%
1990 percentage of adults with college degrees	20.3%	10.0%	9.0%	7.0%
1990 percentage of adults who had not finished high school	24.8%	39.0%	42.0%	51.0%

Participants in the Appalachian Consortium agreed on the value of a regional approach among Appalachian districts without regard to state lines. Their unique circumstances meant that districts across the region often had more in common with one another than with districts in their own states. Therefore, if strategic planning could devise a way to maximize resources on behalf of systemic reform and reduce impediments to multistate collaboration, a regionwide initiative held even greater promise for helping rural schools break out of the status quo. In 1994, NSF awarded the Consortium a development award to plan and draft a proposal for operating the Appalachian Rural Systemic Initiative (ARSI).

Within the criteria established by the RSI program (at least 30% of school-age children in poverty), 66 counties in six states were eligible for inclusion in ARSI. All of these counties were designated by the Appalachian Regional Commission (ARC) as being in Appalachia. These counties constituted the poorest rural (largely isolated and not generally contiguous) counties in central Appalachia (see Figure 1).

Drawing on research conducted during the development period, ARSI designed an overall strategy for assisting these counties. The emphasis was on developing local education leaders who could initiate and sustain improvements in their own schools. ARSI designed a model that was based on a team approach to school reform. In 1995, in response to the development proposal, NSF made a 5-year award to the Kentucky Science and Technology Corporation (KSTC) to fund the ARSI project. NSF concurrently funded RSIs in three other regions: Alaska, the Southwest, and the High Plains Tribal colleges.

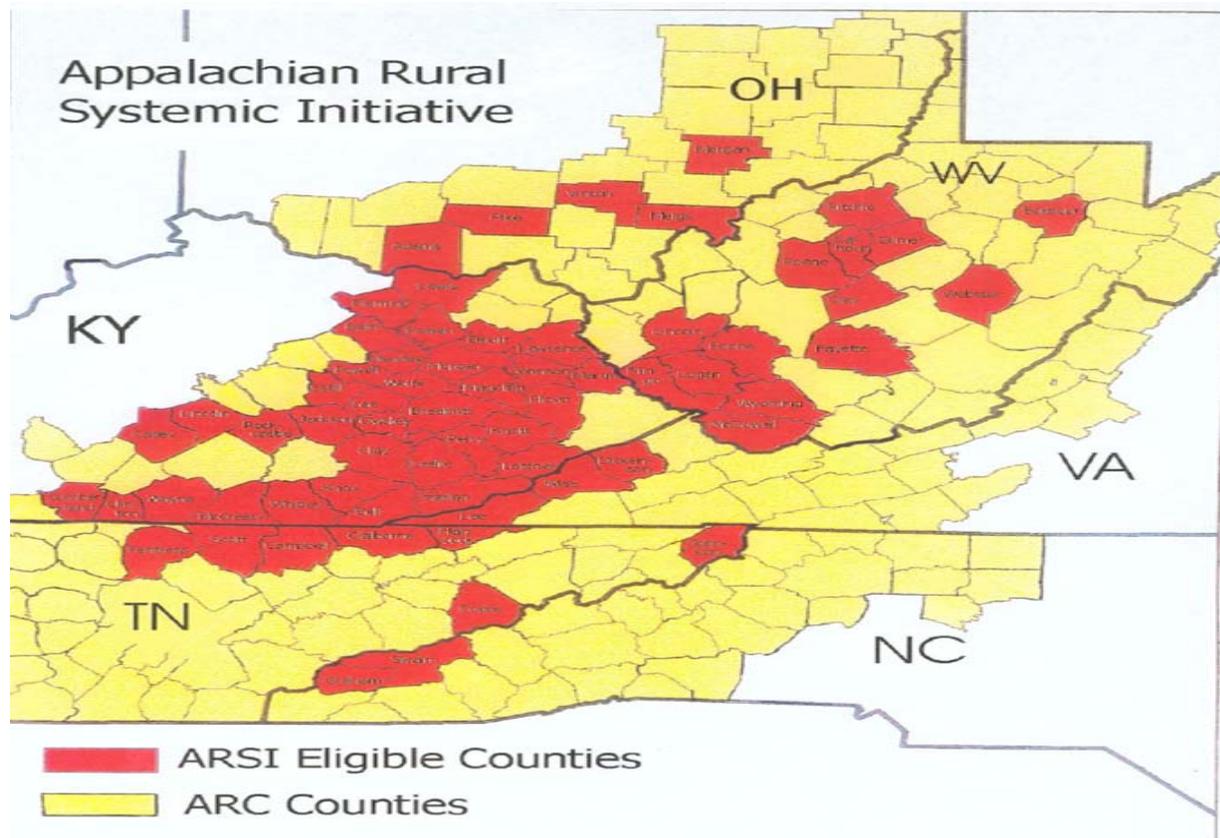


Figure 1. Counties in the Appalachian Rural Systemic Initiative and other counties in the Appalachian Regional Commission

As ARSI began its work, it faced several challenges. The first challenge was to create a coordinated regional approach that would eliminate duplication of efforts and maximize state resources to support reform. ARSI also needs to be a strong outside voice for reform in teaching and learning as states tried to meet the demands of accountability. Further, district readiness to embrace reform varied widely. ARSI had to adopt a developmental approach, creating and implementing strategies that were consistent with the degree to which the district was ready and

willing to embark on an improvement process. The success with which ARSI approached these challenges is reflected in Dr. Luther Williams' remarks at an ARSI Conference in 2005:

In response to the local domain-specific challenges, you set out to implement the ARSI program plan via categorical and predominant use of a strategic model within which unit centrality was assigned to a regional delivery-system and institutional capacity – building strategies in more than 65 counties and 85 school districts across components of six states – in the place called Appalachia, connoting both a sense of place and geography.

Dr. Luther Williams, NSF EHR Director

The ARSI Approach

The success of the ARSI model lies in its regional delivery system and its capacity-building strategies. The ARSI approach established an improvement community that included teacher partners, regional collaborative coordinators, districts liaisons, and regional teacher partners (see Figure 2).

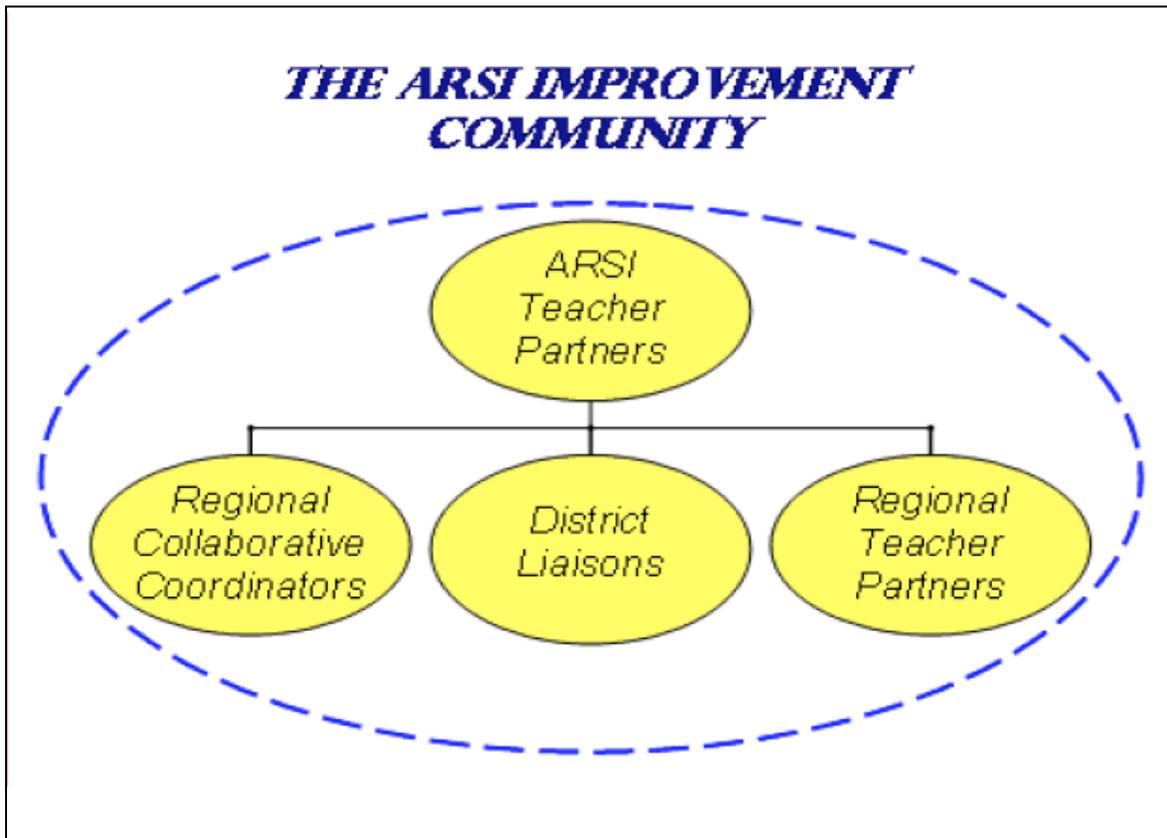


Figure 2. The ARSI Improvement Community.

During its 10 years of operation, ARSI built on significant performance gains and overcame many of the challenges it first faced when working with the rural Appalachian school

districts in six states. Keys to ARSI's success included coordinating and collaborating with several individuals and groups:

- Teacher Partners, selected from the local districts, who build district capacity for improving mathematics and science
- Resource Collaboratives that link to university and other resources to establish a broad-based system that facilitates local planning and decision making
- District Liaisons, district administrators who helped support the Teacher Partners by providing a direct upper-level link to the local school system
- Leadership Teams (consisting of a teacher partner, ARSI district liaison, superintendent, and a principal) that develop district plans to support program improvement
- Resource Collaborative Coordinators who served as "field agents" to facilitate local planning and decision making, coordinate training for Teacher Partners, and direct services to schools in their region
- Regional Teacher Partners (experienced Teacher Partners and some of the region's strongest teachers), funded through a special award to work with individual district Teacher Partners

ARSI leadership incorporated many lessons that were learned along the way:

- Understanding and use of data is critical to the success of school improvement
- Knowledge of the need for improvement is critical to the district's willingness to reform instructional programs
- An active improvement community is critical to successful program improvement efforts
- To be effective, community engagement must be integrated with other district mathematics and science reform efforts
- Administrative support is essential to the change process

ARSI constantly strived to build capacity for local district improvement. As one ARSI district liaison noted:

ARSI provided the catalyst for the development of an infrastructure capable of developing and sustaining high-quality instruction. We have seen much growth in teacher content knowledge, the use of research-based instructional strategies and materials, and the effective use of data to make instructional decisions.

Nancy Wilcher, ARSI District Liaison, Lincoln County,
Kentucky

It is critical that reform efforts be institutionalized so that the gains that have been made in improving mathematics and science instructional programs can be sustained over time. In addition to direct impact and sustainability of ARSI over its 10-year period of existence, a very significant residual has been the spawning of additional projects serving central Appalachian rural school districts, totaling more than \$50 million.

The Rural Systemic Initiatives (RSIs) worked in an environment where a number of factors made change difficult. Poverty, geographic isolation, and the pressure of state accountability measures made the rural context not an easy one in which to pursue educational

improvement. However, by realizing local needs and developing local leadership to connect with national-level resources, the RSIs made enormous progress, considering the limited support.

Leveraging the RSI Legacy

The RSI created important capacity for improving mathematics and science education in a variety of ways. For example:

- Local ownership of improvement efforts and centrality of accepted and highly respected “home grown” leaders
- Local leadership with a systemic view of change and improvement processes (e.g., one-size-fits-all improvement processes do not work)
- Communities more aware of the need for and possibility of improving mathematics and science education
- District and school personnel better able to utilize data in decision making
- Local leadership with knowledge of how to tap national-level resources and expertise for improving mathematics and science education in local schools

What can be done to continue leveraging the RSI leadership legacy? There are several needs:

1. Additional state and national support for the local leadership and improvement community developed by the RSIs to continue reform efforts begun by the RSIs
2. More long-term incremental funding possibilities and wise use of the improvement community (leadership teams) to sustain the impact achieved by the RSIs
3. More focus and training on how to utilize data better to set the stage for more thorough analysis of existing data and better decision making
4. Improvement in the interaction and partnership efforts between public school districts and higher education to create a support system for sustaining reform

ARSI external evaluator Mark St. John of Inverness Research Associates, in a 2006 Memorandum on Appalachian Education, put the significance of the project in proper perspective:

The investment in the ARSI project has been relatively small compared to the scale of the region and the scope of the problems it has addressed. Nonetheless, the investment has yielded important returns. Because NSF provided for 10 years of steady funding and because the work of ARSI has focused on developing capacity in a cumulative fashion, there are strong residual benefits that have accrued out of the work of ARSI. ARSI has not solved all of the challenges of improving education in Appalachia, but it has put those challenges in reach of future projects. Already the AMSP and ACCLAIM projects have drawn upon ARSI-developed expertise and relationships. Because of ARSI, Appalachia is now

a strong candidate for other future investments. Perhaps then, the most important legacy of ARSI will not be found in the good work it did during its lifetime, but in the work of all the future improvement efforts that draw on the assets ARSI has created.



Presentations by RSI Panel of Practitioners

Introduction

Dr. Hobart Harmon
Professional Consulting and Research Services

Dr. Wimberly Royster has explained the context and progress of the Rural Systemic Initiatives (RSIs). For a description of the results achieved by exemplary RSIs from all over the country, see the 2007 report titled *A Legacy of Leadership and Lessons Learned: Results of the Rural Systemic Initiatives for Improving Mathematics and Science Education*. The people who were on the ground making the RSIs happen now have an opportunity to tell their story—and an opportunity to share how they used or are using the leadership capacity that was created by the RSI to continue their improvements in mathematics and science education.

It is difficult to get a school improvement initiative started and successfully implemented. It is essential to involve many partners. NSF's investment in RSIs created the capacity for many districts to continue improving mathematics and science education in rural areas after the NSF funding and RSI support ended. During the panel presentation, five practitioners share their stories of what the RSI did for them and how they have continued to improve programs for students. Insights from these practitioners, as well as another who had planned to attend but could not, are summarized in the forum proceedings.

These practitioners are representative of the leadership capacity that was created among the 28 RSIs funded by NSF. They offer examples of the leadership that is now available in school districts where the RSIs worked. They also represent the diversity of students served by the RSIs, from Alaska Natives to the impoverished of Appalachia, from the Hispanic populations of Texas to the Native Americans of Wyoming to the African Americans of the Mississippi Delta. Each RSI was implemented differently as it strived to serve its unique student population and rural region.

Coalfield Rural Systemic Initiative

Jonathan Escue
Science Teacher, Lincoln County High School
Hamlin, West Virginia

The Coalfield Rural Systemic Initiative (CRSI) served our school district in Lincoln County, West Virginia. CRSI included eight counties in southwestern Virginia and 10 counties in southern West Virginia. The CRSI has been the best professional development experience that I have ever had. Please do not superimpose my experiences on those of other RSIs, because they were all designed differently. What happened in Lincoln County was unique. It met our needs. When CRSI participants reported out at the end of the project, we found that no person or school system was the same or had the same experiences. There was a wide variance regarding what was learned across the districts. The project uniquely met the needs of the people and school districts involved.

The Lincoln County school district includes eight elementary schools, four middle schools, and one high school. Approximately 3,700 students attend the schools, and approximately 250 teachers serve the students. The area is very rural.

Before CRSI

BC, or before the Coalfield RSI, there was really no professional development program in place for mathematics and science. Most of the central office personnel had a lot of hats to wear; they did a lot of jobs. The person who handled science was assigned to do it as “other responsibilities.” I am not saying that the people assigned to do the jobs were not committed to quality teaching of mathematics and science. But there was just nobody in charge. The leadership wasn’t there.

We had no systematic plan for promoting the science and mathematics curriculum. No data analysis was being done by the teachers. After CRSI started, I went back to the schools and wanted to see the data. Well, everybody looked at each other, and when asked where the student performance data were, a person went scrambling into the counselor’s office and found the student data was still in the envelopes.

Professional development was general, not specific to the needs of science and mathematics teachers for effective instruction. It wasn’t really appropriate for what we needed to be doing as effective mathematics and science teachers. Also, there was no emphasis on recruiting quality science and mathematics teachers from our student body. With the assistance of the CRSI, that changed.

After CRSI

After CRSI, you could describe what happened as AD, meaning “after data.” We spent our first 2 years studying data and how to use it—and it changed what happened in our schools. Now we have devoted entire continuing education days for teachers to break down data in

multiple ways so we know what is happening with each student. It has changed things in Lincoln County schools. Data now drive curriculum and instruction. Decisions are not based upon what we feel or what people think, but on what data reveal. And that is a world of change in rural Lincoln County, West Virginia. It is not going to change back to the old ways.

Leadership Teams

Another change is that we developed leadership teams in both science and mathematics. As a result, we now have direction and purpose in our mathematics and science programs. On the teams we have teachers, a principal, a central office designee, and the superintendent. As you know, superintendents come and go. But the leadership team sustains itself. We are better able now to talk about what we need in the middle school, or in the high school. We are able to talk about higher expectations for students. None of that was being done before CRSI came along.

It is exciting to get together with colleagues. We have done wonderful things in Lincoln County. We talked about a learning community through virtual hands-on labs, book studies, and common goal setting. I know book study is not the newest thing in the world, but it was for us. Four or five of us got together. We had book studies on research by Marzano, on leadership and other topics. Specific book studies for elementary schools, middle schools, and high schools. It has made us better instructors, and that has resulted in better student achievement.

The reality is that now our teachers are making decisions and we are being facilitated and supported by the central office, and that changed the culture. And once you have been shown how to do it, it is going to grow. It is sustainable. With our science and mathematics leadership teams, we were better able to direct what happened to our mathematics and science teachers.

Quality Professional Development

Our lessons now are inquiry based and research based. We did it through professional development. Quite frankly, I didn't know what the standards were before CRSI. We now have a networking system where answers can be obtained about making necessary curriculum and instructional changes specific to mathematics and science. We now have what has become a wonderful outgrowth of the CRSI program: coaches. We have hired a full-time coach in Lincoln County. This person does a wonderful job of coordinating all the things that need to be done. It is wonderful—and sustainable. I can't imagine or envision the school system now offering professional development that is not what teachers need, or dealing with instruction unless it meets student needs.

Teacher Recruitment

Another area of emphasis in the CRSI and Lincoln County was on recruiting mathematics and science teachers. We started identifying students who might want to become science or mathematics teachers. Initially, we started with just having conversations with prospective students. We had conversations that simply tried to encourage certain students to think about being teachers by telling the students they had some of the characteristics of good teachers, saying , “Maybe you want to consider becoming a teacher.” Our conversations started that way.

Then I developed a club. We had four students in the beginning. Next year in Lincoln County, we will have two class periods devoted to becoming a teacher. We hope to get 15 to 20 students in each of those classes. And that would mean 30 to 40 students are considering becoming teachers.

Personal Growth

The CRSI contributed to my personal growth. My participation gave me a renewed passion for teaching. One of the lessons that we learned was that you need to start small and it will grow. That has been affirmed in Lincoln County. It was difficult to deal with the name “teacher leader” because we are all in this together. But at some point in time, some of us had to step up and say *this is where we have to go*. It took us 2 ½ to 3 years to understand what this means. We wear the badge of a teacher leader with humility. It changed the conversation. There is very little conversation now among teachers about what your administrator is doing. The conversation is about the neat thing I did in class today, or this program is going well, or I heard about this, or did you get a chance to read chapter 8 yet for the book study.

The leadership growth is sustainable. As a teacher leader, I am now involved in a lot of things. Now I am going to be a mentor for general science teachers who want to teach chemistry. Last year in West Virginia, about 54% of our chemistry classes were taught by noncertified personnel. We now have an initiative to take those teachers through a 3-year program at the university to get them certified in teaching—and I will be mentoring them.

Also, I learned it can be pretty neat to go to school board meetings. We presented what we were doing and what needed to be sustained or supported to best serve the students. And board members listened.

CRSI Activities

I experienced many activities that were made possible by the CRSI project with funding from the National Science Foundation. The following list provides a snapshot of the things we have been doing with our RSI initiative. It has been great. It has changed our culture.

Teamwork	Parent/community relations
Graphic organizers	NSTA National Conference
Understanding by Design	Effective questioning
The World is Flat	Formative assessment
Wikis	Technology training
Marzano	National standards
Learning styles	Leadership teams
Leadership	Keynote speakers
Board meetings	Best practices
Program reviews	Role-playing
GPSs	Higher level thinking
Distance Learning	Problem solving
NASA	Rubrics

Inquiry
Virtual labs
Review student work
Standards-based programs

School culture
Coaching
Mentoring
Book studies

I end with an appropriate quote by Margaret Mead:

“Never believe that a few caring people can’t change the world. For, indeed, that’s all who ever have.”

Sunflower County School District and Delta RSI

Angela Winters
Principal, James C. Rosser Elementary, Sunflower County School District
Moorhead, Mississippi

School District/School Background Information

The Sunflower County School District is located in Sunflower County in the Delta region of Mississippi. The district was in the Delta Rural Systemic Initiative (DRSI). The district, composed of four elementary schools, two middle schools, and one high school, serves approximately 1,830 students. The schools are located in Inverness, Moorhead, Sunflower, and Ruleville, Mississippi.

Sunflower County is situated about 100 miles south of Memphis, Tennessee, 120 miles north of Jackson, Mississippi, 30 miles east of the Mississippi River, and 40 miles west of the hill section of Mississippi.

Approximately 87% of the students in the district are eligible for free and reduced-price meals. The student ethnicity is Black, 96%; Hispanic, 2%; White, 2%; and Asian, .26%. The ethnicity of teachers and administrators is Black, 87%, and White, 13%.

James C. Rosser Elementary School

James C. Rosser Elementary School is located in the small rural community of Moorhead, Mississippi (see Figure 3). Moorhead, located off Highway 82, has a population of approximately 2,600. The town is known for its famous railroad tracks, the crossroads, “where the Southern crosses the Dog.” A Yellow Dog Festival is held yearly in the community. This community is also home to Moorhead Middle School, which enrolls approximately 150 students, and Mississippi Delta Community College, with approximately 2,100 students. Moorhead has only one red light, four stores, one bank, a post office, two gas stations, two restaurants, one laundry mat, two factories, two day care facilities, and numerous churches.

James C. Rosser Elementary School (Figure 4) has an enrollment of 262 students in Grades K-5. The school has 261 Black students and one White student. Rosser has a total of 122 male and 140 female students. Rosser Elementary is a Title I school, with 87% of its students eligible for free and reduced-price meals.

The staff at the elementary school consists of a principal, 15 certified teachers, 11 assistants, one campus safety aide, a secretary, three custodial workers, and four cafeteria workers. Student enrollment by grade level is shown in Table 2.



Figure 3. Main Street in Moorhead, Mississippi.



Figure 4. James C. Rosser Elementary School.

Table 2. Enrollment at Rosser Elementary School, by Grade Level

Grade	Student Enrollment
Kindergarten	47
1	46
2	46
3	36
4	46
5	41

DRSI Impact

The DRSI had a tremendous impact on our school as well as our school district. The DRSI project helped our school district acquire professional development with a focus on teaching strategies needed to improve student achievement in mathematics and science. It helped to provide curriculum materials such as mathematics and science manipulatives. DRSI field coordinators provided hands-on teaching lessons in the classrooms, helped to improve student performance, and increased parental involvement through Math and Science Fun Nights (see Figure 5).



Figure 5. A Family Night activity at Rosser Elementary School.

District principals and teachers were able to attend high-quality professional development conferences such as the DRSI Annual Conference, “Sustaining the Momentum,” which was held in Jackson, Mississippi. Conferences helped principals and teachers network with educators in other school districts and learn from various motivational speakers. Teachers also received training from the DRSI field coordinators, and they were able to borrow resources and materials (e.g., manipulatives) to use in their classrooms. Teachers changed their assessments to evaluate students on the concepts taught using the new teaching strategies. These innovative teaching strategies encouraged students to think more creatively.

Personal Impact

The DRSI had a vast impact on me professionally as an administrator. As a principal, I became involved in the mathematics and science trainings. I observed DRSI field directors teaching lessons in our classrooms. I participated in Math and Science Fun Nights, where the field coordinator trained teachers, parents, and students at the same time. What an exciting event!

As a result of DRSI, I became aware that as the instructional leader at Rosser Elementary, I needed to help teachers sustain the momentum of innovative teaching practices. Teachers also implemented the new strategies in our after-school and summer programs. When additional funds became available, I purchased math manipulatives, digital microscopes, and science kits for class instruction. I began to encourage teachers to do classroom observations to view new teaching practices in mathematics and science.

Intensely focused on providing high-quality professional development in mathematics and science for teachers, I took action to hire an intervention teacher, previously trained by DRSI, to help new teachers implement effective mathematics and science strategies. I scheduled meetings for teachers to share mathematics and science strategies with each other. I shared more data about student performance with teachers and discussed improvements needed. As the instructional leader, my role was essential to creating a science lab for teachers to use hands-on strategies that helped motivate students and improve achievement.

Leveraging the Impact of DRSI

As funding for the DRSI project came to an end, I had to find other ways to keep new teachers abreast of new teaching strategies. Our teachers became a part of the Achieve MS program. This program provided high-quality professional development on problem-based learning. Achieve also provided funding to purchase technology and science equipment for use in the classrooms. I was also trained in problem-based learning. This initiative helped to motivate teachers, students, and parents. As an administrator, my role was to help teachers stay abreast of the state and national standards, to provide resources and materials for teachers, and to provide them with high-quality professional development.

In summary, my role as an administrator has been to

- provide teachers with access to high-quality professional development that helps them implement a standards-based curriculum
- provide resources and materials for classroom instruction
- help teachers effectively use mathematics and science strategies that will improve student academic achievement
- increase parental involvement through Math and Science Fun Nights and parent training workshops

Teachers sorely miss the trainings from the experienced DRSI field coordinators. The school and district continue to look for funding to access this type of high-quality professional development for mathematics and science teachers.

In conclusion:

1. Rosser Elementary and the Sunflower County School District have enriched the lives of many students and parents through DRSI assistance.

2. Rosser Elementary teachers continue to implement these effective strategies in classrooms with the assistance of an intervention teacher previously trained by DRSI.
3. Rosser Elementary now has a science lab where teachers can more effectively implement DRSI strategies with students.
4. Our great challenge is to continue motivating and training teachers to help students reach high expectations for academic achievement in mathematics and science.

Kodiak Island Borough School District and Alaska RSI

Teresa Schneider

Coordinator, Native and Rural Education Support, Kodiak Island Borough School District
Kodiak, Alaska

I am a descendent of people who have lived continuously on the Kodiak Archipelago for a long time. My husband Eric and I have three children: Patrick, Tatiana, and Natalia. I am an elementary teacher, having taught in third through fifth grades for 8 ½ years. I have served as a program coordinator in my school district for the past 11 years. During the past 4 years, I also have worked as the camp manager for the Dig Afognak program. As a matter of fact, just 2 days ago, I left the camp of 45 people to travel here to Washington, DC. Talk about culture shock! I understand even better now the shock our students and families go through as they adjust to life in a city after living in a remote village.

School District

I live and work on Kodiak Island—the second-largest island in the United States behind the island of Hawaii. Some call us the northernmost Hawaiian island, partly because of geographic location, but also because of the extreme green that covers the islands during our summer months, and also because of the friendliness and hospitality of Kodiak Islanders. Historically, there were as many as 20 villages throughout the archipelago. Today there are six Native villages and a logging camp. The town of Kodiak serves as a hub for economic and political activities. The impacts of World War II, the Cold War, urban renewal, the crab fishing boom, and now tourism, have converted Kodiak from a sleepy little village to the island’s “city center.”

The Alaska Rural Systemic Initiative (AKRSI), a partnership between the University of Alaska Fairbanks and the Alaska Federation of Natives, served my area of the state from 1995 to 2005. From 1997 through the end of the project, I served as the AKRSI Alutiiq/Aleut Regional Coordinator from within my school district. This meant that I worked with schools and organizations from the Aleutian Chain, the Alaska Peninsula, Kodiak Island, Lower Kenai Peninsula, and the Prince William Sound. I became a coordinator and liaison between the project, school districts, and Alaska Native organizations that crossed cultural regions of the Unangan/x, Alutiiq/Sugpiaq, Yupik, and Athabascan peoples.

The AKRSI role led to my current position in the school district as program coordinator for the Native and Rural Education Program. The sole purpose of the program and “department” (that is, a department of one person) is to bring curricula, programs, funds, and educational opportunities to the district that are specifically focused on the unique needs of our indigenous and rural students who live in Kodiak’s city center and outlying communities.

Alaska is huge in geography and diversity, with over 254 recognized tribal governments. My cultural region of the Alutiiq/Sugpiaq people is along the Alaska Peninsula, Kodiak Archipelago, Lower Cook Inlet and Prince William Sound. This group has a unique language and culture, but is linguistically close to the Yupik/Cupik people of Western Alaska and

culturally connected through our maritime lifestyle to the Unangan/Aleut of the Aleutian Chain and Pribilof islands.

The Kodiak Island Borough School District (KIBSD) serves approximately 2,800 students in 15 schools situated in nine communities throughout the archipelago. Located in the northern Gulf of Alaska, these communities are not easily accessible. The city of Kodiak is accessible by plane and the state ferry system. Seven of our communities are accessible only by small plane (by small, I mean planes that carry only 3 to 9 passengers) or by small boats (i.e., skiffs or small fishing boats). The decline of population in two of our communities has led the district to close two of the smallest schools. The largest community on the islands is the city of Kodiak, with about 11,000 residents. Karluk is the smallest community, with approximately 30 year-round residents. We serve communities with schools that have 10 students spread throughout grades K-12, and schools in communities with as many as 800 high school students.

KIBSD employs approximately 200 certified teachers and 150 paraprofessionals to support student learning. Our village schools suffer a 35-55% teacher turnover annually. This is double the turnover of any school in the town of Kodiak. In our smallest communities, new teachers may be adjusting not only to a new career, but also to the rural Alaska way of life.

The school district serves a very diverse population: 44% Caucasian, 23% Asian, 22% Alaska Native and American Indian, 8% Hispanic, and 3% other. This is the first year that our Alaska Native/American Indian population has fallen below that of our Asian community members. Each of our schools is somewhat unique in its make-up—some schools are 100% Alaska Native, while others are 85% Asian and Hispanic. Kodiak is home to the largest U.S. Coast Guard base in the nation. As a result, one of our schools serves primarily the dependent children of military families. The district also serves children who are a part of a transient community that supports the seasonal fishing industry and tourism.

Families living in the town of Kodiak experience a 30% higher cost of living than the national average. We believe this has something to do with our geographic isolation and limited transportation options. The cost of living differential is even higher in each of the outlying villages. The village poverty rate is 75%, more than six times the national average. Residents throughout the islands rely heavily on traditional hunting, fishing, and subsistence activities to alleviate some of the high costs in feeding a family.

AKRSI Impact

Many district activities stimulated by the Alaska Rural Systemic Initiative have persisted beyond the AKRSI project. A somewhat foreign idea before AKRSI, many activities created and implemented within the Native and rural population have been complemented, enhanced, and supported through the school district. Consequently, the Kodiak Island Borough School District created what is now called the Native and Rural Education Department. This has built an umbrella for gathering curricula, materials, grants, resources, and opportunities that can effectively serve this unique population of students. Moreover, the department also helps focus professional development opportunities to facilitate proper use and implementation of the

materials and resources in serving students. Many activities have come to be known as “something we do in our villages.” For example:

1. Academy of Elders Science Camp—a camp, cosponsored by district, that brings together students, elders, teachers, and community members in a remote setting to engage in place-based learning activities grounded in the values of the Alutiiq culture.
2. “Alutiiq Weeks”—a week in the schools during which communities literally take over the planning and much of the implementation of daily activities that focus on the arts, crafts, language, and values of their indigenous people. Though many such activities are taught throughout the year, this week allows the school to truly reflect the community by stepping aside and facilitating the community to complete a larger-scale project, invite special guests, and concentrate resources to a greater extent.
3. Rural Leadership Forum—a newly formed not-for-profit organization made up of leaders and community members living in the outlying communities whose only focus is to equalize opportunities and resources for their unique living situations.
4. Annual Education Summit—a gathering of Alutiiq leaders and community members to celebrate and share successes among their people, including the youth of their communities.

An annual Rural Science Fair that grew from the AKRSI project now drives the science, mathematics, and social studies curriculum taught in our villages (see Figure 6). Hands-on, place-based science projects entered in this annual event are now part of our culturally and environmentally responsive science curriculum. Teachers now use FOSS [Full Option Science System] kits in Grades K-8 and provide higher levels of mathematics and science instruction to meet the needs of our students. Oral histories are also being documented and used as another perspective on topics like global warming and economic trends. Use of the Alutiiq language has increased as students speak to elders about scientific concepts, place names, and beliefs about our environment. District technologies such as two-way videoconferencing capabilities support teaching lessons to multiple sites that have only a few Native-speaking students.



Figure 6. Students display their project at an annual science fair.

Additional impact, capacity, and lasting legacy from the Alaska RSI include the following:

- Purchased FOSS science kits for Grades K-8
- Developed distance-delivery courses for high school math and science
- Integrated Traditional Ecological Knowledge (TEK) in science classroom study
- Purchased hands-on math program for K-5
- Increased Elder/community involvement in the schools
- Developed culturally and environmentally relevant teaching materials
- Adopted “best practices” model for Advisory School Board operations in village sites

New capacity created by establishing the Native and Rural Education Program enabled the school district to

- Increase locally relevant staff development opportunities
- Create teacher leaders and program development in collaboration with administrators and community leaders
- Have a liaison for the district with community organizations, particularly with the Native community
- Improve support for transitioning transient students, increasing standards of curriculum delivery, and retaining teachers
- Increase opportunities for professional collaboration
- Align district curriculum with cultural standards

In my region, the Native Educators of the Alutiiq Region (NEAR) continue to focus on development of a culturally and environmentally relevant curriculum. NEAR welcomes and

supports new teachers in the region and communities. NEAR also supports Native students in their academic pursuits, particularly future educational professionals who may choose to return to their homes to live and teach. NEAR is a fantastic resource, connecting schools with elders and others in Native communities to take part in the development of the Alaska Standards for Culturally Relevant Schools (and other AKRSI-produced standards and booklets). These standards and materials are now a part of Alaska State Standards of Education. NEAR also provides professional development activities for teachers and supports students in developing projects for the Rural Schools Science Fair.

As AKRSI made its way throughout Alaska, and specifically my region, people began to see how the indigenous knowledge system could complement traditionally taught Western science concepts. Professional educators could see through project and curriculum examples what that meant and how it would enhance not only the educator’s success in reaching students, but how it increased the teacher’s satisfaction in doing the job while also increasing student performance and confidence.

Teachers could easily make sense of and immediately use the AKRSI-produced materials. Examples of the materials used by educators throughout Alaska include these:

- *The Handbook for Culturally Responsive Science Curriculum* (see Figure 7)
- *Alaska Science: Camps, Fairs, and Experiments* (see Figure 8)
- *High School Math Problems from Alaska by Alaskan Teachers for Alaskan Students* (see Figure 9)
- *Estimating, Measuring, Counting, and Grouping: Adapting Yupik Elders’ Knowledge*

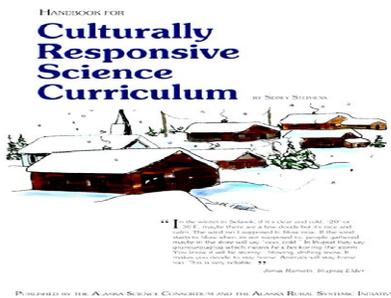


Figure 7. AKRSI curriculum product.

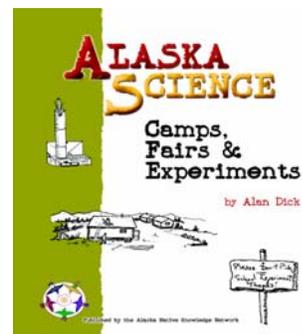


Figure 8. AKRSI science guide.

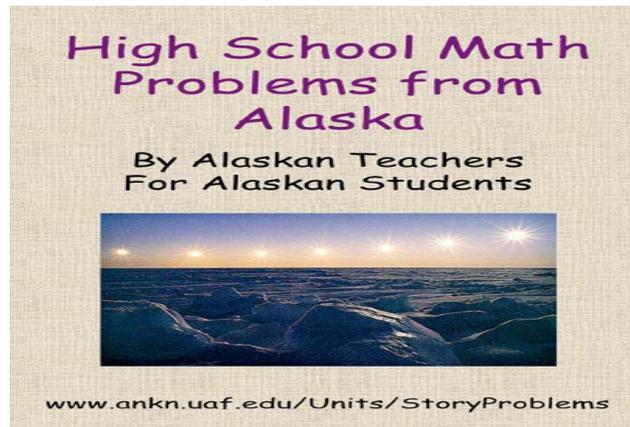


Figure 9. AKRSI teacher resource.

Leveraging the Legacy

A lasting capacity was built by the AKRSI in a multitude of public and private, Native and non-Native organizations. Greater contact and commitment inspired through the communication and mutual confidence of project participants resulted in numerous products. For example, an enriched partnership between the school district and the Alutiiq Museum and Archaeological Repository resulted in the following:

- Alutiiq Language Revitalization program
- Community Archaeological program, which provides science instruction and high school and/or college credit to participating students
- Annual Rural Schools Art Show
- Archaeological site stewardship program
- Traveling Traditions museum outreach to the schools

We are now fortunate to team up with the Alutiiq Museum to provide unique professional development opportunities, student learning activities, and curricula. The increased collaboration and communication encourages sharing of resources and funding opportunities.

Though the Kodiak School District and the Kodiak College campus of the University of Alaska at Anchorage has always had a great working relationship, the AKRSI project provided the time and opportunity to launch new ideas regarding outreach, course delivery, academic support, and course selection. Kodiak College now provides college credit to Alutiiq Language apprentices and facility use for workshops and gatherings to develop language curriculum. The district and college have worked together to provide a weeklong intensive course on culturally responsive teaching and other unique summertime courses and opportunities, such as the Dig Afognak Culture Camp.

We now work with the college to provide two-way video conference courses for teachers and paraprofessionals, Illuminate Web courses, and on-site “intensives” for our rural student

body. The college has provided on-site rural advisors who assist college-level community members and also visit with high school students about dual-credit opportunities and postsecondary options. Our local campus has also provided Learning Center tutors, whose work has proven to increase student performance.

Other lasting partnerships and capacity have grown from the AKRSI legacy, including those with Tribal organizations. The state-adopted Standards for Culturally Responsive Schools has reinforced what many tribal people have worked for: a curriculum that better reflected the place in which we live. The standards have become a powerful tool used by tribal organizations and outside agencies to develop place-based educational materials.

District capacity has increased to develop and use these materials in schools. Materials are used in supporting workshops, providing professional development opportunities, and implementing place-based curricula. We have collaborated with a growing number of organizations in seeking grants and implementing projects with local relevance and global impact. The district has seen an increase in attendance from community organizations at education meetings. Funds from nonprofits and Tribes are now being spent with more focus on student achievement in schools. Tribes are also providing counselors and tutors in the schools to help increase student performance and graduation rates. Now, communication between schools and these organizations is not only to inform of what is needed, but rather to complement each other on how we are affecting students in a positive way every day!

So, through the collaboration created by the Alaska Rural Systemic Initiative, there are lessons learned and new capacities built as a lasting legacy. We are now

- Encouraging greater *community involvement*
- Holding ourselves *accountable* to the whole community
- Solving community issues together—striving for *consensus*
- Viewing *organizations as tools* for whole community
- Looking at issues from *multiple angles* instead of relying on the perceptions of a small group
- Acknowledging our internal *diversity* and using it as a strength
- *Sharing resources* to accomplish common goals
- *Supporting each other* as advocates for issues that affect the community

Quyanaasinaq! Thank you very much for your time and for this opportunity to share!

Fort Washakie Charter High School and Wind River RSI

Gene Meier
 Superintendent, Fort Washakie Charter High School
 Fort Washakie, Wyoming

Discussing the impact that the Wind River Rural Systemic Initiative (WRRSI) has had on our rural, public, private, and government-run schools (BIA) is an easy task for me because our district utilizes what we have learned from the RSI program.

School Districts Served

My focus is on the Wind River Rural Systemic Initiative. Today it continues as the Math/Science Partnership. The WRRSI served the Eastern Shoshone and Northern Arapaho nations. There were five school districts on the reservation considered “site” schools. There were two school districts off the reservation considered “focal” schools. Each site school provided representatives that made up the Advisory Council. Table 3 shows selected characteristics for the five school districts served by the WRRSI as well as the two focal sites.

Table 3. Wind River School District Characteristics

School District	School Type	Grade Levels	No. of STEM Teachers/Total # of Staff	No. of Students	Ethnicity
Arapaho	Public Charter	K-8 9-12	3/79	286	100% Native American
Fort Washakie	Public Charter	K-8 9-12	3/87	303	90% Native American
St. Stephens	BIA	K-12	4/61	230	100% Native American
Wind River	Public	K-12	4/81	395	30% Native American
Wyoming Indian	Public	K-12	5/178	635	100% Native American
Lander*	Public	K-12	5/287	1877	25% Native American
Riverton*	Public	K-12	6/450	2471	35% Native American

*Lander and Riverton are focal schools.

The WRRSI school districts served predominately Native American populations, with few exceptions. In all site schools, 80-90% of the student population were in the free or reduced-price lunch program; in focal schools, only 25-30% were in the program. In all site schools, 95% of the students were considered “at-risk,” and 100% of the students were considered to have

limited English Proficiency (LEP) in all of the site schools except Wind River, where 25% of the students were considered LEP.

What NSF Funding Enabled

Funded by the National Science Foundation, the Wind River RSI enabled districts to establish standards for mathematics and science. Standards are now reflected in policy statements. We really did not know much about standards before the WRRSI. Staff became proficient in standards and assessment, and all staff became highly qualified as defined by the federal No Child Left Behind Act. We have implemented assessments aligned with these new standards in mathematics but not in science.

A Council of Superintendents was formed that met quarterly to discuss science, technology, engineering, and mathematics (STEM) issues within schools, address policy issues, and reaffirm the importance of professional development. Talking Circles were used to discuss common issues. One issue was the high attrition rate among school districts. For example, one school reported a 57% transient rate. This is common. Our families are all connected, so moving from one school district to another is common.

Advisory councils were formed. Superintendents come and go, and we struggle to get culturally attuned leaders and teachers in school districts. No superintendent is Native American. Only about 35% of the teachers are Native American. The advisory councils were formed, in part, to represent the importance of culture, and included 12 members with responsibilities such as disseminating materials and information to districts, meeting weekly with superintendents and principals, and proposing to WRRSI activities that promoted STEM within their districts. Our goals addressed the following areas of concern:

- Professional development
- Summer school activities
- After-school activities
- Summer teacher institutes
- Cultural curriculum development
- Inclusion of *all* stakeholders
- National conferences and presentations
- Career-related activities for students

The career-related activities became very important. If students (especially high school students) couldn't see an end product or understand what they were working toward, they developed little interest in mathematics or science. Fish and wildlife services are one way to connect student learning activities to science-related careers. We know in the future there will be many issues on the reservation related to protecting natural resources such as water and oil. As a sovereign nation, it is our responsibility to protect natural resources on tribal lands.

Partners

We have a lot of partners in the WRRSI. When we first started, we saw the need for a bottom-up reform effort. We also saw the need for top-down reforms and hoped we would meet somewhere in the middle. So we brought in superintendents and the advisory council. One of the important elements also was listening to the community, elders, tribal leaders, and tribal government. They all had an interest in what we were doing in schools.

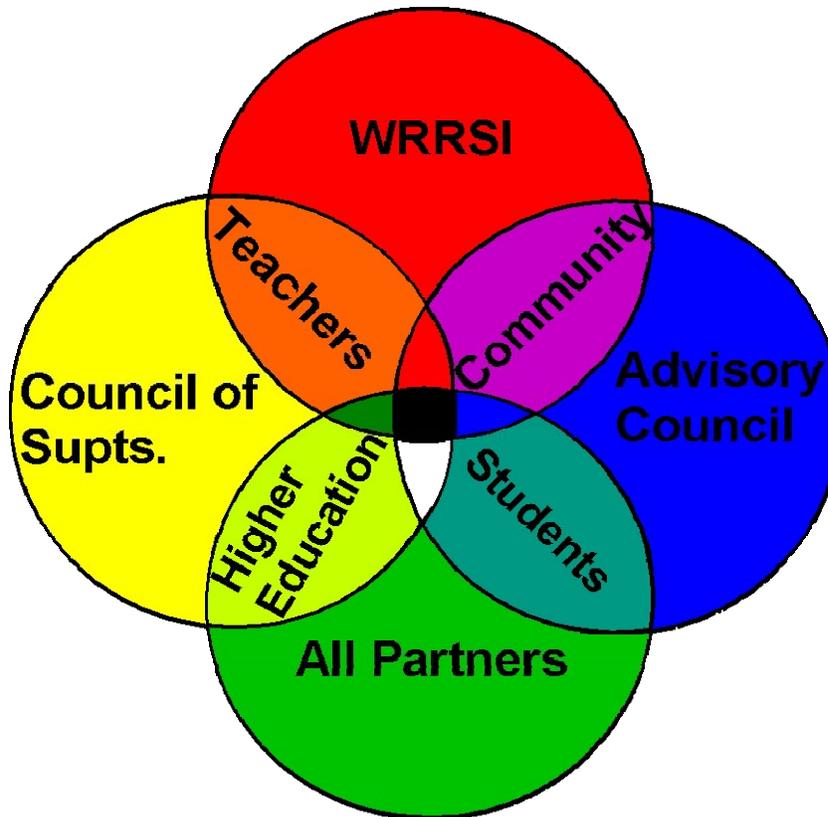


Figure 10. Wind River Rural Systemic Initiative partners in education.

Examples of community partners included the following:

- Eastern Shoshone Tribal Council
- Northern Arapaho Tribal Council
- Wind River Tribal College
- Wyoming Education Network
- Elders
- Parents
- Native Visions
- Students
- Teachers
- Wind River Alliance

Our partners were those who had a vested interest in seeing our children succeed in STEM reform. Higher education was important because it traditionally has been difficult getting high-quality professional development in the rural areas. So we partnered with higher education, including our tribal colleges.

We also worked with business and industry to effectuate change, particularly with those who eventually might hire the students. Here are some examples of business and industry partners:

- Texas Instruments
- Wyoming Department of Education
- Teton Science School
- Wyoming Outdoor Council
- Wyoming Game and Fish
- National Outdoor Leadership School
- The Nature Conservancy
- BLM
- Tribal H2O Engineers
- Yellowstone National Park
- U.S. Fish and Wildlife Services
- Wyoming Historical Society

Standards-Based Curriculum

The WRRSI encouraged school districts to implement standards-based curriculum and advanced placement courses. Example curricula included these:

- Full Options Science System
- Cambridge Physics Outlet
- Everyday Mathematics
- Connected Mathematics
- Bridges Mathematics
- Texas Instruments

Of particular importance was the Native Ways of Knowing (NWOK) document, which we adopted from the Alaska RSI and integrated into the standards-based curriculum. We had 25 teachers and administrators in a camp meeting with elders for a week to learn how to incorporate culture into contemporary mathematics and science. We then took a couple of years developing the curriculum. We continue to offer summer institutes for teachers on this topic.

Offering high-quality professional development was essential. Here are some examples of professional development offerings:

- Center for the Advancement of Mathematics and Education (CAMSE) Site Visits for National Science Education Standards (NSES) and National Council of Teachers of Mathematics (NCTM) Curricular Adoptions
- Research-Based Mathematics Courses
- Middle Level Mathematics Initiatives (MLMI) and UW Master Teacher Program
- Teachers Teaching with Technology in Jackson
- Wind River Tribal College and Paraprofessional Courses
- Thinking and Reasoning in the Classroom
- SMART boards
- Native Ways of Knowing
- Bison Ecology Week
- Outdoor Classroom
- Online Pedagogy
- Teaching Advanced Placement Online

We also learned from our experiences in the WRRSI that the way many schools traditionally operated was not meeting the needs of Native American students. So we started our own virtual high school—the only one in Wyoming that is a virtual public high school. We can now provide Advanced Placement courses for students, and we offer online advanced training for teachers in mathematics and science programs. We also partner with more than 20 school districts in the state to provide online training for at-risk students.

Clearly, we learned that professional development was important, and we continued offering professional development activities such as these:

- Youth Alliance
- Lights On
- Native Waters
- Wyoming Heritage Project
- First Interstate Mini-Bank
- National Indian Education Association
- IBM Conference
- GEAR-UP
- Tribal Culture Meetings
- Elders Gathering
- NSTA Conferences
- NCTM Conferences
- Science Fairs
- Sustainability Workshops
- Eagle Week

We also conducted a native science center. Highlights included

- Winter Ecology Project (T.I.)
- Eagle Week

- Bison Ecology Week
- Minto Camp
- Native Ways of Knowing
- T3 in Jackson

Capacity Building and Policy Changes

Numerous policy changes and actions were instituted reservation-wide to build capacity and support implementation of standards-based curricula and professional development. These included

- Student Transfer Policy
- Student Tracking Policy
- Teacher Calendar Increases
- Common Calendar for WRRSI Training Days
- 65 Hours of College for Teaching Aides
- Native American Indian History Requirement for *all* Staff
- Tribal Education Liaison in State Department of Education

Capacity building policies implemented at the local school district level included:

- School Improvement Plan (SIP) Action Plans
- Adoption of FOSS kits
- Adoption of Everyday Mathematics
- Adoption of Connected Mathematics
- RSI Drivers as a priority of SIP Action Plans
- WyCAS assessment
- Policy statements for research-based STEM
- Teacher recognition

Additional capacity for change was created through a philosophy of resource convergence. We believed that stakeholders must include business, industry, community, elders, and teaching professionals who had a vested interest in seeing all children succeed. Also, we believed that all stakeholders must be empowered to help change the way people think about STEM reform. We believe this capacity building is positively impacting student achievement, as shown in Figures 11 and 12.

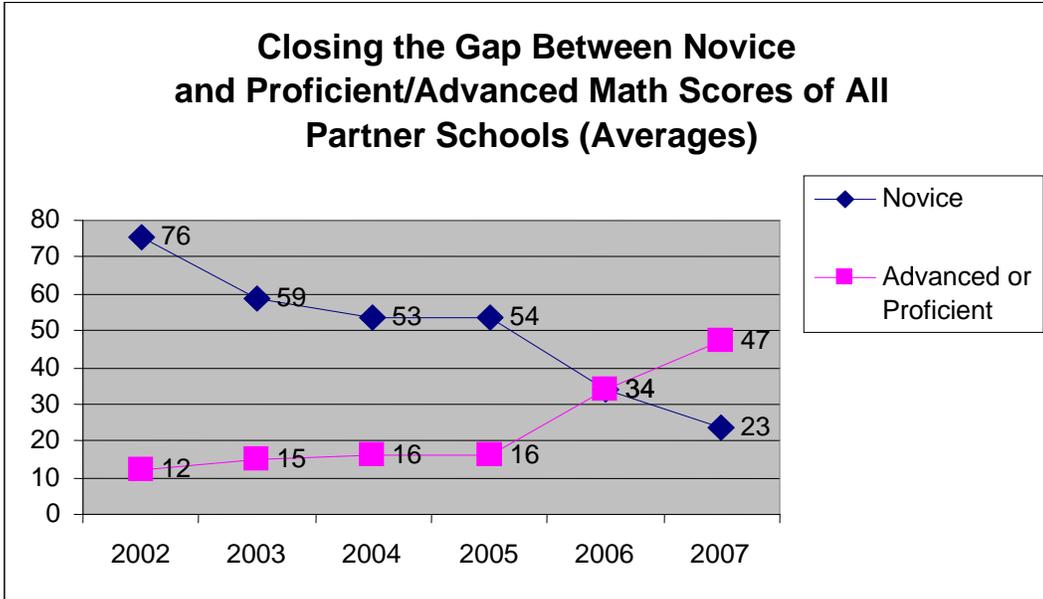


Figure 11. Closing the mathematics achievement gap in WRRSI districts.

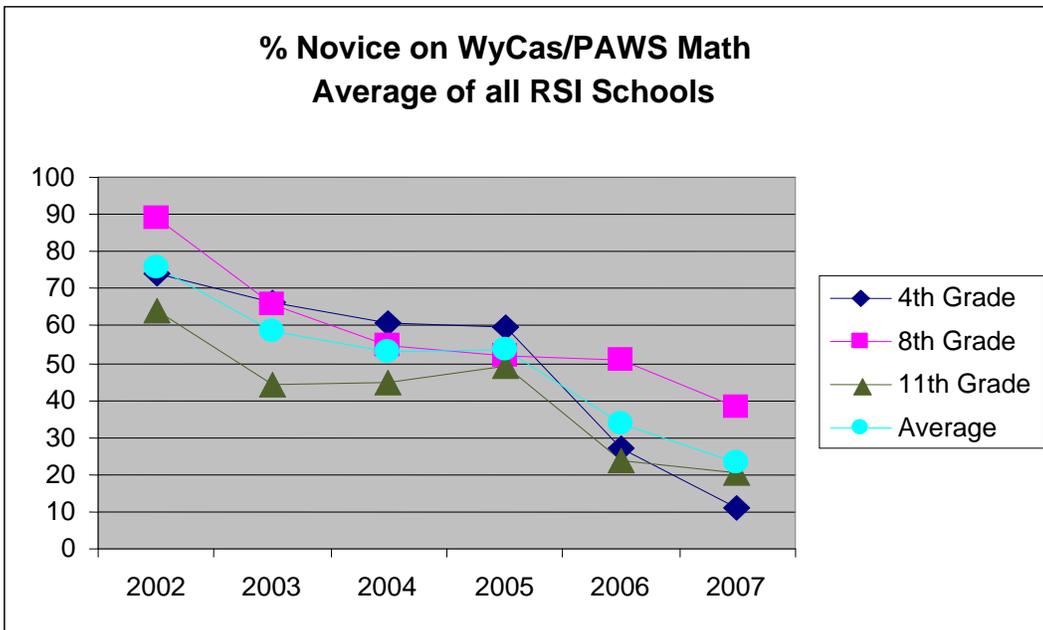


Figure 12. Reductions in percentages of students scoring at the Novice level in WRRSI districts, by grade level.

Elements in the WRRSI model that seem particularly valuable in helping build capacity for change included

- NWOK Summer Camp
- Mini-NWOK Seasonal Camp
- Lesson Study (PD)

- Advisory Council
- Texas Instruments Instructional Materials Development Winter Ecology Project
- Fiscal Policies
 - Reimbursement to districts for supplies/expenses
 - Districts supply school-level staffing
 - Advisory Council Stipends

Leveraging WRRSI Impact

The WRRSI program created an *understanding of how change occurs* and how to effectuate change in rural reservation communities. This has been one of the most truly dynamic, sustainable impacts that we have seen. Walking around in our communities are true change agents who, after working with the RSI program for 10 years, are now using the same philosophies and ideologies of systemic reform in their own professions.

The RSI program has also given districts the ability to *leverage resources* in order to bring students the best options and choices in education. Wyoming is a state of choice. Statements about choice by proponents of NCLB sometimes amount to little more than lip service to being in compliance with the federal law. Yet, come to Wyoming, and one will quickly see that there is no choice for parents and students, unless they want to drive 100 miles one way to attend another school district. So instead, the RSI program was able to bring excellent mathematics and science curricula to schools, provide outstanding professional development to teachers, establish an understanding of alternative assessments, and bring business and industry to the table to provide career choices for students.

The RSI program was able to work with local colleges and universities to create *the dialogue* in mathematics and science reform that prepared teachers in high-quality pedagogy. In the WRRSI case, this preparation included helping teachers understand the importance of Native American pedagogies and methodologies. As a result, we were able to bring communities of educators from around the state together to participate in Native Ways of Knowing seminars and institutes. These educators worked directly with national leaders in Native American education, tribal elders, business and industry partners, and state officials to acquire important knowledge for implementation in their school districts.

Having an RSI program gave WRRSI partner schools *credibility* and enabled them to become experts in STEM reform issues. And you know what the old E.F. Hutton commercial says about credibility: “When E.F. Hutton talks, people listen.” Credibility established by schools and personnel in the RSI is still going. Today, we have become a math and science partner with the University of Wyoming. We work with local businesses and industries that have a vested interest in seeing students succeed in mathematics and science. We participate in national panels, present at national forums, and disseminate best practices to teachers across the reservation.

We now have a *contingency of experts* in curriculum, assessment, standards, technology, institutional dynamics, and policy making. This is because the RSI did not focus only on one group or one area. It was truly a program that allowed for systemic change to happen. With the

guidance of the NSF and the experts from around the country who also ran RSI programs, we were able to bring a national dialogue on STEM reform to our communities. It brought our small school districts to the apex of best practices from around the nation.

There's still a lot of work to do. We are not there yet in utilizing everything that we learned from the RSI program, but my district continues to leverage the capacity created by the RSI in the following five ways:

1. We review and adopt policies that support changes needed in mathematics and science.
2. We seek out partners in the community (and beyond) who want to help students succeed.
3. We collaborate with colleges and universities in preparing effective teachers in mathematics and science.
4. We implement nationally recognized best practices in STEM.
5. We continue to use experts made available by the RSI program to offer high-quality professional development for teachers.

Resource Collaboratives and the Appalachian Rural Systemic Initiative

Kim Zeidler

Director, University of Kentucky Resource Collaborative
(P-12 Math and Science Outreach Unit of the Partnership Institute for
Math and Science Education Reform)
Lexington, Kentucky

The Appalachian Rural Systemic Initiative (ARSI) included six states: Kentucky, North Carolina, Ohio, Tennessee, Virginia, and West Virginia. ARSI Resource Collaboratives were strategically located at institutions of higher education in five of these states. Each collaborative had a coordinator who worked with the ARSI Principal Investigator (PI) and Project Director to spearhead ARSI's reform efforts. The higher education institutions provided office space for the collaborative and assisted with fiscal management. The collaboratives were expected to establish relationships with the institution's faculty and with faculty at other institutions in the region. These relationships later proved invaluable when ARSI sought funding from local districts to conduct outreach support, when applying for grants such as state Math and Science Partnership funds, and for sustaining the work of the resource collaboratives.

The Role of the Resource Collaboratives

As "field agents," the collaboratives facilitated local planning and decision making. They also helped rural school districts eliminate barriers to improvement efforts in mathematics and science. For example, most of the rural districts in the ARSI region lacked a local mathematics or science specialist who could provide leadership and expertise to improve student achievement. This lack of expertise resulted in several barriers for rural districts. One such barrier was the *lack of time*. Rural districts did not have sufficient time to identify high-quality resources to help with local improvement efforts. A second barrier was the *lack of capacity*. In most cases, the district instructional supervisors or professional development coordinators were responsible for providing support to all content areas across grades K-12. They also were routinely assigned additional responsibilities at the district level. Because of competing priorities, district employees could provide only minimal attention to any one content area.

The ARSI project, with support from the resource collaboratives, addressed these barriers in several ways. The collaboratives first worked with local districts to identify an educator who would serve as a Teacher Partner (TP). Many TPs were initially released from 50% of their teaching responsibilities. Many of the TPs were good classroom teachers, but they needed training and support in their new roles. Therefore, the resource collaboratives designed and facilitated regular meetings for TPs to help them develop expertise in curriculum, instruction, assessment, content, and leadership.

Tps worked in partnership with the collaboratives to develop specific strategies for adapting instructional materials, aligning local curricula to national and state standards, and analyzing student needs based on mathematics and science assessment results. TPs, in turn, broadened ARSI's effectiveness by working locally with teachers and administrators on mathematics and science program improvement issues that were identified through examination

of data. Most TPs reported that time was the greatest barrier to improving student achievement in mathematics and science.

Each TP worked with his or her respective collaborative coordinator to identify ways to better manage time. Many of the TPs worked with local school district administration to form professional learning communities that the TP facilitated, often by using resources received and strategies modeled at their regular meetings. Districts and schools began to see the value of having a TP, and many worked to release them full-time from their teaching responsibilities by the end of the fifth year of the ARSI project.

Therefore, the role of the collaborative was to partner with educators—teachers, administrators, schools, districts, and communities—to enhance mathematics and science instruction and to improve access to resources. Resource collaboratives used national, state, and local mathematics and science experts to provide TPs and district administrators with customized professional development opportunities. These experiences helped to develop the leadership capacity and infrastructure necessary to improve local mathematics and science programs.

Challenges and Successes

One major challenge in establishing the resource collaborative as a valuable technical assistance provider was the time required to develop relationships with each of the schools and districts in the region. Another challenge was the limited staff at each collaborative. Initially, each was composed of a coordinator (often with mathematics and/or science expertise) and a staff assistant. Eventually a curriculum specialist was added. The number of districts assigned to each resource collaborative was in some cases a barrier because each district and school had its own unique needs; therefore, the support provided from district to district needed to differ.

Often, the districts and their teacher partners were unsure of where to focus their attention to improve the quality of the mathematics and/or science program. Initially, many of the teacher partners used a door-to-door approach to identify changes needed in mathematics and science programs and teaching. To help districts and schools, the Program Improvement Review (PIR) was introduced. The PIR provided a mechanism to examine a school's mathematics and science program. The result was a report with recommendations on where to focus improvement efforts. The resource collaborative then helped the districts and schools design a plan based on the PIR. The collaborative's personnel brokered services to support each school's diverse needs and sought additional funds (federal and state) to provide training and support opportunities. A final challenge in the initial stages of the project was the turnover of TPs. In those districts affected, the turnover caused the program improvement effort to lose momentum for a period of time.

The success of the ARSI project was enhanced by the receipt of Phase II NSF funding. The funding allowed resource collaboratives to focus on the recommendations identified as part of the PIR process and to further cement the relationship with schools and districts. Districts and schools recognized the value of the TPs because they began to see improvement in test scores. As a result, many districts added additional TPs. In an effort to reach the critical mass of teachers who normally did not receive specific training and support in mathematics or science, most of the TPs began to facilitate trainings with a local cadre of teachers. Cadre meetings were often

held during the school day, and the districts funded the released time for teachers to participate. Resource collaboratives also worked with districts to sustain the teacher partners after the project ended.

University of Kentucky Resource Collaborative Success

The remainder of the successes I will discuss are based on my experiences at the University of Kentucky (UK) Resource Collaborative. By the end of the ARSI project, 20 of the TPs were released full-time by their districts, using local funds. Most TPs facilitated local cadre professional development meetings. Moreover, other districts in Kentucky began to take notice of the quality training that the TPs were receiving. The state department of education's mathematics and science consultants recognized the training as quality and began to attend as part of their own professional growth.

The UK Resource Collaborative received a supplemental leadership grant from NSF to expand the role and training of the TPs. Six TPs (five from Kentucky and one from Tennessee) were selected to participate in the Master Teacher Project. Master Teachers, also called Regional Teacher Partners (RTPs), received specialized training in curriculum, instruction, and assessment. They in turn trained the other TPs during their monthly meetings. Each RTP was also aligned with up to three schools that wanted to focus on improvement in mathematics and science.

This technical assistance model required the school to agree to release all of the teachers in that content area one day per month during the school year. The teachers also had to agree that they would meet for 3 days during the summer. The school paid for the released time of the teachers and provided a stipend during the summer. The school also had to agree to form a leadership team that comprised the building-level principal, a district office representative, two classroom content teachers, and one special education teacher. The team was to meet directly following the release day. The purpose of the team was to examine barriers that prevented program improvement and to provide support and accountability.

The leadership team meetings were facilitated by the RTP. In order for a school to be considered for team support, it had to agree to implement the improvement model for a minimum of 2 to 3 years. This allowed a critical mass of teachers to be impacted and gave the content-area teachers time to work in partnership toward program improvement. Table 4 provides an example of the achievement results in one school that committed to the model.

At the end of the ARSI project, the TPs and RTPs, as well as the districts they supported, were beginning to see gains in student achievement. TPs and RTPs expressed considerable interest in continuing the monthly meetings. Moreover, other districts not eligible for ARSI were also interested in participating in the meetings.

Table 4. Mathematics and Science Academic Index Scores, McKinney County, LC Elementary, Kentucky

Mathematics Academic Index Scores				Science Academic Index Scores			
Year	McKinney County	LC Elementary	Kentucky	Year	McKinney County	LC Elementary	Kentucky
2000	40	52	61	2000	53	69	73
2001	47	56	64	2001	74	71	77
2002	67	62	66	2002	80	74	77
2003	62	59	68	2003	77	80	82
2004	61	72	77	2004	81	84	88
2005	83	65	74	2005	100	86	88
2006	99	72	84	2006	102	85	89

For example, 13 Kentucky school districts have been actively involved with the ARSI project during the previous 5 years. All participating school districts have increased their science achievement scores, and consequently, their science academic index scores. Increases in the science achievement index range from a low of 3% to a high of 48%, with a mean increase of 27% for the 13 districts at the elementary level, 26% at the middle school level, and 20% at the high school level. Figure 13 illustrates gains in science academic index scores.

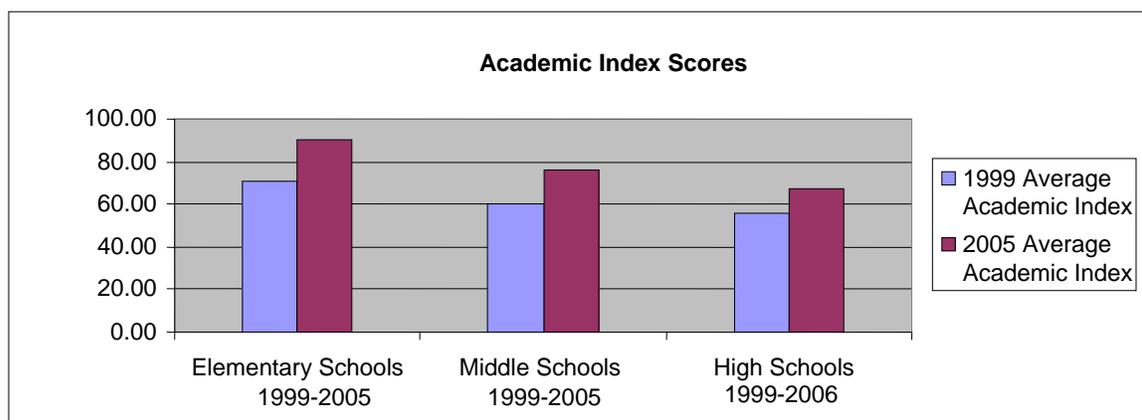


Figure 13. Science achievement for ARSI districts in the UK Resource Collaborative.

Mathematics achievement has also increased dramatically in ARSI participating school districts served by the UK Resource Collaborative (see Figure 14). Mathematics scores at the elementary level increased by 44% overall, and four districts recorded index increases greater than 50%. For middle schools, district-level increases ranged from a low of 8% to a high of 107% (in that instance, the district more than doubled its academic index in mathematics, going from just under 40% to more than 82%). Although high school index gains were not as pronounced, all ARSI districts improved, averaging a 20% increase in the mathematics index score.

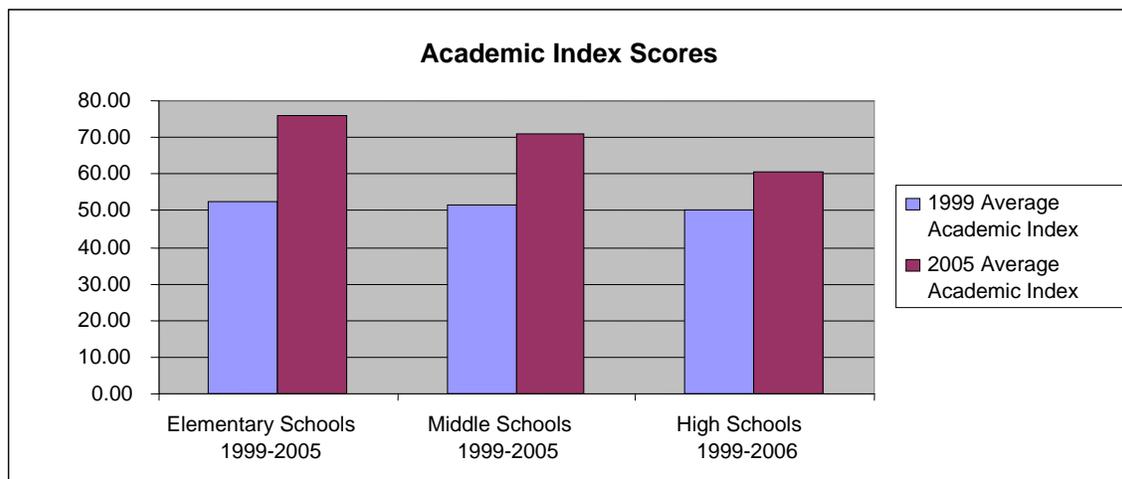


Figure 14. Mathematics Achievement for ARSI Districts in the UK Resource Collaborative.

Testimonials from TPs and others became common as improvement initiatives showed results:

Before ARSI came into the picture, our school had struggled with the initiatives of the Kentucky Education Reform Act and had been unable to meet the goals set by the state.... It has been one of the most rewarding experiences anyone could hope for in the education profession to be a part of the transformation of a school that has enjoyed such improvements that their state test scores have nearly doubled in the past 5 years. We are so proud, in 2005, to have exceeded our state goals for 2010.

Gloria Davis, Lincoln County, Kentucky

To sustain the monthly meetings that helped achieve the increase in student achievement, the UK Collaborative worked with the Kentucky Department of Education to create a statewide initiative called the Math and Science Leadership Support Networks. All districts across Kentucky were eligible to send a leader to a network for a fee. During the first year, the plan was to accept 50 mathematics and 50 science teachers to each of the networks. When the registration period was over, 85 mathematics and 55 science leaders had registered to participate. The networks met monthly for a full day. A 3-day summer event also was held.

In Year 2, the networks expanded network meeting locations to two for mathematics and two for science. The Kentucky Department of Education provided some funding to support the efforts of the networks. Since then, the networks have continued to grow, and the leaders who are being developed are seeing results in their local districts.

The Regional Teacher Partners facilitate the statewide networks, which focus on curriculum, instruction, assessment, and leadership development. The growing demand for RTPs to lead local cadres in districts across the state is another success of the UK Resource Collaborative. All five of the Kentucky RTPs continue to work with cadres in districts across the state to improve mathematics and science education.

Teacher testimonials provide evidence of how the networks benefit teachers as a high-quality professional development experience:

I can honestly tell you that the sustained professional development opportunities offered by this network have made, and continue to make, by far, the most impact on me as a teacher.... Involvement in the network has greatly expanded my knowledge of science content. For me, as well as for many science teachers, lack of any formal training in science left me with no choice but to rely on a science textbook to drive my instruction. But through participation in this network, I have learned how (and have also been given the resources by this network) to deconstruct the National Science Standards. This has allowed me to know exactly what content and concepts need to be taught to my students and has made me aware of the misconceptions I held about various science concepts.... There is no doubt in my mind that participation in this network is directly proportional to not only my students' interest in science (due to a more engaging curriculum), but also to their performance on the CATS test. Since I began attending these professional developments, my students' scores on the CATS have steadily increased each year. Currently my science index is at 107.

Rachel Adams, Fourth-Grade Science and Language Arts
Teacher, Perry County, Kentucky

Sustaining the UK Resource Collaborative

The UK Resource Collaborative has been sustained through the University of Kentucky's formation of the Partnership Institute for Math and Science Education Reform (PIMSER). What began as an ARSI resource collaborative is now called the P-12 Mathematics and Science Outreach Unit of PIMSER. The president of the university wants the outreach to have a statewide impact. This is occurring through the work of the networks and the outreach work being facilitated by the RTPs. Approximately 110 of Kentucky's 120 school districts have received support for mathematics and science improvement through the PIMSER P-12 Outreach Office. The RTPs have been essential to the success of the outreach assistance provided by the unit.

The staff at the unit also has grown, and funding for the unit comes from the University of Kentucky and through grants. From 2000 to 2008, \$4.8 million in grant monies have been generated to support the unit. The office has received \$2 million in grant funding since moving under PIMSER as the P-12 Mathematics and Science Outreach Unit. In FY 2007-2008, the unit was awarded \$698,456.

Future Implications

Local leadership that was developed through the work of the ARSI resource collaboratives continues to reside in the rural districts. Many of the TPs have been assigned additional leadership responsibilities. The districts are more aware of high-quality resources, including curriculum resources (e.g., Connected Math, Investigations, Math Trail Blazers) and how to locate them to support their continued improvement efforts. Many of the schools and

districts now adopt these research-based materials to help teachers provide high-quality mathematics and science instruction. In addition, schools and districts in the region have continued to build their capacity for improvement by being good consumers of opportunities (such as the Appalachian Math and Science Partnership, a comprehensive MSP funded by the NSF) that will continue to move mathematics and science programs forward.

We know from research that if student achievement is to improve, teacher practice must improve. Teachers need access to information that will help them design and deliver high-quality mathematics and science instruction for students. The resource collaborative can help school districts identify resources and mechanisms that will allow classroom teachers time to work as a professional learning community, thus improving their practice and, ultimately, student achievement.

The resource collaborative can also help leverage ARSI-developed leadership by continuing to inform and encourage teacher leaders and administrators from the districts to be involved on state-level committees that influence educational decisions and policies. Among these committees are the team that works to design the state assessment, the team that works to revise and have input on the design of state standards, and various textbook selection committees. The rural voice needs to be part of these committees so that local expertise will continue to reside in Appalachia, and so that the issue of isolation can be addressed.

Lastly, leveraging the expertise developed in local school districts to continue to apply for federal and state funding (e.g., Math and Science Partnerships) is another way the resource collaboratives started by ARSI can assist rural school districts in improving mathematics and science education.

Lyford Consolidated Independent School District and the Texas RSI

Irma Mondragon
Administrator for Curriculum and Instruction
Lyford Consolidated Independent School District
Lyford, Texas

Lyford Consolidated Independent School District (CISD), the school district where I have worked for 34 years, is 50 miles from the southern tip of Texas. I have lived in Lyford all my life, except for the years I attended college. I am so blessed that Lyford is my home and place of employment.

My passion is ensuring that children in a poor rural district such as Lyford can achieve and receive the same quality education as children throughout Texas and the United States. My parents instilled that belief in my siblings and myself. It was always understood that education was a non-negotiable. Service to others was a recurrent theme in our home. My parents' passion to this day is education and patriotism. It is not uncommon to hear our parents express congratulations to grandchildren and others who achieve milestones in education.

My family is a strong advocate of getting an education to have a better life. My husband, Carlos, is from a large metropolitan city, Corpus Christi, Texas, and he wanted our children to grow up in a small town. Carlos has a Masters of Business Administration. I have a master's degree as well as educational certifications. Our oldest daughter has a marketing degree. Our second child has an early childhood degree, a master's degree, and is presently pursuing a doctoral degree in educational administration and policy studies. Our son received an aviation mechanics degree from a state technical college.

School District/School Background Information

Lyford CISD is a large district that covers approximately 300 square miles. Its boundaries extend into three counties: Hidalgo, Cameron, and Willacy. The district encompasses the city of Lyford, with a population of 1,979. It is the only incorporated city. The towns of Sebastian and Santa Monica are considered colonias. There are six colonias within the boundaries of Lyford CISD: Bansell and Ellis, Lyford South, Santa Monica, Sebastian, Willamar, and Zapata Ranch. Some of the other places that our students call home are Alazan, El Maneado, Tres Norias, and La Rosita. Some of the ranches where students live can be traced to original land grants from Spain.

The term *colonia* to some, and perhaps to the federal government, has a negative connotation. The federal definition of colonia has come to be known as residential areas along the U.S.-Mexican border that may lack basic water and sewer systems, electricity, paved roads, and safe and sanitary housing. A colonia, as it applies to my district, is an unincorporated area (without city services) where a large number of people live. Conditions are poor; however, areas are not slums. The citizenry are hard-working individuals who nevertheless meet poverty guidelines. Some colonias only recently have acquired potable water, sewage systems, and paved

roads. Many of our constituents live in these areas because land was affordable even though the services have not always been available.

Table 5. Demographics for Colonias in Lyford CISD

Colonia	Percentage of Population Living in Poverty	Percentage of Population With a High School Diploma
Bansell and Ellis	20.7	56.5
Lyford South	39.7	32.0
Santa Monica	30.8	54.2
Sebastian	22.6	40.6
Willamar	0	100.0
Zapata Ranch	0	42.6

The City of Lyford has a 27.7% poverty level. Approximately 46.9% of the population has only a high school diploma. In Willacy County, 35.8% of the population has less than a 9th-grade education; 15.4% of the population has a 10th to 12th-grade education but no high school diploma; and 24.4% of the population has only a high school diploma.

What does Lyford look like? There are two grocery stores, a gin, seven churches, and a navigation district office. Lyford CISD is the largest employer. Most community members work in neighboring cities. Students attend one of three campuses: Lyford Elementary (PK-5); Lyford Middle School (6-8); and Lyford High School (9-12). Because a high percentage of students qualify for free and reduced-price meals, the district provides breakfast and lunch to all of its students. Table 6 shows selected Texas Education Agency demographics for the CISD.

Table 6. Lyford CISD Demographics, 2007-2008

Special Populations	No. of Students	Percentage Enrolled
Title I, Part A Schoolwide	1,540	100
Limited English Proficient	194	12.60
Immigrant	22	1.43
Economically Disadvantaged	1,271	82.53
Migrant	153	9.94
Special Education	128	8.31
Ethnicity	No. of Students	Percentage Enrolled
Asian Pacific Island	2	.13
Black	4	.26
Hispanic	1,484	96.36
White	50	3.25
Economically Disadvantaged	No. of Students	Percentage Enrolled
Black	4	.26
Hispanic	1,246	80.91
White	21	1.36
Total	1,371	82.53

Lyford CISD's partnership began with the Texas Rural Systemic Initiative (TRSI) and later continued with the South Texas Rural Systemic Initiative (STRSI). The Rural Systemic Initiatives' impact on Lyford CISD has been extensive, long lasting, and focused on four areas: on-site assistance, staff development, empowerment, and curriculum.

On-Site Assistance

When Lyford CISD joined the TRSI, one of the first activities was for key personnel to attend the RSI conference in Austin, Texas, the state capital. Rob Wilson was the RSI specialist assigned to Lyford, and he told me on a Friday that he would visit Lyford the next week. I had my doubts that there would be visits to Lyford. But on Monday morning, Rob Wilson showed up, and on-site assistance continued throughout the partnership. This assistance was provided by specialists and TRSI directors Judy Kelley and Joann MacDonald.

On-site assistance was critical for increasing local capacity to improve mathematics and science education programs for students. Central office staff was limited to the superintendent and one curriculum and instruction administrator. Campus support was limited to the principal and assistant principal. Consequently, district personnel lacked the expertise and time to implement a major effort to improve mathematics and science teaching and learning without outside assistance.

Staff Development

The TRSI provided staff development, one-on-one, to key instructional personnel who were designated by the district as "teacher leaders." TRSI mathematics and science specialists met with teachers at each campus. It was not uncommon for other district and campus personnel to be included in meetings (i.e., the district's administrator for curriculum and instruction, the secondary mathematics and science facilitator, and campus principals). Principals and secondary math and science facilitators also attended sessions. TRSI specialists kept staff informed on numerous topics such as the Texas Essential Knowledge and Skills (TEKS), the curriculum framework for Texas schools, the Texas Assessment of Knowledge and Skills (TAKS). Some of the meetings were informational; professional development meetings held out of the district involved training as well.

In a poor district such as Lyford CISD, which has scarce funds available for staff development, travel outside the district is minimal. Funding by the TRSI enabled district teachers and administrators to participate in conferences throughout the state that offered high-quality science and mathematics staff development. Topics of focus were the 5E inquiry-based model and hands-on activities for teachers. Teachers often teach as they are taught, with the textbook as the primary resource. After attending the professional development sessions, however, teachers began to teach concepts using the 5E model. The 5E instructional model involves a specified sequence of phases: Engage, Explore, Explain, Elaborate, and Evaluate. Each phase has a particular purpose:

Engage: This phase initiates an activity. Its primary purpose is to introduce students to the concept, process, or skill that will be explored. The "engage" phase often involves

one or more of the following as well: making connections with prior instruction, anticipating upcoming tasks, identifying learning objectives, and/or clarifying students' current ideas and skills.

Explore: This phase provides students with a common base of experiences. These experiences may involve observations of events or objects, manipulations of materials, work with simulations, examinations or representations, viewing a video, or reading about a scientist's work.

Explain: Students in this phase are provided an opportunity to verbalize their understanding of experiences from the "explore" phase. Students describe concepts or skills in their own words. The teacher provides a formal definition or description.

Elaborate: Students in this phase are challenged to extend their understandings or skills and/or to practice them.

Evaluate: Students in this phase are encouraged to assess their skill levels, and the teacher is able to assess student progress on an assigned task.

The 5E model was demonstrated with lessons so that teachers began to see that each phase was connected to the concept. The model gave teachers permission to approach mathematics and science differently. It became a realization that science and mathematics could be fun, and that it was better to cover objectives with hands-on lessons. The 5E model provided students with in-depth opportunities for mastery, and teachers realized that less is more; it was better than superficially covering objectives.

Administrators were also able to attend staff development sessions provided by the Texas Education Agency (TEA) directors. The Mathematics Unit and the Science Unit in the TEA's Division of Curriculum provided direction and leadership in mathematics and science for Grades K-12. Updates also were provided regarding the mathematics and science segments of the Texas Assessment of Knowledge and Skills. Administrators were able to see the need for comprehensive needs assessment based on data. Mary Soto, Lyford CISD Testing and Media Coordinator, commented, "STRSI helped administrators realize that administrators should not be managers but data specialists."

Book studies also provided teachers and administrators with opportunities for learning. Book studies were presented to administrators as a source of staff development at the district and campus levels.

Empowerment

In 2005-2006, STRSI was asked for the names of districts to pilot the Region IV Gateways to Science fifth-grade curriculum. Lyford CISD brought educators from other districts and participated in the Region IV pilot. The TRSI nominated Lyford CISD, and Lyford CISD brought personnel from Raymondville ISD and Edcouch-Elsa ISD. The Gateways to Science program provided alignment to the TEKS, a scope and sequence, assessments aligned to the

TAKS, and hands-on instruction. Teachers were able to meet every 6 weeks with a staff development trainer. STRSI was an enabler. Improvement was immediate.

Lyford Elementary did not have laboratories, materials, or curricula. The campus administrators realized the need for laboratories and science equipment. Because the Gateways curriculum was detailed, and included resources and hands-on activities, teachers began to change their instructional practices. They began to see that students were mastering concepts, as evidenced in improved student performance. In 2008, fifth-grade science scores increased to 84% mastery.

On May 9, 2003, Lyford CISD hosted a science forum. Presenters at the forum included Dr. Joe Bordogna, National Science Foundation Deputy Director, and Dr. Leo Saavedra, Texas A&M University Vice-Chancellor for Academic Affairs. RSI personnel Dr. Judy Kelley, Dr. Joann McDonald, and Dr. Diana Marinez, along with Lyford teachers and administrators, discussed the impact of the RSI at Lyford CISD. The forum provided an opportunity for Lyford CISD teachers and administrators to convey how mathematics and science were being addressed.

Dr. Bordogna spoke of his beginnings, which were similar to those of our students, and indicated that one never knows what will become of those we are educating. The RSI-sponsored forum presented an opportunity that would not have been possible otherwise. District personnel left the meeting with feelings of personal value and accomplishment—and a commitment to providing the best education possible for students.

STRSI enabled two teachers to participate in the Leadership Fellows of America (LFA). What they learned through LFA continues to bear fruit:

Through Leadership Fellows of America, I was able to take on greater challenges that otherwise would have seemed out of my reach. Through knowledge gained from LFA, I was able to apply for a grant from Lowe's. Because of the grant, our parents and students built a garden that remains a site for learning and enjoyment.

Rachel Bray, Teacher, CISD

STRSI wrote a colonias grant that involved the parents of students from Santa Monica and Sebastian. Fifty families from the two colonias were targeted. Family Learning Events were conducted in the two colonias. Families were provided with take-home mathematics and science activities and related children's literature. The grant provided a director and two liaisons (promotoras).

Promotora is a Spanish word and is similar to the English word "promote." Promotoras are female community leaders who speak fluent Spanish and have the necessary skills and knowledge to connect colonias families to schools. The promotoras visited parents' homes in Sebastian and Santa Monica, and provided materials and assistance related to home science and mathematics projects.

As a method of program integration, the director and promotoras targeted parents participating in the Even Start program and the Migrant Program. A family literacy program, Even Start aims to help break the cycle of poverty and illiteracy by improving educational opportunities for low-income families through integrating early childhood education, parenting education, and adult education in a unified family-centered program. The Migrant Program required that districts address the early childhood/school readiness of migrant preschool children ages 3 to 5.

Both programs provided an excellent venue for the colonias. Family nights provided evening activities in Sebastian and Santa Monica. In the Santa Monica community, the only building available was the Santa Monica Catholic Church, so an agreement was signed with the Catholic Church. In Sebastian, activities were scheduled at the Martin Cavazos Literacy Center, the hub for community-focused activities.



Figure 15. Promotoras connected colonias families to School Family Nights.



Figure 16. Family Nights integrated mathematics and science literacy with reading through literature.

All trainings included culturally relevant library books, in English and Spanish, that were aligned to the concepts taught. Presenters included the RSI specialists, consultants hired through the RSI, the colonias grant director, and project director Dr. Joann McDonald.

Curriculum

In 1998 Texas required a curriculum shift. Lyford CISD did not have a curriculum in place, and the new standards were a major challenge for the district. Shirley Neely, former Texas Commissioner of Education, explained the shift from the Essential Elements to the Texas Essential Knowledge and Skills (TEKS):

Why are there learning standards for our children? Every day our world becomes more complex and demanding. To succeed beyond high school, students must be better prepared than at any time in the history of our state.

Shirley Neely, former Texas Commissioner of Education

TEKS became effective in all content areas on September 1, 1998. TEKS constitutes the curriculum framework for Texas schools.

The specificity of TEKS in mathematics and science were uncharted waters for our teachers. The K-8 science TEKS were divided into three parts: Introduction, Scientific Processes, and Scientific Concepts. All students in high school science courses had to conduct field and laboratory investigations, use scientific methods during investigations, and make informed decisions using critical thinking and problem-solving. All high school courses had to include a 40% laboratory and field requirement. Mathematics TEKS included three parts: (a) Introduction, (b) Knowledge and Skills, and (c) Student Expectations.

Elementary teachers, who were not always content specialists, found the TEKS curriculum framework difficult to implement. For them, mathematics and science were the most difficult to implement. Accountability was an added challenge. Science had not been tested in the previous curriculum, but a fifth-grade test had been added to the required state assessments. Teachers had a new test and a new curriculum that focused on student expectations. Moreover, the expectation was that teachers would teach the entire curriculum. Secondary teachers, not all of whom were content specialists, had different interpretations of student expectations and were challenged by the 40% lab requirement in science.

STRSI provided direction in mathematics and science for teacher leaders and administrators. TEKS were addressed at numerous meetings between teachers and specialists, including conferences and special meetings.

Personal Impact

My role in the RSI was as contact or go-between for the RSI and the Lyford CISD. Attendance at trainings, conferences, and special meetings provided an opportunity for me to keep abreast of changes, gain new knowledge about teaching the mathematics and science TEKS, learn how to align the curriculum with the state assessments, and gain other valuable insights. Teachers wanted to do a good job; however, teachers and administrators needed training. As a result, I continued to search for ways to assist teachers and assumed the role of facilitator for campus administrators and teachers. I have become a proponent of providing in-district training and using technology for staff development.

On a personal level, Dr. McDonald and Dr. Kelley cared about me as a person and valued who I was as a professional. My opinions were sought out as they planned staff development and projects. To this day, I feel they are my peers and my friends.

Sustainability

During the STRSI partnership, Lyford CISD Superintendent Jack Damron observed firsthand the need for on-site assistance. Jack Damron is now director of the Region One Educational Service Center (ESC), which serves several school districts. On-site assistance for school districts has evolved at Region One ESC. Lyford CISD contracts for and seeks out on-site assistance whenever possible. Staff development at the district and campus level is not uncommon. Staff development is not a hit-or-miss effort, but is based on a need. The Region One ESC, as well as contracted consultants, provides on-site staff development. Campuses seek out consultants that can model mathematics and science lessons; consultants teach students modeling strategies. Our students learn key concepts while their teachers learn key strategies.

The district now employs facilitators at each campus. The facilitators (curriculum specialists) assist campuses with curriculum. Because of the district's location and pay schedules, it has been difficult to employ personnel who have expertise in mathematics and science. However, facilitators are directly involved in bringing in consultants and working with teachers in grade-level and department meetings. Liaisons have been hired to assist with parental involvement. Title I A and Title I Migrant liaisons have roles similar to those of the

promotoras. Liaisons have established a connection between home and school for addressing student absences, grades, and discipline. Liaisons also facilitate training and ensure that federal policies for parental involvement are addressed.

Lyford CISD was fortunate to have been a pilot site for the Region IV Gateways to Science curriculum. Gateways to Science is now established at Lyford Elementary and is used in Grades 1-5.

Lyford CISD now uses a Web-based curriculum called CSCOPE, which is available in the core subjects for grades K-12. Selected teachers receive training every 6 weeks and are available to use the CSCOPE Vertical Articulation Documents and Year at a Glance. All campuses have aligned the science curriculum to the state assessments. Teachers have a grasp of the Texas Essential Knowledge and Skills.

Parents who participated in the colonias grant continue to be involved, and some have participated in pilot projects such as the Open Book literacy program, which integrates technology and reading. Some of the original participants are now citizens and are employed by the district. The children of these parents are excelling academically. Parents are now more comfortable as participants in district efforts.

Teachers who participated in the RSI can present a better perspective on sustainability. For example, here is how one elementary school teacher responded to questions about sustainability:

First of all, I learned that math and science can indeed be FUN! You don't have to use a textbook to learn science concepts. I believe the best way to teach a science lesson is to use the 5E Model. It allows for much exploration, interaction, and active participation... I learned to share information with my team. I don't think I would have shared so enthusiastically had it not been for the systemic initiative. It taught me to be a better teacher. Thanks so much for the wonderful opportunity.

Miranda M. Ramos, Second-Grade Teacher, Lyford CISD, Texas

Benita Zepeda, Lyford Elementary fourth-grade teacher, expressed what carried over to teaching from the RSI: "Inquiry-based lessons, implementing 5 Es in lesson planning, cooperative groups, manipulatives and models, and teaching grade appropriate TEKS objectives."

A high school teacher discussed the benefits of collegial learning:

I learned that meeting and collaborating with other professionals in the same field was very beneficial to me.... Trading ideas, strategies, and concerns with people that understand what you are going through and coming up with solutions was probably the best aspect of this initiative. In the many workshops I attended, I brought many hands-on activities back to my classroom which the students

enjoyed, and I enjoyed teaching. I will continue to use these activities for years to come.

Mark Garza, Teacher, Lyford High School

A Lyford Middle School teacher summed it up well.

I would say the most significant learning that has carried over to the present is a better understanding of how to approach the teaching process. Since TRSI, we have been given Scope and Sequence and Curriculum models,...which emphasize what is expected to be taught and learned at each grade level. The district's approach with the introduction of the...models has been to improve student learning and student scores. From the Region IV Gateways Scope and Sequence to the Region I CSCOPE,...I would say the TRSI staff development and summer institutes gave me a good foundation because both of these models focused on the 5EModel.... This made it easier to adapt to both curriculums and use them throughout the year.

Ramiro Rodriguez, Lyford Middle School Teacher

The partnership with the TRSI helped me as an administrator to see our parents in a different light. The partnership renewed my belief in the necessity of cross-planning and cross-training for the parents of special population students. Parents can learn. One needs to expect it and provide training; parents will respond. And I have become more service oriented.

Table 7 illustrates the improvement in student achievement at Lyford CISD by comparing district with state average passing rates for TAKS. Table 8 shows data trends of increased improvement in science with less consistent results in mathematics.

Table 7. LCISD District and State Comparisons in Mathematics and Science Achievement

Indicator	2008 PBMAS Standard (%) or State Rate	2008 District Rate or Difference (%)
<i>Title I Part A TAKS Passing Rate</i>		
Mathematics	50.0	70.4
Science	45.0	68.1
<i>Migrant TAKS Passing Rate</i>		
Mathematics	50.0	65.9
Science	45.0	70.8

Source: Texas Education Agency, 2008 Performance-Based Monitoring Analysis System No Child Left Behind (NCLB)

Table 8. LCISD 3-Year AEIS Longitudinal Data Profile (Title I), 2006-2008

Grade	Year	Read/ ELA	Math	Writing	Science	Social Studies
3	2008	88	71			
	2007	82	78			
	2006	83	56			
4	2008	76	83	92		
	2007	76	82	87		
	2006	54	63	85		
5	2008	90	93		84	
	2007	85	85		76	
	2006	78	88		73	
6	2008	93	69			
	2007	89	76			
	2006	81	70			
7	2008	88	88	95		
	2007	84	59	93		
	2006	77	48	91		
8	2008	99	81		78	94
	2007	84	53		55	81
	2006	66	51		54	53
9	2008	87	49			
	2007	81	44			
	2006	75	48			
10	2008	88	40		48	80
	2007	72	44		29	80
	2006	77	55		39	77
11	2008	86	59		59	89
	2007	79	63		52	91
	2006	88	61		42	91

The Texas Education Agency’s Division of Performance Reporting develops and implements the state accountability rating system, which is used to rate all Texas public schools and school districts. A district and/or campus can achieve one of four performance ratings, based on the percentage of students with a passing score on TAKS: Exemplary (90%), Recognized (75%), Academically Acceptable (45%), and Academically Unacceptable (below 45%).

Lyford Elementary and Lyford Middle School achieved “Recognized” status in all tested areas: mathematics, science, social studies, writing, and reading for all students, including Hispanic, white, and economically disadvantaged populations. Work continues at Lyford High School, which is rated Academically Acceptable by the Texas Education Agency. Math achievement is a primary concern at the high school, and Lyford CISD is addressing that concern.

Future Implications

Ongoing evaluation and disaggregating of student performance data must continue to occur. Data needs to drive staff development and instruction. The RSI trained parents, teachers, and administrators. Training cannot and must not be limited; training builds competencies and ownership. RSI provided on-site assistance, which was most beneficial and more economical. The district must continue to provide on-site and teacher-directed assistance, and to search for research-based and proven programs.



Presentations and Remarks by Federal Agency Representatives

Introduction of Presenters

Dr. Keith Smith
Edvantia, Inc.

The practitioners who took part in the forum's panel discussion are people who have been on the front lines, implementing improvements in mathematics and science with the support of their respective Rural Systemic Initiatives. Their presentations exhibit some commonalities, but clearly there are differences as well, stemming from the uniqueness of their circumstances. Each is a model of excellence for meeting the needs of those they served.

The next question is, what do we do with this legacy now that the National Science Foundation's financial support for the RSIs has been withdrawn? How do we involve other groups that have potential for changing policy, providing funding, or continuing the high quality of professional development needed to sustain the changes and improvements? Some great ideas and experiences were gained through the RSIs, and we don't want this knowledge to end up in a file where it can't move forward the nation's agenda for continual improvement in mathematics and science education.

To explore this issue, the forum brought together representatives of federal agencies that have responsibilities for improving mathematics and science education in the United States. How might the programs operated by these agencies interface with the capacity created by the RSI programs? Representatives of key federal agencies attended the sessions and listened as practitioners reported on their experiences. Here, these representatives suggest linkages that might offer the potential for their programs to leverage the best of the RSI legacy.

Dr. Brian O'Donnell
Program Manager, Office of Science, U.S. Department of Energy

The Office of Science is one of many programs in the U.S. Department of Energy (DOE). Previously a supplier to the Department of Defense, the Department of Energy is now a multifaceted agency involved in environmental cleanup, energy efficiency, nuclear energy, and fossil energy. The Office of Science is a \$3 billion program inside DOE, a \$22 billion agency. We have a program called Workforce Development for Teachers and Scientists. The mission of the program is to provide a continuum of opportunities to the nation's students and teachers of science, technology, engineering, and mathematics (STEM). It is a \$7 million program with a particular purpose: to develop the next generation of scientists and engineers.

DOE has a huge need for scientists, engineers, and mathematicians throughout its 17 laboratories. We have approximately 150,000 scientists and engineers working for the DOE. The Office of Science supports them. A principal component of the workforce development program is an undergraduate internship program. Over 600 interns have the opportunity to spend 10 weeks at the various 17 laboratories doing intensive research. We collaborate with NSF on the program. NSF is a tremendous support for the program and funds the participation of many students. A stipend is provided that covers travel and housing at the laboratories.

The success of the program is validated through the fact that every participant must coauthor an abstract of their research with their mentor that is published in the *Journal of Undergraduate Intern Research*. A selection of as many as 25 students each produce a 15-page research paper that is published in the journal. A second component is the Albert Einstein Distinguished Fellowship program, which brings middle school and high school mathematics and science teachers to Washington, DC from September thru June for a federal agency or Capitol Hill experience. There are 17 of those teachers completing their internship this year; the number of teachers who participate each year varies, ranging from 12 and 17, depending on funding.

DOE relies heavily on the fellowship teachers to help develop programs such as the DOE Ask- a-Scientist program, a third component of our workforce development program. It provides an online question-and-answer service from DOE's national laboratories for K-12 students and teachers. The program also invites middle school and high school mathematics and science teachers to the 17 labs for three consecutive summers to participate in a 4-, 6- or 8-week research experience. This is a hands-on research experience with mentors and other teachers. The teachers partner with the laboratories throughout the year as they are integrated into the scientific community to make them feel a part of the larger national infrastructure that supports scientific education and research.

In addition to receiving stipend and housing, participating teachers are provided with a minigrant and some professional development travel funds. Various components of the Einstein Fellows program have actually been developed by the teachers participating in the program over several years. Each year, Fellows came to the program and added value that changed some of the components. So the program is really developed by those that get the greatest utility out of it. It is quite successful. Currently 130 teachers are in the program. More teachers are added each year

but some temporary funding issues limited growth in the program this year. Another component of the program is a middle school and high school science bowl, in which students from around the country compete regionally in a Jeopardy-style science competition. Middle school students also compete in a fuel cell car competition that emphasizes hands-on experimentation.

As far as leveraging with other agencies, we have worked very successfully with NSF in the Einstein Fellowship program, along with NASA, NOAA, and other federal agencies. There may be ways to use those DOE programs to sustain and leverage the programs you have implemented in the RSIs. Meanwhile, you should encourage your rural students to participate in the DOE's Ask-a-Scientist program. Rural students who go on to college should consider participating in DOE's undergraduate internship program.

We instituted a new program this year for Hispanic undergraduates. We started a cohort component of the undergraduate internship program where we put two or three Hispanic students together on a research project in close proximity to each other so they could collaborate on what they were doing, on their research papers, etc. This program created a level of comfort for them. We will know more about the success of the program in a few months, but early indications are that the approach was very successful. We may start something like the cohort program for the Native American community as well.

Dr. Carl S. Person
Manager, Minority University and Education Program
National Aeronautical and Space Administration

I am very pleased to be here. The practitioners who presented were very impressive. I grew up on a farm in rural North Carolina. We had only one stoplight in the little town. It is comforting to hear about the progress you have made and the support you have had in the rural areas targeted by RSI projects.

NASA has a number of programs and activities designed for K-12 education. Some are for undergraduates. Several components of the programs match up very well with what you have been doing in the RSIs. One is professional development. All NASA projects have some component of professional development. All of the higher education projects for students have a hands-on component as well, including internships.

We also ensure there is an involvement of parents in the activities (i.e., Parent Cafes). I am very impressed with the efforts you are putting into your RSI projects to sustain them. NASA emphasizes sustainability in everything it funds. The Office of NASA Education budget has been stable over the years, but we were unable to have some competitions this past year. We are looking forward to many competitions in FY09 for programs that did not have competitions this year because of limited funding.

The Education Portfolio Strategic Framework pyramid drives our programs (see Figure 17). It basically is a push and pull effect whereby we push students and faculty from one level to the next. The base of the pyramid shows that we get them inspired, engage them, and ultimately get them employed. We need K-12 students with great minds to prepare for the NASA workforce. If they chose not to work directly for NASA, then they can be contractors in the aerospace industry or teachers in various institutions. The top of the pyramid—employment—is our number one outcome. We also want to get the public more involved in national issues (like NASA), and consequently, if more of the public is involved, then we believe more young people will become involved in STEM.

In elementary and secondary education, the desired outcome is to attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty. In higher education it is to contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals, through a portfolio of investments. The outcome for informal education is to build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission.

In 2008 and beyond, NASA will continue to pursue three major education goals aligned with the strategic plan: (1) strengthen NASA and the nation's future workforce, (2) attract and retain students in STEM disciplines, and (3) engage Americans in NASA's mission. One of the key programs is the NASA Explorer Schools.

NASA Education

The Education Portfolio Strategic Framework

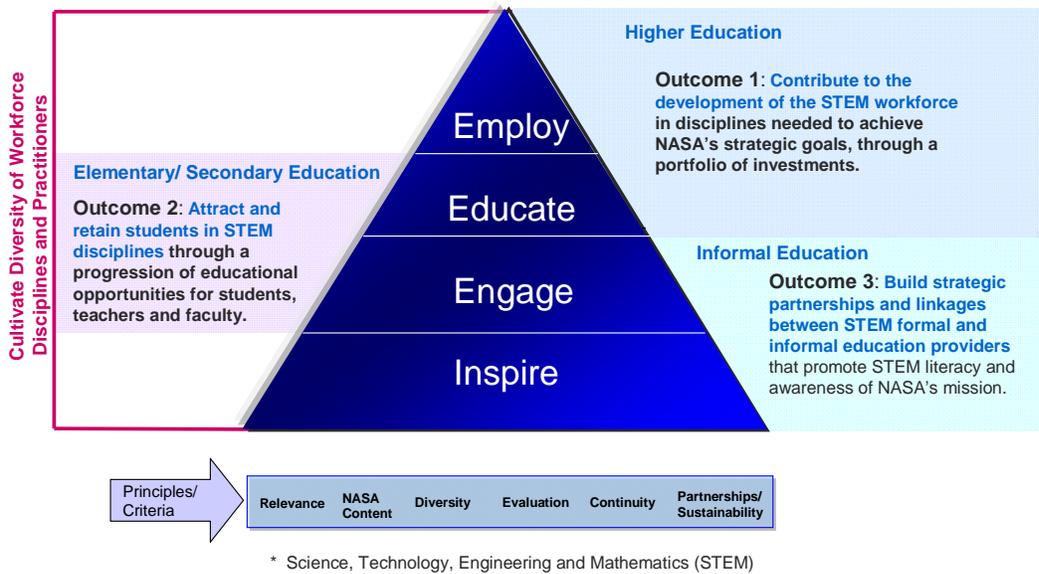


Figure 17. The Education Portfolio Strategic Framework.

NASA Explorer Schools

Basically, NASA Explorer Schools is a 3-year commitment by NASA to work with schools that identify a project to address over the 3 years. There must be at least one administrator on the school team. Some schools also include students on the team. The NASA Explorer Schools program involves a 3-year partnership between NASA and school teams (Grades 4-9) from diverse communities across the country. The focus is on underserved populations. The program uses NASA mission content as a context for teacher professional development to help address school improvement goals in Science, Technology, Engineering, and Mathematics (STEM). The schools receive \$17,500 in grants for technology tools, as the program works to add relevance to the school's STEM curriculum by providing unprecedented access to NASA research, people, and technologies.

The first year, each school spends a week in the summer at NASA's national center developing a customized action plan on the issue the school identified to address with the support of NASA personnel, content, and so forth. The first year also includes getting better acquainted with NASA technology, particularly how to use technology in the classroom. The second year is about implementing an action plan; again, the school team spends a week in the summer at NASA's national center. In the third year, another week in the summer is spent addressing how to develop partnerships to sustain what has been accomplished in the school's project.

NASA supports the school's efforts through teacher training, student opportunities, technology integration, and family involvement. Approximately 200 school partnerships have been funded. Almost 154,000 students and 8,000 teachers have been served, with approximately 87% of the schools serving high-poverty populations. In more than three-fourths of the schools (77%), the minority population exceeded 50% of the school's enrollment.

SEMAA

Another program that has been around for about 13 years is NASA's Science, Engineering, Mathematics, and Aerospace Academy (SEMAA). It provides opportunities for K-12 students primarily. The program provides enhanced activities that are in line with the national science and mathematics standards. NASA SEMAA is an innovative national project designed to increase the participation and retention of historically underserved and underrepresented K-12 youth in the STEM areas. NASA SEMAA is currently located at 14 sites in 11 states and the District of Columbia. SEMAA site locations include community colleges, 4-year colleges and universities, Historically Black Colleges and Universities (HBCUs), Hispanic-serving institutions (HSIs), Tribal Colleges and Universities (TCUs), elementary and secondary schools, science centers, and museums.

The goals of SEMAA are to (1) inspire a more diverse student population to pursue careers in STEM-related fields; (2) engage students, parents, and teachers by incorporating emerging technologies; and (3) educate students by utilizing rigorous STEM curriculum enhancement activities that meet national mathematics, science, and technology standards and that encompass the research and technology of NASA's four Mission Directorates.

SEMAA components include hands-on/minds-on K-12 curriculum enhancement activities (CEA), an Aerospace Education Laboratory (AEL), and a Family Café. In 2007, over 64,000 students, parents, and teachers were served (17,773 direct student participants; 5,393 direct parent participants; and 41,130 outreach participants). Over 2,000 elementary, middle, and high schools were represented. Here are some key academy demographics: 86% of participants were from ethnic groups historically underrepresented in STEM; approximately 49% were female; 53% lived at or below poverty level; and 495 were special needs participants.

SEMAA was recognized as one of the nation's top 18 innovative government programs in Harvard University's 2007 Innovations in American Government Award competition.

INSPIRE

Another innovative program that started this fiscal year is the Interdisciplinary National Science Project Incorporating Research and Education (INSPIRE). This program, which replaced the SHARP program, is a multi-tiered student pipeline project for students in Grade 9 through the freshman year of college and their parents or legal guardians. INSPIRE is designed to provide grade-appropriate, NASA-related resources and experiences to encourage and reinforce students' aspirations to pursue science, technology, engineering, and mathematics (STEM) education and careers.

Central to INSPIRE is the On-line Community (OLC). It provides resources, activities, and educational modules and is a mechanism through which students and parents can interact by asking questions and sharing knowledge with each other and with NASA, thereby building a community of practice. The student activities include grade-appropriate NASA content, adding relevancy to courses being taught in school. Through the OLC, students are able to participate in four video teleconferences with a NASA facility during the year.

INSPIRE participants have four tiers of internships or opportunities to apply for that offer a unique variety of summer experiences. These range from a 1-day experience for 10th graders to an 8-week paid internship experience for high school seniors and freshman college students. The tiers are as follows:

- Tier 1 (NASA Explorers): Rising 10th-grade students and their legal guardians compete to be awarded a summer visit to the NASA facility that services their state for a 1-day VIP tour and workshops.
- Tier 2A (Collegiate Experience): Rising 11th-grade students compete to participate in a summer 2-week, on-campus residential experience.
- Tier 2B (Residential Internship): Rising 12th-grade students who will be at least 16 years of age at the start of the internship compete for participation in an 8-week, residential, paid summer internship.
- Tier 3 (Collegiate Internship): Rising college freshmen who will be at least 16 years of age at the start of the internship compete for participation in an 8-week, paid summer internship.

NASA has almost 3,000 interns from around the country spread throughout the NASA nation. We are big on bringing in students to give them hands-on opportunities to engage in NASA research. Many of these students are from rural areas and from underrepresented and underserved groups. One of the new things we did this year with tribal colleges was to conduct a 3-week summer research institute that we took to Indian country. We had NASA scientists, engineers, and tribal college faculty at the institute. The college student and faculty member came in as a team that worked together for 3 weeks at the institute. Then they went back to their respective colleges and continued the research and learning for the next 5 to 7 weeks. It was a great accomplishment of the students and faculty. We hope to expand the program starting next summer.

Preservice Institute and Conference

We hosted a preservice teacher institute at 8 of our 10 NASA centers this year. We brought in students who will become STEM teachers at the K-12 level. They spent 2 weeks with NASA gaining an understanding and getting more insight on national content and different pedagogical methods. So far we have had great results. We have had representatives from minority and majority institutions.

AESP

The Aerospace Education Services Project (AESP) is a comprehensive project designed to reach out to the formal and informal education communities in all 50 states and the U.S. territories. The AESP staff consists of specialists who are professional educators assigned to each NASA center. The AESP specialists share NASA's use of emerging instructional technologies and the motivating outcomes of NASA's research, exploration and discovery with education communities, and the public. The primary focus of AESP is a professional development effort that serves the elementary and secondary education community by providing classroom demonstrations, distance learning events, in-service training for educators, preservice training for university students, and identification of appropriate NASA education resources.

The program was changed to focus more on teacher training and professional development. Contact NASA, and someone from AESP will come to your campus and help you with an area of professional development related to STEM. To support your activities, you will be connected to resources of the NASA resource center that is closest to the state.

Miriam Lund
Program Officer for Mathematics and Science Partnerships
U. S. Department of Education

It was great listening to the presentation of the teachers and their passion for their RSI projects. What I came away with the realization that passion creates great ideas. For example, creating curriculum and cultural standards that better serve students whose needs are not being met through traditional methods is thinking outside the box and is commendable. Also, any school district with the foresight to say to students, “You might be good at being a teacher,” and then form two classes as electives for students who might want to learn about being a teacher, is to be commended for thinking outside the box and having a new perspective on “growing your own” teachers. Creating a virtual high school, designating and supporting teacher partners, building partner relationships that met student needs—these were ideas I took away from the presentations as thinking outside the box.

So, how can we in the U.S. Department of Education support the things you are doing? First, I would encourage you to go after grants. There are 35 pages of grant opportunities from the U.S. Department of Education in the notebook provided to forum participants. Not all of these grants may be appropriate for you. Look for the ones that relate to your needs. Use the experiences and knowledge gained in your RSI projects to apply and compete for the grants.

I work in the Math and Science Partnerships (MSP) office. Congress authorized the MSP program in 2001. The program is all about partnerships that result in improving the mathematics and science achievement of students (see Figure 18). We provide the money to the states as formula grants, and they run the competitions to encourage the local education agencies (LEAs) to partner with institutions of higher education so they can, for example, have professional development in a STEM content area. Some of the requirements in the federal legislation include the following:

- Professional development program
- Formula grant program to states
- States make competitive awards for projects
- Projects required to evaluate the impact of work on teacher knowledge and student learning
- Projects required to submit annual report to ED

Projects must submit an annual report that is based on an annual evaluation. MSP project evaluations require pre- and post-testing. While NSF gives very large Math and Science Partnership grants, the awards by states average about \$200,000 per year.

MSP Program Results

In 2005, two primary professional development models were used in MSP projects. Of the 375 projects, 324 (86%) focused on increasing teacher content knowledge. The remaining 51 projects (14%) focused primarily on the creating the teacher leaders model. Consequently, RSI projects that emphasized teacher leader models might want to apply for state MSP grants.

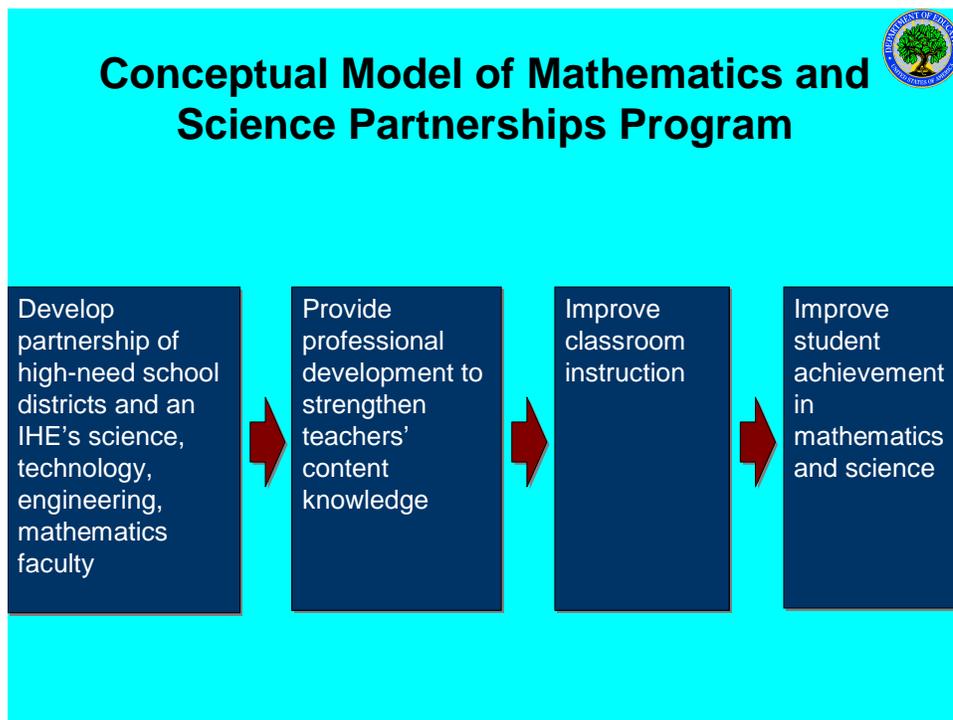


Figure 18. The ED Math and Science Partnership program concept.

MSP projects awarded by states include a variety of professional development activities, such as summer institutes and follow-up activities, on-site professional learning, college coursework, content and pedagogical content knowledge workshops, or any combination of these or other activities (see Table 9). “Follow-up” professional development activities include one or more on-site professional learning experiences, study groups, online coursework, distance learning networks, resource development, and short-term professional development. “Combination/other” includes one or more of the following activities: on-site professional learning in combination with other activities, coaching/mentoring, study groups, online coursework, college coursework, distance learning networks, resource development, and short-term professional development. In Table 9, the mean duration of professional activities is based on 324 reporting projects.

Of the 375 projects in FY 2005, 161 (43%) focused on mathematics content in the professional development activities, 100 (27%) focused on science content, and 114 (30%) focused on both mathematics and science content.

Nearly half of all MSP projects, 48% in FY 2005, reported using a quasi-experimental evaluation design. Few projects reported using an experimental research design, the most rigorous form of evaluation. Table 10 shows the types of evaluation designs used by MSP projects. In FY 2005, only 3% of the MSP projects used experimental designs, and the Department has been pushing for greater use of the “gold standard” experimental evaluation design in the state MSP projects.

Table 9. Types and Duration of MSP Project Professional Development Activities, FY 2005

Professional Development Activity	Percentage (No.) of Projects		Mean Duration, in Hours
Summer institute	2.0%	(8)	99
Summer institute + follow-up	88.0%	(322)	137
On-site professional learning	1.5%	(6)	105
College coursework	1.5%	(6)	137
Content and pedagogical content knowledge workshops	1.0%	(3)	89
Combination/other	6.0%	(22)	206
Summary information	100%	(367)	129

Table 10. Types of Evaluation Designs Used by MSP Projects

Evaluation Design Categories	FY 2004 Percentage (No.) of Projects		FY 2005 Percentage (No.) of Projects	
<i>Experimental design</i> – using random assignment of schools, teachers, and/or students to MSP (Treatment) vs. non-MSP (Control) groups	10%	(23)	3%	(12)
<i>Quasi-experimental design</i> – using various methods other than random assignment to compare schools, teachers, and/or students with and without MSP services (e.g., pre-post comparisons, matched comparison groups)	35%	(82)	48%	(168)
<i>No control/comparison groups</i> – using post-Professional Development-test only and/or other one-time data collection methods	54%	(128)	47%	(164)
<i>Other</i> (e.g., case studies, formative research)	30%	(72)	29%	(101)

Note. Percentages are based on 237 projects reporting in FY 2004 and 348 projects reporting in FY 2005.

Evaluation findings also show that, based on available FY 2005 data, 76% of K-5 teachers who received content assessments in mathematics and/or science significantly increased their content knowledge (see Table 11).

Table 11. Number and Percentage of MSP K-5 Teachers Assessed for Content Knowledge Who Showed Significant Gains

Type of Content Gains for K-5 Teachers	No. of Teachers Assessed	No. of Teachers With Significant Gains	Percentage of Teachers With Significant Gains
Mathematics content knowledge	4,937	3,158	64%
Science content knowledge	1,364	1,128	83%
Mathematics and/or science content knowledge	5,637	4,286	76%

Note: The individual percentages of mathematics and science teachers do not total the combined percentage because some projects reported significant gains in both mathematics and science for the same teachers. Data in this table are from 99 projects reporting on significant gains in K-5 mathematics, 60 projects in K-5 science, and 128 projects in K-5 mathematics and/or science.

What about student achievement? Table 12 shows the students who scored at proficient or above in mathematics on state assessments. Table 13 shows student achievement results in science state assessments. Overall, for the MSP program, there was a 5% net positive change in mathematics student achievement for teachers who participated in the program, and an overall 7% gain in science student achievement.

Table 12. MSP Project-Reported Percentages of Students Who Scored at or Above Proficient in State Mathematics Assessments

School Level	Mean % Proficient	Mean % Change
Elementary	60%	+7%
Middle	51%	+4%
High	48%	+3%
All (Elementary, Middle, and High)	53%	+5%

Note. Percentages are based on 158 projects reporting mathematics scores.

Table 13. MSP Project-Reported Percentages of Students Who Scored at or Above Proficient in State Science Assessments

School Level	Mean Percentage of Students Proficient or Above	Change in Mean Percentage
Elementary	54%	+11%
Middle	55%	+5%
High	57%	+6%
All (Elementary, Middle, and High)	55%	+7%

Note. Percentages are based on 78 projects reporting science scores.

Future Directions

Research shows that it takes a lot of professional development to change a teaching practice. The typical teacher in the MSP projects received about 137 hours of professional development in a year. A vast majority of projects offered professional development as summer institutes, with follow-up during the school year. In some cases the MSP partnership between the LEAs and institutions of higher education changed the teaching practices in higher education. The average size of a MSP grant was \$250,000 to \$350,000, with about 48 teachers per project participating, on average. Of course, there were fewer participants per project in rural areas, about 20 participants, compared to urban areas. Most teachers whose content knowledge was measured showed increases.

In the future we really want to examine the impact of the MSP on teaching practices and student learning. We want to know more about the nature of the content provided in the professional development and the nature and quality of the follow-up professional development. We are interested in the impact of MSP on high-need schools. We recently brought in Title 1 coordinators and worked with them to see how MSP can help them have better professional development in their schools. We want to emphasize that the MSP projects need to conduct more rigorous (i.e., quasi-experimental and experimental) evaluations.

Dr. Jody Chase
Program Director, Division of Human Resource Development
National Science Foundation

The first professional development activity I attended through an RSI was a NASA workshop. The content was fabulous, and it was a great opportunity to observe the workshop instead of just hearing about it. The NASA workshops that I have observed are phenomenal. The Department of Energy is offering great opportunities for the tribal colleges, the group I now work with full-time. The relationship with the Department of Energy labs is great for the tribal colleges' faculty and students. NSF has also tried to be a good partner with everything that the Department of Education offers to improve mathematics and science education.

When I started at NSF it was the beginning of a new era. One of my new bosses was Dr. Luther Williams. He and others charged me with the responsibility of developing a new area in the systemic initiative, one for rural areas. And Dr. Williams indicated I needed to go and talk to a person in Kentucky by the name of Wimberly Royster. A couple other persons at NSF, including Peirce Hammond, told me I needed to go talk with Wimberly Royster. So, I went to Kentucky and talked to Wimberly Royster.

Wimberly has always been so modest and humble about his role in the RSIs. But he has been a major player behind the development of the RSI program. There are many persons that I need to thank, including those in the tribal college community. I was fortunate to have Dr. Jerry Gibb as a colleague, mentor, and friend for 6 years in helping to start the RSI journey. He moved on to head the Tribal College Association before retiring. I greatly appreciate his presence during this forum.

NSF's role is to fund discovery and to provide support so that leaders in the field can create and use knowledge. So it is important to stop every once in a while and examine what we did, what we learned in the RSI. There have been so many reports, the work of Mark St. John, the *Legacy* report that Hobart Harmon and Keith Smith produced—all have contributed to our knowledge base.

One of the first things we learned in the RSIs was that leadership matters. We were fortunate that leadership was there in the people in the schools, in the classrooms, in the universities, and in the communities. The NSF support went to mostly providing practitioners (e.g., teachers) with released time from the daily grind of duties to look at the standards, to examine the new curriculum, to participate in professional development, and to meet quarterly or monthly to develop the RSI together. The leadership was there, and it can't come from the outside. What it needed was support so the leadership could be expressed. Every RSI had a cultural component to it. I was thinking today how similar the projects were, yet so very different, as each had its own special niche. Infusing that culture into the curriculum, connecting to the environment that the students were in, was so vitally important to the success of the RSI projects. Language also mattered. The Navajo Nation RSI had an immersion classroom where the students were taught in the native Navajo language. Today what you have is a total immersion school on the Navajo reservation. So the RSI helped them see that they needed to be able to teach the students in their native language.

One of the first policy changes was in the Tuttle Mountain RSI. All the superintendents were brought together monthly, and the first thing they addressed was different starting dates (4 different weeks) for schools on the reservation. Some transfer students were getting up to 3 weeks less instruction by attending a late-starting school and then transferring to a school that ended the school year earlier than the school from which they transferred. The superintendents agreed to the same school calendar so that all students received the same number of instructional days every year.

Standards matter, but they need to be owned by the community. We started the RSIs in the era of standards-based instruction. I always encouraged PIs to use national, state, or locally developed standards—but they had to be real and mean something to the local schools and communities. Some developed their own local standards.

Collaboration and community matter. One of the most amazing things to me is how many of the RSIs that have ended still have networks of people who come together to discuss mathematics and science education. They use other funding sources to conduct collaborative activities and get together every couple of years, still consulting with each other and continuing the sharing that started with the RSI.

I learned that resources matter. I remember when one RSI had a school that was participating in professional development on using FOSS kits. I noticed that there were teachers from three schools in the training but only one FOSS kit, which they had to share in the training. When I asked why each teacher did not have a kit, I was told that NSF policy was one kit per training. I had to clarify that the policy was one kit per teacher in the training but no classroom sets for use by a school. I learned communication matters too.

Three or possibly four of the RSIs had outcomes that enabled them to win MSP funds to continue the good work started by the RSI. In addition, many of the projects changed how they used their Title I funds. Some were also able to get state funds directed to the RSI model so that activities were replicated at other schools around the state. This is phenomenal as a way to leverage the legacy of the RSIs.



Commentary and Observations About the Forum

Dr. James Rubillo
Executive Director, National Council of Teachers of Mathematics

In some ways, I am completely unqualified to speak on rural education because I grew up in south Philadelphia in inner city schools. My teaching experience has been in community colleges in urban areas. So I will use a slogan I heard earlier today: Lack of knowledge shouldn't prevent me from saying things. Throughout the forum, I have been listening and observing. Let me give you some impressions.

First of all, the forum has shown the broad range of communities and settings that we deal with in rural areas. For folks like me, that is very insightful, and to get the message out broadly in this policy-making arena is really important. Also, the federal agencies seem to be aware of educational needs in rural math and science—and of the fact that their agencies can help. There is probably an understanding in the agencies regarding how large the problem is. Many of our agencies have started or will start programs to address the needs, but they can't solve the problem in its entirety.

The other thing that stood out during this forum is the centrality of the teacher—how central the teacher is to the enterprise of educating the student. Probably the most important thing not mentioned directly is what might be called a teacher's "residual effect" on their students. Residue is what is left long after the experience. Some of you can think about the tremendous impact that a teacher left on you. You may not remember a thing about what they taught. But you remember the setting and environment they created for learning—how the teacher invited you to learn.

In mathematics and science in particular, we suffer from a lot of negative residue from teachers: *I was never good at that. I don't like math. I don't like science.* So, one of the things that sometimes we don't acknowledge is that the teacher is the exemplar in terms of enthusiasm, love of the subject, and so forth. We also don't always think of teachers as attitude setters, but they subtly influence student attitudes and expectations. Sometimes I hear teachers say, "My students can't learn." Such statements, and the attitudes behind it, unintentionally leave a residue of discouragement.

This forum clearly identified the need to convert isolated teachers into interconnected, collaborative teams of professionals—that is, to change the expectations of the job. That is one side of the equation. On the other side, I started asking myself, who is the audience for this forum. Is it teachers, or is it policymakers? One of the things I have learned in the 7 years I have been in this town (Washington, DC) is that there are a lot of wheels spinning, and every once in a while something happens.

But I am not sure I heard the answer to the questions I commonly hear from legislators: What do you want me to do, and why? And what will the outcome be? I heard about the RSI legacy, and the *why* question was answered, but I did not hear specifics about what to do next.

So, to help legislators or policymakers who review these forum proceedings, I'd like to review some obvious facts that have not been mentioned out during the forum. First, since the RSIs began some 14 years ago, there has been an absolute turnover in the U.S. school population. During that same 14-year period, there has probably been tremendous turnover among teachers as well. Yet policymakers often assume that once we put a program in place, the problem is solved. Policy makers simply don't understand. Improving mathematics and science education is a process, not an event.

For example, people ask me at NCTM: "Do you have a strategic plan?" I say absolutely not. But I have a planning process. It is the process that is important. Do you know how many strategic plans are prepared and simply put on the shelf? I often say, "A plan is useless, but the process is priceless." So the process of keeping the RSIs going is the legacy issue that has to be brought to policymakers. It is wonderfully clear today that one project doesn't fit all. And that leads us back to another message that was clear: local needs and local control constitute the storm driving things, especially in rural communities. That gets complicated because there is a lack of local resources. It is a conflict that is difficult to resolve.

There is a need to invest continually in each generation of children. We often talk about professional development as an investment in teachers—but teachers use their professional development experiences to benefit students. I love putting adults in front of a newborn baby. Why? Because they see the future in the baby. We want people to see their future in children.

The more attention we give to anything, the more results we get. Inattention results in the status quo at best or a drift downward at worst. There is a need to keep pressing. I do, however, have a caution for us in these times of standards. We keep emphasizing that the RSI initiatives have enabled us to do what the public expects us to do. The public expects us to be teachers who are learning, naturally. Not that we have to force teachers to keep learning, or that we ought to coordinate our curriculum better, because that is what the public expects us to do. This allows us to collaborate because that is what the public expects us to do. But sometimes we are not experienced enough in the policy arena to think about how to communicate effectively with the policy audience.

I think we have to be pushing a little more regarding the needs of policymakers. So what is this legacy requirement? In my view, what is needed for the RSI legacy is not to say we presented the ideas that can be read by policymakers, but to actually formulate some policy action and answer policymakers' questions: *What do you want me to do, and why? What outcomes might we expect as a result?*

The last thing I will mention is that there are some disconnects. I heard some disconnects today. One is in the area of sustainability. One is about seed money and the expectation among policymakers that they seed something and there will be sustainability. Among schools, especially in local areas, I hear they can't sustain it without support. This disconnect is evidently

going to cause problems. I see it now with private foundations and what they are willing to fund. They are not interested in funding unless there is sustainability. So, not only is there a stronger evaluation requirement for projects, but also the need for sustainability. However, as mentioned previously, the local control needs that we want to preserve can at times come into conflict with what the funders and policymakers are expecting on the other end.

So, the legacy of the RSIs is active, not passive. What is the expectation from this point forward? I close with one of my all-time favorite quotes, and it is rural. In the words of Albert Hubbard, an essayist who wrote in the early part of the last century:

Those who want milk should not seat themselves on a stool in the middle of the field in the hope that the cow will back up to them.

In this particular area of rural education—mathematics and science education—there is a real need to go and chase the cow.

Appendix: Forum Agenda



National Science Foundation

**THE FORUM ON LEVERAGING A LEGACY OF LEADERSHIP
IN MATHEMATICS AND SCIENCE EDUCATION**
Rayburn House Office Building, Room 2325
9:00 a.m. – 3:00 p.m.
July 16, 2008

- 8:30 Registration and Coffee
- 9:00 Welcome and Recognitions
Dr. Keith Smith, Project Director, Coalfield Rural Systemic Initiative, Edvantia
The Honorable Alan B. Mollohan, West Virginia Representative from the First Congressional District
Dr. Sandra Angius, Vice President of Programs at Edvantia
- 9:20 Setting the Context
Dr. Wimberly Royster, Principal Investigator, Appalachian Rural Systemic Initiative
- 9:35 Practitioner Introductions and Presentations
Dr. Hobart Harmon, Consultant, Writer, and Rural Expert
- First Practitioner Presentation
Jonathan Escue, Science Teacher, Lincoln County High School, Hamlin, West Virginia
- Second Practitioner Presentation
Angela Winters, Principal, James Rosser Elementary, Moorhead, Mississippi
- Third Practitioner Presentation
Teresa Schneider, Coordinator, Native and Rural Education Support, Kodiak Island Borough School District, Kodiak, Alaska
- 10:40 BREAK
- 10:55 Fourth Practitioner Presentation
Gene Meier, Superintendent, Fort Washakie Charter High School, Fort Washakie, Wyoming

- Fifth Practitioner Presentation
Kim Zeidler, Director, University of Kentucky Resource Collaborative, Lexington,
Kentucky
- 11:35 Open Forum Question and Answer Session I
- 12:00 Lunch and Follow-Up Discussion
- 1:00 Introduction of Representatives from Federal Agencies Involved in Mathematics and
Science Education
Dr. Keith Smith
- 1:05 Reactions from Agencies
- Department of Energy
Dr. Brian O'Donnell, Program Manager, Office of Science
- National Aeronautical and Space Administration
Dr. Carl S. Person, Manager, Minority University and Education Program
- U.S. Department of Education
Miriam Lund, Program Officer for Mathematics and Science Partnerships
- National Science Foundation
Dr. Jody Chase, Program Director, Division of Human Resource Development
- Open Forum Question and Answer Session II
- 2:35 Commentary and Observations About the Forum
Dr. James Rubillo, Executive Director, National Council of Teachers of Mathematics
- 3:00 Closing Comments
Dr. Keith Smith