The Rural Systemic Initiative of the National Science Foundation An Evaluation Perspective at the Local School and Community Level

by

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The Evaluation Center
Western Michigan University

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This material is based upon work supported by the National Science Foundation (NSF) under Grant REC-9819347. Any opinions, findings, conclusions, or recommendations expressed in this materials are those of the author(s) and do not necessarily reflect the views of the NSF.

Foreword

This study of the Rural Systemic Initiative of the National Science Foundation has been one of the most interesting and enjoyable endeavors of my professional career. It involved my two primary areas of academic interest, science education and evaluation, and the context was in rural America, where I spent my early years and now call home. I could not have hoped for a better match between my professional knowledge and my personal values.

In conducting this study, I was so fortunate to have continuing support from my NSF program officer, Dr. Bernice Anderson, and the advice and cooperation of the Research Advisory Team. These are the best of the best, and I am so pleased that they chose to work with this project. Their input and sage advice was worth more than I can ever repay.

I want to thank two colleagues at The Evaluation Center, Dr. Craig Russon and Ms. Gloria Tressler, for their loyalty and hard work during important stages of the project. Further, I want to thank Christine Hummel and Mary Ramlow at The Evaluation Center for their fine work in coordinating some of the data analyses and providing administrative assistance. As usual, Ms. Sally Veeder applied her great editorial skills, but I also want to thank her for her friendship and assistance during this entire project. Certainly, I owe much to Drs. Daniel Stufflebeam and Arlen Gullickson, Directors of The Evaluation Center during the course of the study. As colleagues and friends, I could not ask for more.

I want to express appreciation to Drs. Brian Lotven and Kenneth McKinley for their valuable assistance as consultants to the project. They were able and creative contributors.

I commend the principal investigators and project directors of the RSIs for their cooperation and willingness to participate in the study. Without this support, many doors would have been closed to the study. Most importantly, a great appreciation is extended to the hundreds of teachers, administrators, students, parents, and other community members who gave their time and shared important information that greatly added to the accuracy and richness of this report.

Finally, I dedicate this report to my wife, Anna. Not only has she read thousands of draft materials over the years and listened to my complaints and frustrations, she has steadfastly supported me in every way. This project required much travel and many days away from home, and I want to thank her for her willingness to do what had to be done during those times.

Jerry G. Horn
Principal Investigator

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Introduction

This report is based on an almost 5-year continual study of selected collaboratives engaged in education reform and improvement with a focus on science, math, and technology in schools serving K-12 students in rural America. (Formal annual and end-of-project/final reports have been submitted to the National Science Foundation, and more than 20 other reports of specific investigations or substudies have been produced and are available for public review.) Each collaborative included in this study was funded by the National Science Foundation (NSF) as a part of its Systemic Reform Initiative (SRI) program.

This version of the final report of the study is primarily intended for use by educators, decision makers, and others who are interested in education program improvement from the perspective of the local school and community. This report does not reflect all elements of this study, nor does it attempt to evaluate the NSF or the Rural Systemic Initiative (RSI) of this government organization. It is an attempt to describe some of the critical components of the effort, the perceptions of these at the local level, and an objective view of the impact and change that occurred.

The format and style of this report were selected to provide an easily readable and nontechnical description of selected communities and to encourage a critical comparison of these with those of the readers who may be involved in systemic or other large-scale school improvement efforts. Further, it provides summarized feedback from a variety of local project participants and other stakeholders on their views and values of critically identified "drivers" of education reform and their perceptions of efforts to improve/reform local education programs through large-scale initiatives, as designed by collaboratives with federal funding.

In response to a "Dear Colleague" letter from the National Science Foundation that requested proposals to conduct studies of rural, urban, and state systemic reform initiatives, researchers from a number of universities and other organizations submitted requests for support of a variety of studies. None of the proposed studies focused on the Rural Systemic Initiative, and most proposed approaches using state-based test scores and the intentions of the projects (collaboratives) as indicators and guidelines of the studies. Having need for a study of all three major components (rural, urban, and state) of the systemic component of the NSF program, representatives of the National Science Foundation requested a proposal from Dr. Jerry Horn, Principal Research Associate at The Evaluation Center at Western Michigan University (WMU), to study the Rural Systemic Initiative. In the discussion phase that followed, Dr. Horn explained that his proposal would focus on the local perspective and that it might be quite different from others who would favor collecting large amounts of collaborative project data and major use and reanalysis of state test scores or other standardized test data sets. At the same time, NSF representatives indicated that a proposal from Dr. Horn would be subjected to the same scrutiny and evaluation of any other proposal submitted to the Foundation. With agreement on all of these elements, Dr. Horn and his

associate at The Evaluation Center, Dr. Craig Russon, developed a proposal and submitted it to NSF for consideration. After the required review and evaluation, NSF awarded a three-year grant to The Evaluation Center for "The Rural Systemic Initiatives Evaluation Study," with Dr. Horn as Principal Investigator. Operationally, the project initially was planned to be conducted largely from 1999 to 2001. Three currently funded collaboratives were selected to be the focus of the study because it was thought that these were made up of school districts serving the traditional rural communities. Those selected were the Appalachian Rural Systemic Initiative (ARSI), the Delta Rural Systemic Initiative (Delta RSI), and the UCAN Rural Systemic Initiative (UCAN RSI). ARSI included school districts in the Appalachian area of Kentucky, North Carolina, Ohio, Tennessee, Virginia, and West Virginia; the Delta RSI had participating school districts from the delta region of Mississippi, Louisiana, and Arkansas; and the UCAN RSI focused on selected school districts in Utah, Colorado, Arizona, and New Mexico.

In Spring 2000, Dr. Horn and The Evaluation Center were asked to consider an expansion of the study to include 3 additional collaboratives that had been funded recently or were scheduled for funding in the near future, i.e., the Texas RSI; the Michigan RSI; and the Coastal RSI, with school districts in Virginia, North Carolina, and South Carolina. Accepting this addition and challenge to the study, the project was extended, with an expected completion date of May 31, 2003. Each collaborative will be described in more detail later in this report. Over time, more than 15 RSI collaboratives were funded by the NSF, but only the 6 identified above were a part of this study.

For many years, the NSF, other federal agencies, state governments, and other public and private entities, including local schools, have focused on education reform and school improvement. Some of these efforts supported a variety of change mechanisms, but in the mid-1990s systemic reform was in the vogue. For major and long-lasting change to occur, it was thought that the impact must be continuous throughout the grade levels (K-12) and must (1) include all schools within a system, (2) relate to alignment of the curriculum with recognizable standards, (3) include policies that relate to these standards and goals, (4) be reflected in budgets, and (5) be a part of the ongoing educational experiences of all children. Since math, science, and technology are the recognized interests of NSF, these became the focal points of the systemic initiative. Earlier efforts by NSF included summer and academic year institutes and workshops for teachers, the development of curricular materials, and a variety of other programs that identified teachers or a single subject area as the target for improvement.

Systemic reform had a broader connotation and one that seemed to be well received by K-12 schools and higher education scientists, mathematicians, and science and math educators, who likely would be providers of services and knowledge for these projects. Also, state departments of education had some experience in this approach in earlier state systemic initiatives. Yet, NSF and other planners had little existing experience for building large-scale collaboratives (in terms of number of participating units and geographic area) that differed considerably from the earlier conceived and implemented urban SIs. These earlier SIs were single districts with limited geographic areas to be served when

compared with the rural systemics. While there were some similarities with the state initiatives, the RSIs often involved multiple states, regulations, and governmental jurisdictions. Whether anticipated or not, the RSIs faced some interesting, if not even major, challenges to fulfill the expectations of the NSF program as well as what was promised in the collaboratives' proposals. Further, rural schools and the communities they serve are radically different from suburban and urban school districts. While this topic will be addressed in more detail later, suffice it to say that rural communities have a distinct culture that is based on trust, a sense of ownership and pride in their schools, and caution with regard to external interventions in their schools. Overall, the RSI program faced some existing obstacles from the outset.

The principal investigator of this evaluative study, Dr. Horn, was particularly interested in this study because of his background and experience in science education and rural education. He had served as the national president for the Association for the Education of Teachers in Science (AETS) and the National Rural Education Association (NREA), as well as serving on the Board of Directors of the National Science Teachers Association (NSTA). Much of his research as professor at the University of South Dakota and Kansas State University related to the improvement of science in schools and rural education. He founded the first officially recognized "Rural Research Center" under the auspices of the NREA at Kansas State University in the early 1980s. After joining The Evaluation Center at Western Michigan University in 1994, he led the evaluation of a number of educational initiatives, including the charter school programs in Michigan and Connecticut.

Even with this strong base of experience and knowledge of science education and rural education, he broadened the base of expertise for this project with the creation of a Research Advisory Team, which included the careful selection of individuals who are nationally known and who bring additional credibility to this study. The membership of this team and some of their involvement will be discussed later in this report.

The Rural Systemic Initiative of the National Science Foundation

An overview of the Rural Systemic Initiatives program, as taken from the official Web site <http://www.ehr.nsf.org/hrd/rsi.asp> for this program, is as follows.

The Rural Systemic Initiatives in Science, Mathematics, and Technology Education Program was developed in FY 1994. RSI, like the Urban Systemic Initiatives and the Statewide Systemic Initiatives, stimulates system-wide educational reform of science, mathematics, and technology.

RSI is focused on improved education for students in rural, economically disadvantaged regions of the nation, particularly those that have been underserved by NSF programs; and on sustaining the improvements through encouraging community participation in instructional and policy reform. RSI is tailored to address policy, leadership, and workforce issues related to education, to provide a comprehensive and sustainable framework for science, mathematics, and technology education technology in elementary, secondary, and higher education.

RSI targets regions that are highly rural; characterized by significant levels of poverty among their school-age children; and that share common cultural, social, and economic characteristics. Interested individuals or identified leaders within eligible regions form consortia that include large NSF-funded Initiatives (e.g., SSI, EPSCoR, USP). RSI regions can be geographically vast, typically crossing state lines, or may be composed of areas that are geographically separated but linked by a unitary vision and other commonalities.

The RSI project scope is divided into two strategic elements. The initial element is a Development phase, to support planning for structuring Implementation (second) phase vision, strategies, and priorities. During the Development period, projects conduct regional self-studies to gather pertinent information regarding target populations, regional strengths and barriers, and policies that enhance or hinder instructional reform. Moreover, successful Development projects should result in a viable evaluation strategy to be utilized during the Implementation phase. The second strategic element, the Implementation phase, focuses on realizing the strategies for systemic improvement in RSI districts, schools and classrooms. The strategies can include teaching workforce enhancements, curriculum innovation, leadership development among teachers and local district administrators, and innovative and pertinent assessment strategies; and must result in better classroom instruction and higher student achievement.

RSI goals include:

> *The improvement of science, mathematics, and technology education in rural, economically disadvantaged regions of the nation.*
>
> *The preparation of a technologically competent workforce to enhance the infrastructure of economic development activities within a*

community or region, by strengthening the science, mathematics, and technology instructional capacities of regional colleges and universities.

The enhancement of scientific literacy and science understanding and appreciation among students and the general community in rural, economically disadvantaged regions of the nation.

The development of community infrastructure to provide resources to sustain educational improvements.

RSI collaboratives developed in a number of ways and through the efforts of individuals and groups. In some cases, an individual served as the initiator of the idea and he/she was able to put together a consortium of individuals/schools with a common interest and set of goals. In other cases, earlier efforts for science and math education had produced workable groups that wanted to continue this relationship and effort with new and potentially a major increase in support. In the application materials, development grants were made available by NSF on a competitive basis and groups were encouraged to pursue this opportunity as means to develop the collaborative and the design of a full plan for the systemic improvement project. (In this report, we refer to a *program* as the overall entity at the NSF level and a *project* as one funded element at the implementation level, such as a collaborative.)

It should be understood that while this program was entitled "rural," it had specific qualifications that excluded major geographic areas of what is commonly known as rural America, e.g., those areas that did not meet the criterion for "highly rural" and "characterized by significant levels of poverty among their school-age children." In the application material, eligible school districts are defined as "those designated as 'rural' or 'small town' according to the U.S. Department of Education, National Center for Education Statistics, and in which greater than 30% of the school-age children are living in poverty."

There are many definitions or characterizations of "rural" and particularly "rural schools." However, the common elements of these characterizations include considerations of sparse populations and isolation (from major residential and commercial areas), which might be the result of geographic distance or geographic barriers, i.e., mountain ranges, water expanses, absence of passable roads during seasonal periods, etc. However, there are other, more subtle barriers to access to metropolitan areas, such as culture, religious or language differences, socioeconomic status, historical events, etc.

According to official U.S. Census Bureau definitions, rural areas comprise open country and settlements with fewer than 2,500 residents <www.ers.usda.gov/Briefing/Rurality/What is Rural)>. Urban areas comprise larger places and densely settled areas around them. Urban areas do not necessarily follow municipal boundaries. Most counties, whether metropolitan or nonmetropolitan, contain a combination of urban and rural populations, and since metropolitan and nonmetropolitan status is determined on the basis of counties, a rural school within a defined metropolitan area was ineligible to participate in an RSI collaborative.

The Beale Codes are used by the U.S. Department of Agriculture to define points on a continuum from 0 (most metropolitan) to 9 (most rural). A designation of 8 (no places with a population of 2,500 or more and adjacent to a metropolitan area) or 9 (no places with a population of 2,500 or more and not adjacent to a metropolitan area) would be "highly rural." When queried on this issue, RSI consortium leaders often referred to the Beale Codes as the indicator they used to determine which school districts would be invited to participate in the projects. This is an important point, because it helped determine participation and guided this study's selection of schools with whom to compare selected RSI schools' achievement on substudies described later.

The use of governmental definitions of *rura*l is further complicated by the fact that many school districts are "county school districts," which may contain some schools that serve urban children and others that serve rural students. In rural education circles, it is commonly stated that about two-thirds of the schools in this country are rural and one-fourth to one-third of the students attend a rural school. Further, rural is a state of mind in that there is a sense of value for the land, the culture, and the rural life style. Others may have an address and a home in a rural area but work and have a social life with suburban or urbanites, but they do not share the values and way of life of the traditional rural resident. Expectations of students and schools and the value placed on specific factors may differ drastically between the traditional rural family and the newly arrived suburban or urban family with a residence in a rural area.

With regard to the requirement that participating schools must have "significant levels of poverty among their school-age children," there is the U.S. Census definition of poverty, which is based on income and the size of the family unit, and then there is the U.S. Department of Education's common usage of "eligibility for free and reduced lunch." While these definitions use similar data, eligibility for free and reduced lunch is usually determined only when a student or his/her parent/guardian requests consideration for this status. School people routinely will tell you that publicly reported data for free and reduced lunch for high school students are substantially underestimated. In many rural areas, there is a stigma associated with being tagged as living in poverty.

The third requirement for participation is related to a sharing of common cultural, social, and economic characteristics, which seems to be largely included to accommodate collaboratives that would serve Native American children. At the same time, a special section of the solicitation notice NSF 01-57 provides for a "Tribal Colleges and Universities Component."

This information related to requirements for participation is included in this report, not to infer that any school districts in the collaboratives were ineligible, but to indicate that this is not a program that is inclusive of all rural schools or schools serving rural areas. Further, it was quite likely that the requirement that 30 percent of the students must be living in poverty may not be a true estimate of reality. In summary, by definition entire states would be excluded from participation in the RSI program, even though they may have considerable geographic area that is rural. It seems most likely that the RSI

program was conceived and planned to serve a fairly narrowly defined group of schools and children. Thus the title of the program, Rural Systemic Initiative, may not be a totally accurate descriptor.

Early descriptions of the program, including the program solicitation document (NSF 01-57), refer to "six impoverished regions," but they are not named. Later in that same document, it says that by 1994 "the program made four implementation awards to six of these sites." Thus, it would seem that the areas served by the ARSI, Delta RSI, UCAN RSI, and the Alaska RSI were a part of the six predetermined areas to be targeted by this program. By early 1999, the program had made implementation or development awards to 11 regions. It is not clear whether these grants were made in the "six impoverished regions" or whether the target area for the program had been expanded from 6 to 11.

Funding for the implementation stage was restricted to those collaboratives or consortia that had received Development Awards. Implementation awards were expected to be funded at a level of $500,000-$1.5 million per year, depending on the size of the consortium, not to exceed $6 million in 5 years. Further, during their fifth year there was an opportunity to apply for funding beyond the initial 5-year implementation period in an amount up to $1.5 million per year, not to exceed $6 million in 5 years.

Rural Education and Schools Serving Rural Areas

While there are a variety of definitions of rural, we can reasonably say that two-thirds of the schools and approximately one-fourth of the students who attend public schools reside in rural areas of this country. Prior to the mid-1970s, rural education or schools with enrollments of less than 300 were not recognized in many of the statistical reports and there was little interest in what they were doing. The concept of a "one best model" for schools existed, and the quickest way to get to that model was to conduct massive consolidations. However, a nucleus of researchers began to look seriously at the data and discovered that some of these small schools were the most effective schools that existed. Largely, the criticisms of the small schools related to a "restricted curriculum" and inefficiency, i.e., operating costs per student.

Without going into lengthy discussions of the pros and cons of supporting schools with small enrollments, there has been a rather substantial movement to rural areas by people who maintain employment in suburban and urban environments. Oftentimes, these new residents are well-educated professionals who simply want to live in a quieter and less congested environment. This type of rural community is quite different than the thousands of villages and towns across the country that have served rural residents for generations. Their schools are the heart and pride of their communities, and they challenge efforts to consolidate with another community that has been their rival in school sports for years.

Today, some rural communities protect themselves from suburban sprawl by restricting the number of acres that can be sold from farmlands for housing. Residents value their lifestyle and the institutions of their communities, including the local schools. Where schools have been closed for whatever reason, this has triggered the decline of the community as a social institution and as a business factor for the residents. Large discount stores have forced the closure of family-owned businesses, and government agricultural programs have on occasion "emptied" rural communities of many of its residents. Coupled with the lack of employment for young people, rural communities that are far from large cities or major transportation routes have declined and will likely continue to do so in the future.

The RSI program was designed to address the science and math needs of these areas, i.e., those that are "highly rural and poor." Some rural families have considerable wealth in the form of land and equipment, but they are income poor. A common pattern is for one or more adult members of farm families to work off the farm. As a result, farming is done in the evenings and on weekends, which leaves little time for these hardworking people to share time with their families and especially their children. Plus, much time to support the school or become involved in school-related work is not available.

Schools in rural America range from a few remaining one-room schools to large schools with several thousand students that serve an entire county. The smaller the school and the more geographically isolated it is, the more

difficult it is to attract well-qualified teachers, especially math and science teachers. Oftentimes, provisional certification or emergency is the route followed to address the unavailability of teachers in these areas. Also, there may be only one high school science teacher, and if he/she goes, the program goes as well. Thus, there is a real need for a written curriculum that teachers follow to ensure continuity for students.

However, it is interesting that charter schools and private schools have been developed in the interest of some of our more privileged parents, and they have adopted many of the characteristics of small schools serving rural areas, i.e., small class size, individualized or small group instruction, parental involvement, community-based instruction, looping arrangements for assignment of teachers, etc.

In the last 25 years, rural education has become a much more prominent fixture in education research. The National Rural Education Association (NREA) has grown from a semisocial/professional affiliate of county school administrators to a sophisticated body of professionals from K-12 schools, higher education, government agencies, and business and industry. It has a research component in which research is encouraged and recognized in various ways. A number of rural education centers around the country were developed to serve as advocates, provide needed services, and conduct and coordinate research appropriate for small schools in their service areas. The ten nationally funded regional research centers across the U.S. have worked under directives that a specific amount of their programmatic resources (25%) must be allocated to rural schools and their needs.

In summary, rural education is as diverse as is rural America. Some schools are financially well supported with the most up-to-date technology supporting some of the most creative instruction and curriculum you can find. On the other hand, there are schools serving rural areas that are without adequate resources and incapable of much improvement. Yet, there is the entire range of schools with varying capacities for offering students quality programs in math and science that could launch them into promising professional careers. Some limitations or potential barriers for these students are financial, and some are due to lack of opportunities. It is in the interest of this country and it is a right of all students to have an opportunity to develop to the fullest of their academic capabilities. Some schools within the realm of rural education, just as some in urban and suburban areas, meet these expectations.

In 1995, the Association for the Education of Science Teachers (AEA) devoted its yearbook to "rural science education." A number of other papers and research reports related to rural education can be found in *The Rural Educator*, the official publication of the NREA. For those seeking further information regarding rural education, various reports and writing by such authors as Paul Nachtigal, Jonathon Sher, Jerry Horn, Robert Stephens, and Toni Haas are recommended.

The Drivers of Education Reform

While the goals of the RSI program are prominently stated, a set of six elements of achievement toward systemic reform were identified and disseminated by NSF. These elements became known as the "Drivers of Systemic Reform," and they became the focal point for much of the planning, operations, and planning of the RSI program. The drivers, as developed and promoted by NSF, are listed below.

Implementation of a comprehensive, standards-based curriculum and/or instructional materials aligned with instruction and assessment, available to every student served by the system and its partners

Development of a coherent, consistent set of policies that supports provision of high-quality mathematics and science education for each student/excellent preparation, continuing education, and support for mathematics and science teachers (especially of the elementary level); and support for administrators who have responsibility for implementing science and mathematics education reform

Convergence of all resources that are designed for or that reasonably could be and to support science and mathematics education—fiscal, intellectual, and material—both in formal and informal education settings—into a focused program that upgrades and continually improves the educational programs in mathematics and science for all students

Broad-based support from parents, policymakers, institutions of higher education, business and industry, foundations, and other segments of the community for the goals and collective value of the initiative

Clear evidence that the program is significantly enhancing student achievement and participation in science and mathematics through a set of indices that might include achievement in standard and performance-based tests, portfolio assessments, course enrollments, college admission rates, higher level courses passed, advanced-placement tests taken, perceptions of local employers, and college majors in SMET

Significant reductions in the achievement of disparities among students that can be attributed to socioeconomic status, race, ethnicity, gender, or learning styles

Because of the nature of rural schools/-communities and the timing of this evaluative study (late 1998 and early 1999 with an expansion in 2000), a number of issues impacted the study. For the sake of understanding them, I have related them directly to the most appropriate driver.

Almost every state initiated actions to create and implement standards and benchmarks

with an accompanying set of mandated statewide assessment instruments. Thus, action to align curriculum with state tests occurred. Were actions to align the science and math curricula a mutually supportive endeavor (NSF programs and state requirement) or a timely coincidence? Further, the No Child Left Behind (NSLB) initiative by the federal government had late impact on this area of reform. However, the consortia that served as the focus of this evaluative study occurred before NCLB became a significant consideration.

Policies in many small/rural communities are patterned after a generalized set often promulgated by the state association of school boards. In effect, a set of policies that cover the required elements of the operation of a school district serve as the basis for some customizing to meet local demands. Further, the specific aspects of "schooling" that served as the focus of the RSI program are not addressed in school district policies. However, a number of practices are commonly known and understood, and in effect these serve the purpose of written policies. In rural communities, informality is more often the manner in which education programs operate. For example, the science teacher for the high school might be given the responsibility for reviewing textbook options without there being a specific policy as to how that will occur. In a larger and more urban setting, there is likely a specific set of policies that deal with the manner in which review committee members are selected and how such a review will be conducted and considered by the local school board.

Resources in many school districts are scarce and hardly of such magnitude that major shifts can occur. However, simply defining that library materials or software will first be used to address science or math needs would be a positive indicator that this driver is being seriously considered. Financial resources really became the focus of this driver, even though it is much broader than this, including a call for converging intellectual capital into this effort.

Broad-based support (from parents, policymakers, etc.) has a variety of operational interpretations. Something as noncommittal as attendance at planned events or willingness to be listed as a member of an advisory committee or board can be construed as evidence of broad-based support. However, this author has a much higher standard for "broad-based" support, which would include making substantial commitments of financial resources for professional development for science/math teachers, assignment of personnel by a university or company or willingness of an individual to work with a science or math teacher over a long period of time to develop inquiry laboratory activities, parents who are willing to commit several hours a week to a specific task related to improving science and math experiences for children and youth, or a community group's efforts to raise substantial amounts of money to purchase up-to-date technology for the school, etc.

Clear evidence that the program is enhancing student achievement is difficult to discern, since there are any number of ongoing interventions in schools. To attribute success (or failure) to any one of them is a bit of a stretch of both logic and good research. The types of achievement included with the driver are meaningful and observable but, unfortunately, the tenor of the times focuses on only one measure of achievement—the

results of state-mandated tests. Since most of the RSI consortia are multistate projects, it is difficult to interpret the various reporting systems of the states and/or provide clear evidence that the test reflects the instruction to which students have been exposed. Certainly, the alignment of the curriculum with a common set of standards helps alleviate this problem.

The sixth driver relates to the reduction of achievement disparities among historically underserved groups. In the main, this standard would usually be focused on groups of particular racial/ethnicity characteristics. In the RSIs, there is usually only one racial/ethnic group represented, i.e., Hispanic/ Latino, Black, White, Native American/ Indian, etc. Practically all groups attending these schools are historically underserved, poor and largely isolated from public learning institutions (museums, research universities, etc.), and children of parents who are poorly educated with few opportunities for postsecondary employment in situations requiring advanced science or math. Necessarily, one must really compare the RSI schools against other schools that are of a similar composition but that are not RSI participants or all other schools in the state.

Objectives and Research Questions of the Study

The objectives of the study being reported in this document, The Rural Systemic Initiatives Evaluation Study, are listed below:

1. to develop a system of indicators around each of the identified six drivers of educational system reform
2. to determine the perceived relative importance and value of each of the drivers and indicators for reform in RSI schools in selected communities
3. to determine the status of innovation/reform within selected communities with respect to factors thought to support or serve as barriers to innovation and education reform
4. to determine the ways and the extent to which the perceived importance and value of the drivers and the characteristics of the community impact on systemic reform effort and student achievement in mathematics, science, and technology

With the expansion of the program to include an additional consortia in 2000, the following research questions were added to the study.

- What new or different forms of student assessment and teacher effectiveness have been developed and used as a result of curriculum transformation and an alignment with state or national standards in science and mathematics, and how were these developed and used?
- What contextual factors (within and across collaboratives) serve to support reforms that result in or are associated with the development and implementation of standards-based curricula?
- What processes and conditions are essential for effective partnerships within large-scale collaboratives that are characterized by large geographic distances between entities and multiple/potentially contrasting governance arrangements?
- What considerations have been given to the use of technology for enhancing the accessibility and effectiveness of math and science instruction and communication within and among collaborative members?

Methodology of the Study

As stated earlier, this study of the National Science Foundation's Rural Systemic Initiative was intended to better understand these major efforts by consortia of school districts and other entities to reform/improve science, math, and technology education in rural America. Further, the study was designed to be conducted from the perspective of the rural school/community, not from the perspective of the administrators of the RSI consortia. The study was not intended to determine the effectiveness of individual RSI groups or even the success of NSF's RSI program. Thus, at times, our observations and findings may appear counter to those who have taken a different slant on the study of SIs and/or other large-scale improvement efforts, including evaluators of individual projects who characteristically choose to identify extreme examples of observed success (or failure). We often refer to this as "cherry-picking," which we think serves a purpose but may be not be the most solid basis for decision making with long-term potential for impact.

We have already explained that while all the schools generally are from rural areas, they are both unique and inclusive. The uniqueness is generated from the requirement that they must be given an extreme "ruralness" index (8 or 9 on the Beale Code developed and widely used by the U.S. Department of Agriculture), and they are unique in that a large percentage of the students must be designated as impoverished by U.S. Census definitions.

To try to address a broad base of issues and research questions, we chose to implement an array of methods that are truly indicative of mixed-model methodology. In that regard, we used surveys of targeted groups on specific aspects of the study; case studies in 15 communities; reanalysis of selected publicly available achievement test data; direct observations of classroom practices; interviews with a wide variety of stakeholders; focus group meetings with educators, parents, other and community personnel; and document reviews. Further, we couched the study in a loosely constructed application of the CIPP Model of evaluation with particular attention to the context and process elements of this model.

The case studies were generally the most interesting and produced the most enlightening descriptions of the context of the community and the "gut feelings" of informed persons. The case studies were conducted over a period of 2-4 days by a team of three or more specially selected personnel. One member of each visitation team was a member of the Research Advisory Team. A manual of procedures, entitled the *Site Visitors' Guide for the Rural Systemic Initiatives Evaluation Study* (1999), was developed as a part of the project. This manual/guidebook served an important function in maintaining focus and consistency in the case study visits. It included sample visitation schedules, background information on case studies/qualitative studies, and researcher worksheets for recording evidence on each of the six drivers.

The Research Advisory Team

The Research Advisory Team (RAT) was an important component of this study. This

group of ten professionals, all known for their specialized expertise and experience, were carefully selected and invited to participate prior to submission of the proposal to NSF. Every person on this team readily agreed to participate on first request. Members of the RAT are listed below along with their professional affiliation, state of residence, and area of expertise.

Enochs, Larry - Oregon State University, (OR)–science education

Hall, Gene - University of Nevada, Las Vegas, (NV)–science education and education reform

Harris, Mary - University of North Dakota, (ND)–education reform and teacher education

Jess, James - CAL Community Schools, (IA)–rural education and school administration

Nachtigal, Paul - Annenberg Rural Challenge, (CO)–rural education and education reform

Newlin, Joe (deceased) - National Rural Education Association, (CO)–rural education

Oliver, Steve - University of Georgia, (GA)–science education

Sanders, Jack - SERVE, (NC) - rural education and educational research

Stufflebeam, Daniel - Western Michigan University (MI)–evaluation

Stephens, Robert - (formerly University of Maryland), (OK)–rural education and regional service centers (Succeeded J. Newlin)

Webster, William - Dallas Independent School District, (TX)–testing and achievement assessment

The RAT served in various capacities throughout the study, sometimes working as a group and other times as individuals or subgroups, depending on the needed area(s) of expertise. For example, as a group, they identified a long list of possible indicators for each of the six drivers and served as participating subjects in the Delphi technique used to identify those for which there was at least 80 percent agreement after two rounds of the Delphi procedure. (A full report of this effort is referenced as *A Report on the Identification and Validation of Indicators of Six Drivers for Educational Systemic Reform* by Russon and Horn, August 1999.) In other instances, several RAT members reviewed and helped assure validity of survey instruments, reviewed data and offered interpretations, planned additional substudies as questions and issues arose, provided feedback on publications and presentation materials, and served as members of the case study visit teams. In total, the Research Advisory Team, which was composed of some of the best minds in their particular fields, provided valuable assistance and added to the project's validity and credibility.

The Case Studies

Small teams of professionals with complementary expertise and experience conducted case study visits to obtain a snapshot of the schools and communities and to understand how the systemic reform effort was being received and applied in this particular setting. The common goal was systemic reform and not the evaluation of one approach or another.

From a list of schools given to Dr. Horn by each consortia administrative head (PI or PD), two schools/communities were selected for each of the initial three RSI projects and three were selected from each of the three local projects included in the expansion of the evaluative study. The primary criteria for selection included (1) active participation in the project, (2) includes grades K-12, and (3) typical of rural schools in the projects. A list of the selected schools by consortia follows. (Schools chosen for case study sites were given the option of not having their name used in public documents and none requested such consideration.)

- UCAN–Gila Indian Reservation (AZ) and Wagon Mound (NM)
- Delta RSI- Humphreys County (MS) and East Feliciana Parish (LA)
- Appalachian RSI-Cocke County (TN) and Rockcastle County (KY)

Three study sites were selected for each of the latter three consortia. A more purposeful selection occurred here, because there was a desire to select schools/-communities with particular characteristics, which will be discussed later in the findings. The study sites for the Texas, Michigan, and Coastal RSIs are shown below.

- Texas RSI-Clarendon (TX), Carrizo Springs (TX), and Pittsburg (TX)
- Michigan RSI-Nah-Ta-Wahsh Public School Academy (MI), Baldwin (MI), and Whittemore-Prescott (MI)
- Coastal RSI-Charles City County (VA), Marion (SC), and Elizabeth City (NC)

After being selected as a potential case study site, Dr. Horn or his designate made an initial visit to each study site to discuss the purpose and plan for the case study, to address any concerns of the local school district, and to get official approval for the visit. Of the school districts nominated, only one did not grant approval for the visit; that one simply was nonresponsive to repeated efforts to meet with the superintendent.

The case study teams were composed of one or two project staff members and a member of the RAT. With the Site Visitors' Guide providing a blueprint, each case study was conducted over a period of 2-4 days. In the case of the Coastal and Michigan RSIs, two visits were conducted, since these RSIs were in their earliest stages of operation and we wanted to give additional time for development before completing the observations and finalizing the report.

Whenever possible, the team members obtained lodging and had their meals in the local community in order to obtain some informal input and to get a sense of the context of the school and this community.

A draft of each case study report was shared with the designated contact persons in the case study schools with instructions to read them for accuracy and to provide suggestions for improvement. In the main, feedback consisted of corrections of titles or names and/or other minor modifications. In no case were there objections to the observations, perceptions, or findings as expressed in the reports.

A final version of each case study was made into a separate report, with sections describing the history of the development and education of the area, socioeconomic information, description of the school/school district, involvement and major activities of the RSI, student achievement and accomplishments, and observed presence of the six drivers of systemic educational reform. Each report is available on the project's Web site <http://www.wmich.edu/evalctr/rsi/>.

The Surveys

Reports on two surveys are included in this report. The first was administered among stakeholders in schools and communities where case studies were conducted. This survey focused on perceptions regarding the drivers and other aspects with the realm of systemic reform. The full results of this survey are reported in two volumes (*A Summary of RSI School Personnel's Perceptions of the Drivers for Educational Reform, April 2001* and *A Summary of RSI School Personnel's Perceptions of the Drivers for Educational Systemic Reform–Part Two*, September 2002). In total, there were 797 respondents to this survey, with 524 from ARSI, UCAN, and Delta sites and 272 from Michigan, Texas, and Coastal sites.)

Another survey was administered to schools within five consortia that had been identified as "having participated with a reasonable level of involvement for the course of two or more years by the principal investigator (PI)." (UCAN was dissolved as an operating consortium at this time and was not included in this effort.) This loose definition was necessary because participation in an RSI consortium was voluntary after eligibility was determined.

This survey was sent as a school district packet with instructions to distribute a copy of the survey to "a building principal"; the school district RSI contact"; and the "local facilitator, teacher partner, or local person who has substantial involvement in the RSI program." A total of 195 school district packets were distributed, and the response rate from individual groups ranged from 11 percent from Coastal RSI "local facilitators" to 80 percent for Michigan contacts. In summary, completed and usable survey forms were received from 79 "administrative contacts," 45 "school principals," and 55 "local facilitators" for a total of 179 respondents This survey was intended to obtain perceptions and information about the RSIs' impact on various aspects of the school program and a comparison between what they expected and what really happened.

The Substudies

Two major substudies of the project are reported in this document. Both related to comparisons of student achievement between a selected group of RSI schools and a comparable group of eligible but not participating RSI schools that were matched on selected variables (enrollment size, minority representation, and percentage of economically disadvantaged students, etc.). One substudy focused on Texas and the other on Kentucky. These two states were selected because it seemed that the RSI serving each state had demonstrated a substantial amount of growth and maturity at the time of the time of the substudy (~2004), a state testing program was fully implemented, and state test data and other school information were accessible through public interconnections. An additional and smaller study of Mississippi schools was made in an attempt to determine

the extent to which the initial findings were state specific.

Various other data gathering techniques were used in the overall evaluation project, including review of documents generated by project personnel, external evaluators, internal assessment staff members, and others; classroom observations; focus group meetings; and interviews/discussions with RSI project and NSF program personnel. However, we are confining this report to those elements and procedures described above, which we believe more directly reflect these systemic reform efforts from the perspective of the local schools and communities. The case studies provided a wealth of information about the context and its importance in these poor, rural communities and the perceptions of the input and impact of the effort. These points are included along with additional information in the next section.

The Findings

The findings from this extended study of the Rural Systemic Initiative of the National Science Foundation are based on a mosaic of data sources and investigations that span some 19 states, each with its own set of standards for instruction and definitions of achievement. We used an array of mixed methods, which produced both quantitative and qualitative results, in an effort to understand the context of this uniquely defined set of schools and communities, to observe how each RSI and each school approached "systemic reform," to assess the extent to which reform/ improvement has occurred in terms of the presence of the drivers, and to determine what factors support or serve as barriers to systemic reform.

We began this effort without preconceived notions about the NSF program, and we did not restrict ourselves to considering a set of research hypotheses. We produced more than 20 separate reports; generated hundreds of pages of field notes; reviewed many sets of test data; and collected stacks of documents and other materials describing individual RSIs, school districts, and individual schools. Whenever possible, we have verified observations and findings through triangulation of data sources and methodologies. As Sharan Merriam emphasized in a book published in 1992, we are not beginning the analysis of data, we are organizing and refining our findings and stating our discoveries. And, of course, we will always wonder about the extent to which we can generalize our individual findings and to what extent there are confounding factors that make that goal an impossibility. Thus, we will describe our findings with as much explanation of the context as reasonably possible. In the remainder of this section, we have organized our findings around some simply stated questions to help ensure both interest and understanding.

Who did the RSIs serve?

The regulations for participating in the Rural Systemic Initiative program of the National Science Foundation are specific and restrictive. Basically, to be eligible, a school must be classified as highly rural and poor, with at least 30 percent of its students identified as impoverished. However, this is a grant program and not an entitlement program, i.e., a school had to be located in an area for which a successful proposal had been submitted to NSF and had to be invited to participate. Aside from the Tribal Community Colleges, the initial areas were Appalachia, the Delta, the southwest (Utah, Colorado, Arizona, and New Mexico), and Alaska. We chose to focus on the Appalachia, UCAN, and the Delta, because we perceived these to be more closely affiliated with the schools serving the "traditional" rural communities of this country. For Appalachia and the Delta projects, this was an accurate perception, but it was only partially accurate for UCAN. In the UCAN project, a number of Tribal groups spanned across communities and had multiple governmental jurisdictions; thus, some of the sites were anomalies.

The communities ranged across a broad array of peoples, with the majority of them economically poor and with little hope of major improvement in the near future. In some instances, only 1 person in a large

extended family had regular employment and, possibly by default or bad luck, was the sole support for 15 or more persons. On the other hand, almost every community had well-to-do individuals and families that enjoyed considerable wealth and property. Each community had its own unique history, which is richly described in the case study reports.

A rather common finding was that there was a comparatively low level of educational attainment (less than a high school diploma) among many parents of children in the schools. As such, they were limited in their ability to seek higher paying employment or gain entry into technologically-based positions. In the main, they were destined for employment in low-paying service jobs, seasonal work in agriculture or food production enterprises, or other hourly work in industries such as piecework in local factories.

Because of one RSI's location near a major theme park for entertainment, employment for poor and not-well-educated persons was available in neighboring towns. In one instance, a county had a number of state institutions (prisons and a mental hospital), which provided a number of jobs for locals and a career goal for many students.

It should be pointed out that some high school graduates sought entry and reportedly enjoyed some success in largely regional state universities and community colleges.

There was greater racial/ethnic diversity across the consortium than there was within case study schools. For example, a consortia might have a mixture of schools, some largely Hispanic, some almost entirely white, and others with an almost totally African-American population. However, individual schools show little diversity. In Mississippi and in some other locations, the public schools serving RSI schools had an almost 100 percent African-American enrollment, while nearby private schools or "academies" served the white members of the community.

We commonly think of diversity in terms of race or ethnicity, but there are other forms of social and economic diversity. In many of the communities, there is clear evidence of the "haves and have-nots." In the South, i.e., the areas served by the Delta RSI and portions of the Coastal and Appalachian RSIs, one finds families that have controlled the wealth of the area for hundreds of years as well as some of the "newer" wealth enjoyed by professionals who have moved to estate-type housing and others who have become successful in the few businesses or industries of the area. School-age children of the more wealthy families usually attend some form of private schooling. So, while the region has some diversity, the schools are considerably less diverse.

In Appalachian and Texas RSIs, the schools more accurately reflect the composition of the community, since there are fewer private schools available and many of the communities are homogeneous in regard to race. Also, there is some evidence that there is less variance in family income. However, every community has families that are very poor and a few that are quite wealthy by local standards.

Probably the most common type of school district was a "county school district" that was the latest stage of consolidations of smaller K-12 school districts or possibly K-8 school districts. Forced consolidations have historically resulted in bitter disputes among families and often within families, loss of

identity for one or more communities within the county, and a general loss of support for schools across all segments of society. Such is the case in some of the communities served by these RSIs. However, in one case the current school district is the result of an active process in which multiple K-8 districts wanted to have a common high school. In another instance, the community had been a summer retreat for well-to-do minorities from regionally located families, but with the retreat of this industry, the small summer homes were becoming "cheap" full-time residences for persons from nearby cities.

The UCAN RSI contained a range of schools, including regular public schools, Board of Indian Affairs (BIA)-run and BIA-supported schools, Tribal schools, and semiprivate academies of one form or another. The Gila River Reservation in Arizona was one case study site. Along with multiple governmental jurisdictions and sources of financial support, it served only Native American children enrolled in grades K-8. There were no high schools on the reservation. Quality of housing and family income varied considerably, as there were some employment opportunities on the reservation that provided stable incomes, while many residents relied on some form of government support. A financially successful casino provided some jobs and a considerable amount of income for the tribe, which was investing this into the infrastructure of the community rather than dividing it up among registered members of the tribe.

Another aspect of "rural" is geographic isolation, and this was clearly evident in our study. While we generally think of distance as the determiner of isolation, other factors produce this effect, i.e., severe winter conditions, mountain ranges, rivers, etc. However, isolation can occur by simply not feeling safe or secure in leaving your home environment, as explained about reservation children, hill people in Appalachia, Hispanics in small communities in the southwest, and African-American children in the Delta.

Isolation also occurs when you have no physical means to travel to a larger city/community, which is not rare among poor residents. There are virtually no public transportation systems in rural America. At the same time, distance may not be a factor of isolation in a west Texas town where people may drive 50 to 75 miles for dinner at a restaurant or to attend a sporting event. While there may be a general feeling of isolation, this is not to say that people living in rural America are not aware of world news, thanks to satellite communications, cell phones, etc.

The students in the RSI schools had relatively high attendance rates, except for those who might live in areas that have winter weather conditions that close roads for periods of time, i.e., certain mountain regions of Appalachia, the upper reaches of Michigan, etc. An exception to high attendance rates would be among high school students in many of the reservation schools and to some extent in the highly Hispanic communities of Texas and the southwest if you consider dropout as a form of nonattendance. Certainly, elements of the No Child Left Behind legislation and the associated regulations will likely have an impact on both actual attendance and definitions of dropout rates.

In summary, the RSI serves students that it purports to serve in its eligibility requirements, i.e., poor children who live in rural areas. However, the program is not available to all rural children, and since it is

not an entitlement program, someone or some group must develop a consortium and write a program that is funded by NSF to be a participant in the program or receive services through the program. Beyond this, the communities are generally void of potential employment that would make math and science priorities and role models for student to emulate in their K-12 studies or career planning. Adults are relatively poorly educated with half or more in many instances without high school diplomas. Jobs of any type are limited, and those that might be available are low paying with little opportunity to advance. Some communities are without grocery stores, medical facilities, and other businesses or service providers that are taken for granted in larger communities. Yet, there is a sense of pride in rural communities that is reflected in parents and others in attendance at school events, statements made by all types of persons in the community, stories in local newspapers, etc.

Since teachers are targeted groups in the RSI program, it might be well to mention them in this section. For some unexplained reason, most of the RSI activities that we observed were in elementary or middle schools. States generally have a K-8 type of certification that allows a teacher to teach all subjects within a self-contained classroom. Obviously, this situation is ideal for most elementary schools with students in grade six or below, but middle schools often provide instruction in specialized classrooms—i.e., math, science, social studies, etc.—and this may require a different type of certification.

Shortages of certified and qualified math and science teachers are well known, and this is particularly true in rural areas. Thus, many of the teachers teaching science and math in middle and high school are provisionally certified. In effect, this means that they do not have the qualifications for that subject area, but they may be certified in another area.

Provisional or emergency certificates are usually issued for a period of 2-3 years and often with a renewal option. For example, a teacher certified to teach social studies may apply for provisional certification to teach science with an expectation that he/she will be working toward full certification in that area over the next 2-3 years. Schools are granted approval to hire a provisionally certified teacher if they can document that a fully certified teacher is not available.

At one of our case study sites, every math and science teacher was provisionally certified; and in conversations with individual teachers, there was not a clear indication that they were seriously working toward full certification. The annual turnover of teachers in this school was about 70 percent per year, so they would either be teaching elsewhere in 2-3 years or they would be assigned to another subject area with a different provisional certificate. A student could go through every science and math course in this school and never have a teacher who was certified or even minimally qualified to teach math or science. While school administrators can be criticized for their “creative” methods to “legally” place a teacher in each classroom through use of provisional (or unqualified) teachers, what choice do they have? Teachers are simply not available to teach science and math in many rural communities.

When we added the latter three RSIs to our study, we decided to seek out case study sites that might be typical of expected groups of schools within the consortia and ones that

have recognizable characteristics, as discussed in rural education circles and with the advice of selected members of the Research Advisory Team. For example, in the Texas RSI we sought sites that were typical of west Texas cattle, oil, and gas country; one that was relatively near the Mexican border with a high percentage of Hispanic students; and one that was heavily influenced by a single large industry that attracted large numbers of "outsiders" as employees. For the first category, we identified Clarendon, a community near Amarillo that has a local community college and serves a largely ranch-based economy, but a number of the residents commute to jobs in Amarillo.

Carrizo Springs was the site selected to represent many communities in the southwest that have a mixture of long-time families of Mexican/Spanish heritage as well as a number of more recently arriving residents from Mexico. In this particular case, the school district had recently undergone a consolidation process.

For the single or one predominant industry community, we selected Pittsburg, located in eastern Texas relatively near the Arkansas border. This community is the home of a huge poultry growing and processing industry, founded and primarily owned by a long-time member of the community. This industry has attracted low-paid workers from other areas, including Mexico, who brought a different culture and set of education experiences and expectations to this rather traditional small rural community.

This information is provided to the reader as an indication that there was no attempt to study every community or even to find an "average" community, which simply does not exist in these geographically large and diverse settings of people and cultures. We thought it was far better to identify typical or representative communities of those that we might find in each consortium. Further, we wanted to conduct case studies in schools and communities that had been active participants in an RSI. Membership was voluntary, as was participation; and we thought it to be far more valuable and appropriate to devote our efforts to those sites that were or had been heavily involved, which was verified by the PI/PD of each project.

In summary, the RSIs that we studied served a widely diverse set of schools and communities. Some RSIs were fairly homogeneous in terms of types of schools, racial/ethnic diversity, and socioeconomic status, while others, such as Texas and Michigan, included a variety of schools that were typical of those in their area.

***What was the nature and form of the RSI assistance/programming*?**

Each RSI worked with schools and other partners in the development stage to identify needs and programming that were intended to meet NSF's goals for the RSI program. About three different approaches appear to prevail, one most closely associated with each of these RSIs—Delta, Appalachian, and Texas. To help understand these approaches, the goals of each, as extracted from their literature, are listed below.

The goals for the Delta RSI are these:

Enhance the K-12 learning environment in the targeted counties and parishes to address each child's needs and promote each child's

achievement in science, mathematics, and technology.

Increase the capacity of local communities to build and maintain quality science, mathematics, and technology educational programs for each community's children.

Establish mechanisms to champion policy development and implementation at local and state levels in support of sustained reform in science, mathematics, and technology.

Create regional infrastructure that will utilize intra-and interstate alliances to develop sustainable regional improvements in science, mathematics, and technology.

Three strategic goals for the Appalachian RSI are listed:

Strengthen the knowledge and skills of teachers in grades K-12 so they can teach mathematics and science more effectively.

Establish a timely and coordinated system for helping schools enhance their capacity to deliver active, standards-based teaching and learning environments on a long-term basis.

Build regional partnerships, local leadership, and local community involvement and support for long-term educational improvement.

The Texas RSI goals, stated as "attributes," mirror the six NSF drivers of systemic reform:

Successful implementation of the Texas Essential Knowledge and Skills (TEKS), the state standards-based curriculum framework, in mathematics and science.

District policies supporting TEKS mathematics and science implementation and systemic reform through campus administrative support and alignment of district improvement plans with TRSI attributes.

Alignment of resources to support systemic reform efforts and TEKS mathematics and science implementation.

Stakeholders' commitments to systemic reform of district mathematics and science education.

All district students reaching high academic standards.

As explained earlier in this document, this study was conducted in a manner that focused on the RSI from the perspective of the local school and community. Thus, we will not attempt to define or describe the consortial efforts from the projects' administrative perspective or stated intentions.

From what we heard at the local level, not much money ($10K -15K) actually filtered down to the school district level. Thus, whatever assistance and support derived from the RSI program are perceived to be mainly in terms of

leadership capacity building for education reform

- raising the awareness of the importance of science and math
- assistance in aligning curricula with state standards and benchmarks reflective of state-mandated tests
- teacher enhancement through group workshops and directed professional development

However, each RSI consortium developed somewhat unique approaches to provide these services. While these will be discussed more fully in later sections of this report, the single characteristic that seemed to define each of these three RSIs is as follows:

- Texas—assistance to individual teachers in the form of class quantity materials and focus on state-mandated tests
- Appalachian—resource teacher and curriculum review process
- Delta—services provided by teacher leaders and field coordinator provided services

The Coastal RSI showed a good deal of similarity with the Appalachian RSI, but on a considerably smaller scale. The Michigan RSI served rather distinct types of schools, each with more clearly defined differences in needs. The approach was to identify a consultant who would work with a school on a long-term basis, with a focus on meeting these locally identified needs. [A reverse study visit by NSF staff and representatives forced this project to change its approach and leadership personnel or lose its funding. This caused a great deal of disruption within the consortium and added to the participating schools' mistrust of the long-term commitment made to them in the initial planning development stage.]

The UCAN project basically dissolved as a functional entity within the first few years of its operation. During its time of existence, it provided some much-needed assistance in curriculum alignment and a communications network across several states and stakeholder groups.

Although an attractive set of materials related to community involvement in the reform effort was developed by ARSI, there was little evidence of consortia-wide efforts that were viewed as effective by local schools.

The RSIs operated as umbrella organizations with relatively small staffs. In many instances the names of the PIs or PDs of the RSIs were not known in the local schools, since they were most familiar with the individual(s) who conducted workshops or provided on-site consultation services. For example, in the Michigan RSI, a math consultant was assigned to one school and worked intently with the math teachers. He was known by the front office and freely moved around the building from room to room during the times he was at the school. In the Texas RSI, specialized consultants made regular rounds to some schools and even responded to individual teachers' requests for laboratory-type materials to assist in teaching a lesson. These local consultants or persons who provided the assistance were in most cases employed or contracted by the RSI but did their work in local schools, either with some direction from the PD or completely based on an agreement with the local school.

How did local schools view education reform?

There are really two major issues to discuss here. One is what local schools and rural communities think of "outsiders" who have come to "reform" them, and the other issue is of what value or importance these same entities view the six drivers touted by NSF as evidence or indicators of reform in action.

Rural literature would lead you to believe that rural communities are skeptical of outside influence and would resist efforts to take control of their schools away from them. To the first issue, the leadership of the RSIs displayed an awareness of the rural culture and the prerequisite need that participation was voluntary and could be terminated at any time. Plus, not much was offered by the RSI and not much was expected. When consultants were used, which was often, the RSI attempted to select individuals known by the local community or to identify persons with reputations that supported their work with local rural schools. In essence, the myth that rural communities are resistant to outside influence is only partially true, if at all, in regard to the RSIs and their work in these consortia.

The other point about whether the six drivers are recognized as indicators of reform and to what extent they are valued in local rural communities is addressed by the data found in two substudies conducted by WMU. The full results of these substudies can be found in *A Summary of RSI School Personnel's Perceptions of the Drivers for Educational Systemic Reform* (April 2001) and *A Summary of RSI School Personnel's Perceptions of the Drivers for Educational Systemic Reform–Part Two* (September 2002). On a five-point Likert-scale response sheet (5 = Strong agreement and 1 = Strong disagreement), no statement related to the validity of a statement about the drivers or elements thereof was marked lower than 3.69 by the initial RSIs of this study and 3.23 among the latter three consortia. Ironically, the one rated lowest by both groups related to "broad-based support from parents, policymakers, institutions of higher education, business and industry, foundations, and other segments of the community for the goals and collective value of the program." The drivers related to a comprehensive standards-based curricula, coherent and supportive policies, and administrative support were the highest valued drivers.

In terms of the locus of control for the drivers or activities/responsibility for accomplishing what the driver reflected, this was fairly consistently placed with the teacher with the exception of policies and broad-based support for student achievement. Noticeably absent from being listed as having substantial responsibilities were building level administrators (principals), which appears to be inconsistent with most effective schools research. However, we noticed that the building principal was not a major player in most RSI activities, especially when a "teacher partner" or someone with responsibilities for leading the local effort and providing on-site assistance for teachers was a part of the overall scheme. It is not clear whether this was by design or whether it was an unintended outcome. In on-site interviews, principals seemed to be minimally informed or involved in RSI work.

In summary, we found no evidence that there is an inherent resistance to outside assistance for this program among rural schools or

within rural communities. It is also fairly evident that the community (parents and others) was not very aware of the RSI as a major intervention in the local schools. This may be the result of little self- promotion by RSI projects, the reality of the RSI as being one of several ongoing school improvement efforts, or the simple fact that these rural communities do not have much involvement or interest in the schools at this level, i.e., above the experiences of their children.

What elements support large-scale collaboratives?

The National Science Foundation has developed and supported a number of initiatives for school improvement over a period of more than 40 years. Some have focused on the improvement of teachers through workshops and summer and academic year institutes. Other efforts centered on the development and implementation of inquiry/laboratory-oriented curricula for grades K-12 and for other specialized groups. Additional programs involved the enhancement of teachers' knowledge in subject matter fields as well as improved instructional techniques. Probably none have been designed to make such sweeping changes as those in the area of systemic reform—state, urban, and rural.

The rural component differs from the other two components in significant ways. The state systemics were operated by or in very close cooperation with an existing agency (state departments of education) that had resources and legal supervisory responsibilities over the schools it was to serve. The urban systemics dealt with one legal organizational unit (the urban school district), which also had a number of controls and oversight responsibilities. In contrast, the RSIs served vast geographic areas made up of many jurisdictional agencies/school districts and often multiple states.

Most, while not all, of the RSIs were founded by university-related personnel without formal ties to local schools, rural communities, or the state departments of education that had oversight responsibilities. The developmental grants were supposed to provide resources for building these collaboratives, which required the entrepreneurship and effective organizational skills of one or a few individuals and the willingness of many others to engage in planning a proposal for a collaborative that was new and untested.

From the beginning, the RSI collaboratives/consortia struggled to find a niche in the overall and ongoing school improvement efforts. Coincidentally, many states were engaging in developing standards, mandated student testing programs, and accountability systems for local schools. The RSIs recognized the opportunity and quickly became a project to help local schools align math and science as well as the other curricula with state standards. In other words, they identified a common need across schools and offered expertise and the capacity for providing leadership in this area. Schools welcomed this assistance, and by chance or good timing, the RSIs found a home.

As stated earlier, the RSIs received a substantial amount of money from NSF, but with the size of the coalitions and the number of participating school districts, there was little financial support that could or would go to individual schools at the local level. Each RSI developed a set of services it would

provide, and as long as the teachers who were the primary targets were satisfied, there was little reason to question participation.

Because of the size and complexity of the RSIs, there was an almost instant move to decentralize services and responsibilities. Thus, local schools identified a consultant or a resource member of the team as "THE RSI." School administrators were involved only in secondary ways or almost not at all in some cases. Inquiries about RSI activities in many of the schools resulted in the question being referred to the "teacher partner" or the designated contact in the school or school district. Interestingly, we found the school contact to be in the form of various persons, i.e., a superintendent, the high school counselor, the curriculum director, a teacher, the "grants" or federal projects coordinator, etc.

Coordinating councils involving project staff, school representatives, and others from various public agencies and the private sector were established by most RSIs, but when asked about specific operational and programmatic decisions, they did not appear to be critical to the process and certainly not a major decision-making body. In the main, they served as advisory bodies and a vehicle for communicating information about the consortium to their representative groups.

The PI or PD of the project was a key to the success of the RSIs. In some cases, the role was that of a CEO; in others, the PI was involved in day-to-day activities. Essentially, either a PI or a PD needed to be actively involved in the project and able to make decisions without taking it to a higher level. Some projects had very active PIs who liked to be out front with the project and to interact at a school level or at the classroom level if the opportunity presented itself. Someone had to be the motivator, cheerleader, and a good communicator among the various partners and the funding source.

Another critical element of a successful RSI is the ability to recognize needs and respond appropriately, whether that is to provide some information, offer a workshop on a specific topic, select a person who will be an effective consultant to a local school, etc. Schools—particularly rural schools—have had somewhat bitter experiences when they have been promised something and then nothing is ever heard from that group again or they are nudged out of the picture by larger and more powerful groups.

We expected to find sophisticated or at least innovative use of technology within the RSIs for administrative purposes as well as for the delivery of services, but that was not the case. In fact, we cannot cite an instance in which an RSI could be given credit for the invention of a creative use of technology in its operations. While one RSI tried to develop technology as a centerpiece of its operation, this was abandoned within a short period of time.

As a final word about what it takes to operate a large scale collaborative, it might be condensed to a rather simple statement—identify needs, provide timely and reasonable responses, listen to the partners, provide skilled and knowledgeable people who are able to work with teachers, let local schools set their course, and have the collaborative administered by a person who is creative, flexible, and willing to share successes with those who are most responsible for them occurring.

Impact

The impact of the RSI program and its scattered projects or consortia can be viewed from several perspectives. Individual project reports submitted to NSF and some external evaluators' reports cite instances of considerable impact and improvement. Often these citations are supported by examples of extraordinary increases in achievement by a school within a specific time frame, exemplary activities by persons who have been motivated by their involvement in RSI work, testimonials by students, teachers, administrators, or parents, and a variety of other positive outcomes. However, we have tried to avoid cherry-picking isolated instances of impact and focused on evidence of impact that is found in our investigations through various methodologies, i.e., case studies, on-site observations and interviews, and test data reanalyses. Further, we are particularly conscious of our overriding attempt to study the RSI program from the perspective of the local community. Importantly, we primarily have focused our evaluation of impact around the six drivers established by NSF as the areas of evidence that school reform is occurring. At the same time, we must understand that schools have a number of ongoing efforts for improvement. In not all of these cases are these efforts coordinated or even have the same goals; therefore, we must consider participation in an RSI as one such intervention, and impact compatible with the goals of RSI does not necessarily prove that there is a cause and effect relationship.

With regard to the implementation of a comprehensive, standards-based curriculum as represented in instructional practices, student assessment, and in every classroom, laboratory, and learning experience, it is not possible to say that this has fully occurred. However, it is possible to say that the RSI has played a major role in providing a base and a source of expertise for school improvement. As the RSIs were being developed and implemented, most states were requiring local schools to align their curricula with identifiable standards and benchmarks; and this would be carried forward into the state student assessment program.

Federal monies were made available through state departments of education to accomplish this goal and, if not by statute, certainly by statements of consequences for noncompliance, the seriousness attached to aligning the curriculum with established standards was clearly understood. At about the same time, the RSIs came onto the scene with some expertise and a focus for aligning the science and math curricula. Thus, a common goal was established, and the result is an almost unanimous response. However, when you take the other parts of this driver into consideration, there is considerably less positive evidence. In schools where case studies were conducted, we found the entire range represented with regard to a standards-based curriculum being reflected in instruction. More likely, we saw a strong tendency toward teaching to the test of the specific state. Some teachers reported that they planned instruction according to the standards, while others were trying to "guess" the questions that would be on the state test and develop instruction around them. Others conducted periodic checks as to the extent to which the standards had been addressed within recent times.

Local schools that had received the services of curriculum reviews—conducted either by RSI staff members or other external consultants paid with RSI funds—perceive this to be a valuable effort and one that enabled them to improve both the breadth and depth of their curriculum. This practice was confined to two of the six consortia studied. In others some type of curriculum review did occur, and these also were deemed as valuable.

As reported in one substudy (Stark, 2002), some of the changes that occurred in instruction include greater use of manipulatives; increased focus on concepts, problem-solving skills, and higher order thinking skills; more grouping and team work; an increase in the integration of the curriculum across all subjects; and an increased focus on students explaining what they were learning.

Almost anything that included materials was called inquiry teaching, which is a far cry from the traditional definition of inquiry teaching. However, we did see teachers engaged in some creative questioning techniques and other methods that they said were learned in RSI workshops.

There was some evidence that student assessment practices have been influenced by RSI activities. For example, teachers reported greater use of rubrics, open-ended response questions, checklists, etc., as a result of their introduction in RSI workshops (see p. 4, Stark, June 2002). In the main, we saw multiple forms of assessment in use.

The driver dealing with the development of a coherent set of policies took some thought and understanding on the part of the research team. Official policies in most small schools or for that matter fairly large schools are customized adaptations of a standard set of policies often developed by a contractor, e.g., a state association of school boards. These policies are relatively general and do not deal with the specific types of policies that would be reasonably influenced by RSI involvement. However, we decided that a "policy" does not necessarily have to be written and included in a policy manual. Thus, we began to recognize that defined practices, procedures, or requirements that were disseminated, understood, and followed were in effect the same as a policy.

In the site visit schools, about three-fourths of the schools were judged to be making moderate or greater progress toward having policies in place that support high quality math and science for every student. Such policies might relate to the number of credits for graduation, the types of courses that are required, regulations for teacher qualifications or requirements for completing professional development, use of resources/facilities, etc. Other instances directly reflective of a documented practice that could be covered by a policy were the regular review of test data to identify strengths and weaknesses in the instructional program and review of subject matter within a grade level or among teachers of the same course and vertically though the curriculum.

The perceptions of the various groups regarding the impact on policies are found in a substudy report (Horn & Tressler, 2003) in which the mean response hovered around 3 or the midpoint of a 5-point scale.

We saw little evidence that policies had been developed that pertained to an increase in the requirements/educational attainment for teachers or that modified the way teachers are

evaluated. In some cases, policies moved courses down to lower grades, i.e., biology from 10th grade for all students to 9th grade for advanced students, etc.; and these were said to be the result of comprehensive curriculum reviews.

The driver pertaining to the convergence and usage of resources to support science and mathematics education was determined to be strongly evident in about one-third of the case study sites with the other two-thirds showing some visible signs of that happening. The problem is that schools have very few resources to reallocate within an operating budget and grant funds are mostly in the form of entitlement monies, which have "strings attached" as to how they can be spent. The most available dollars for choice assignment are probably within the category of professional development. Questioning about the availability of dollars to support requests for attendance in professional development activities produced rather a generally positive response. Plus, the RSIs could and did provide resources to support professional development. That said, the total amount of school monies for professional development was enhanced by the use of RSI monies.

Other evidence of RSI activities influencing the convergence and use of resources could be found in the use of library monies and equipment monies that were often earmarked for science and mathematics. In summary, the RSI participation heightened the awareness of science and math and focused attention on the needs for science and math. Where science laboratories were found, they were lightly used. In one case, materials that had been delivered months, if not years, before were unopened and unknown to the science and math teacher of this school. Their discovery led to an internal debate about who should have priority on their use. In other cases, we saw some creative use of school grounds and a greenhouse for students' projects. Student gardens and study plots for plants were observed at schools on the Gila River Reservation, which also served as a source of vegetables for families in an area with one of the highest rates of diabetes in the country.

In one school, conversations with the library-media specialist revealed that she used any excess monies only for science materials. In another school, the school improvement committee could decide on where and how operational monies would be spent. During this period of time, science and math areas were given highest priority.

The Texas RSI provided classroom-quantity materials for individual teachers to use. This is a very popular service and one that distinguishes this RSI as a teacher-focused venture. A PI of another RSI emphasized the point that its major goal was to "develop local leadership for science and math," which requires a different priority for using project resources.

On a scale of 1 (Strongly Disagree) to 5 (Strongly Agree), stakeholders in the Coastal, Michigan, and Texas RSIs perceived that this driver (convergence of resources) was rated from 3.27 to 4.22 as an indicator that reform is occurring. In comparison with other drivers or elements of them, this was one of the lowest rated items.

One particularly noteworthy activity conducted by an RSI was designed to teach school teams what certain grant areas permitted and how they could leverage their resources through careful use of multiple

grants for a common effort. For example, professional development funds were permitted by one grant area and equipment could be purchased through another one. Combined, they could buy equipment and conduct professional development activities to teach how they could best be used in the classroom.

In summary, teachers normally do not have the authority to direct monies or the authority to determine how they can be used. However, the RSI initiatives seem to be opening their eyes to how they can let their needs be better known and how to support administrators who have to make decisions that direct scarce resources to areas of priority.

Parental support and involvement in the schools and the schooling of their children has been a long-desired goal of education. Yet, seemingly there has been little widespread success in this area. Unfortunately, the RSI program has not found the "silver bullet." Instances of local activities were successful in attracting parents to math or science nights or to science fairs, but sustainable programs that will greatly increase parental involvement were simply not found. ARSI's guidebook appeared to have potential, but personal communications with leadership personnel of that collaborative confirmed our suspicion that little progress was being enjoyed.

While we think the RSI effort was not very effective in this area, we would agree that "broad-based support and involvement" of parents and others would be evidence of true change and reform. This might be a particularly big challenge among the parents served by this program, because they generally have a low level of academic achievement (half or more without high school diplomas) and may be reluctant to become involved.

The accumulation and use of a broad and deep array of evidence that the program is enhancing student achievement is the focus of another driver. The impact of RSI work in this area seems to be coupled with the reliance on achievement test data as an indicator of successful schools at the state level. Some states included in the six RSIs of this study have been using statewide and high stakes testing for years. Clearly, the consequences of poor results over a period of years are well known and understood. Thus, schools in those states generally spend a good deal of time studying the data, identifying problems, and developing strategies to improve. Some would argue that this is simply another case of the tests driving the curriculum and, as a result, the children's experiences in the sciences are narrow and lack the opportunity for them to explore areas of interest and engage in inquiries that may require substantial amounts of time. Tennessee, for example, has embraced the idea of value-added assessment, and schools in that state receive data that help them understand school and teacher effectiveness. Other states provide local school data to explain how students do in specific areas of the tests, and this seems to be particularly useful in developing math skills in states like Michigan. Some of the professional development activities conducted by RSIs are focused on using assessment data for planning instruction and evaluating program effectiveness. Again, this has been a parallel result, since teachers are doing this in areas in addition to math and science; so the RSIs cannot be identified as THE reason, but they have added to the skill level of teachers and administrators in this area.

Overall, we see teachers and schools using multiple types of assessment. To some extent this reflects a broader array of evidence, but we do not see organized evaluations of instructional programs at the local or state levels. Informal evidence of success, such as student success at the next level, enrollment in courses that lead to career goals, etc., are not generally a part of decisions about the curriculum.

The No Child Left Behind legislation has required states to disaggregate data by various groups, which provides a good basis for determining that all students are achieving. As written, it appears that we are supposed to know who the "historically underserved" are, and that is not the case in the schools and communities served by the RSIs. In reading other research in education, one could conclude that the historically underserved are minority students, but most of the schools served by these RSIs are relatively homogeneous in terms of race/ethnicity. In effect, the RSIs are defined to address the historically underserved, i.e., the poor, children of poorly educated parents, and others with racial and ethnic backgrounds substantially different from the majority in the classrooms. So, this driver seems to be a somewhat moot issue in NSF's Rural Systemic Initiative, and it does not seem appropriate to consider the impact of the RSIs on this area.

Overall, we think that the RSIs have had substantial impact on

alignment of the curriculum with recognized standards

raising the level of awareness of the need and the priority of science and math in the schools, particularly at the elementary and middle school levels

creating better understanding and use of multiple achievement data for curriculum planning

developing local expertise to serve as a resource for other teachers

Certainly, one finds impact in other ways in specific locations. Individual schools and school districts accepted various roles in the RSI movement. Some were involved in the planning of the consortia and participated in developing the proposals to NSF. Reasonably, this group had developed a particular interest and ownership in the process. Others were invited to participate after overall funding from NSF was achieved, and this would put them into a different category as to ownership and interest. In some cases, one or two local teachers jumped at the opportunity to get involved, and they served as the nucleus of a local improvement body. There are instances in which a heretofore rather unknown teacher suddenly emerged as a leader among peers in the effort, and this is why it is so difficult and maybe inappropriate to judge a program across its total expanse. The stories of success (and failures) are at the local level.

Impact on achievement is one of the most important considerations. Unfortunately, we have been unable to identify data that would indicate that there is a consistent and generalized positive impact on student achievement. While each state is different, there is generally a state-approved set of tests that are administered on a prearranged schedule. For example, using criterion-referenced assessment instruments, a state

might test grades 4, 6, 8, and 10 in math every year and test in science in grades 6 and 10 and at the end of the biology course. Further, some states and/or school districts administer an off-year or annual, nationally-known, norm-referenced achievement test. It is presumed that the criterion-referenced tests are based on what the children are "supposed" to learn, based on state-approved standards. Scores are most often reported as percentage of students who pass the tests at specified levels, such as novice, proficient, etc., while the norm-referenced tests provide reports on the percentile of students within a national pool and possibly the school or school district as a whole. In theory, this pattern of testing provides a means for accountability for state expectations and a reference for how well students within a state are doing in terms of achievement compared with students across the country (as defined by the norm pool for the tests).

From on-site interviews with teachers, administrators, and others within the case study communities, there is a general feeling that students are doing better in science and math after (or as a result of) the RSI intervention. Queries for the bases of these feelings often focused on the increase in test scores for a particular grade level in a specified year, descriptions of individual student accomplishments, and "gut feelings" about student accomplishments. Seldom did school personnel or parent/community groups cite data from locally prepared or state originated school reports in support of their feelings or thinking. Specific questioning of school personnel revealed an array of interpretations of test data. More often than not, they were not very familiar with the data or how they should be interpreted.

However, it was important to conduct some substudies to determine if RSI involvement had an impact on student achievement. For the substudies completed in 2004 after the Appalachian and Texas RSIs had been operational for several years, we compared student test data of RSI schools to similar RSI eligible but nonparticipating schools and all schools in the state. We examined and reanalyzed publicly available test data and compared groups and looked for trends. (Full reports of these studies are found on the project's Web site at >http://www.wmich.edu/evalctr/rsi/<. From the Kentucky substudy, it was concluded that the ARSI program may have had some impact on students' mathematics and science achievement as measured by the academic index on the KCCT mathematics and science batteries. At all levels assessed (elementary, middle, and high school), the academic indices have steadily increased each year, although it is interesting that the matching school districts displayed similar trends of progress. Because both the ARSI and matching school districts experienced comparable positive increases, other factors besides the ARSI program may have contributed to increases. Disaggregating the 2003 mathematics and science academic indices for students qualifying for free or reduced price lunch revealed that ARSI elementary, middle, and high schools had slightly higher academic indices than both the matching schools and the state.

From a Texas study conducted in a similar manner, it was concluded that the TRSI intervention made some impact in student academic performance, especially in mathematics after one and two years of programming. However, the Texas assessment system had been substantially modified, and it may take two or more years

of statewide testing to fully understand the extent of the impact. At this point, it appears that the impact may be rather minimal in some cases and not consistent over time. For example, the TRSI group led the other three comparison groups (non-TRSI, Regional Educational Service Center schools, and the state), however slightly, on the middle level science scores in 2001, while in 2002, the last year of the administration of this test, they were the lowest of the four groups.

A similar study was done among a matched sample of 30 Delta RSI schools and 30 non-RSI schools in Mississippi. Each RSI school was manually matched on the selected variables that have historically been of concern in studies of this type. More specifically, these schools had an average K-12 enrollment of around 2,000 students, 80 percent minority (African American), 80 percent eligible for free or reduced price lunch, a special education population of 13 percent, an expenditure of $6,000/student, and an assessed property valuation of ~$25,000/student; and 36 percent of the teachers had advanced degrees with around 8 percent holding emergency certificates. Statistically, the 2 samples were determined to be equivalent.

From data derived from files of the Mississippi Department of Education, a variety of 2002 test scores were extracted and reanalyzed for this substudy, including the Mississippi Curriculum Test (math–grades 6 and 8), the CTBS (math–grade 6), and subject area tests (Algebra I and biology). Again, no statistically significant differences were determined. With other inquiries into these test data and others from previous years, there were no discernable indications that participation in the Delta RSI had affected the achievement of these students, as measured by these assessments. It might be important to note that even though these were selected schools, there were some variations among them. For example, the ranges on selection variables were 616 to 6,415 for enrollment; 33 to 100 percent for African-American minority enrollment; 35.4 to 95.4 percent of students eligible for free or reduced price lunch; $3,317 to 50,143 for valuation per student; and 2 to 24 percent for teachers holding emergency certificates.

Since the two groups were determined to be equal, we calculated a number of correlations between the selection variables and the various measures of science and math achievement for the total group (60 schools) as well as for the two subgroups (30 each). Consistently, there were large, negative statistically significant correlations between percentage of minority (African American) students and test scores and percentage of students eligible for free and reduced lunch and test scores.

In summary, it is difficult to find clear evidence that there was an overall consistently positive (or negative) impact on student achievement as a result of schools/school districts' participation in an RSI. Because of a number of other ongoing programs that are school specific, it is even more difficult to attribute changes to the RSI movement alone. Even as cautious as the above summary statements are, they still could be challenged. Again, we emphasize that individuals or specific schools might have been impacted substantially by an RSI, but there is not sufficient supporting data to say that this is a generalizable finding either within a state or across all states served by one or more of the RSIs that were included in this study.

Concluding Statements and Needs for the Future

Embedded in the sections in which the findings and statements of impact are discussed, one finds some indication of the evaluation of the RSI program. In terms of the objectives of the evaluation study conducted by The Evaluation Center at Western Michigan University, the following conclusions are appropriate.

A system of indicators for each of the six drivers was developed through the use of a Delphi technique using an elite set of professionals (Research Advisory Team).

The indicators were submitted for field validation in the conduct of 15 case studies and from surveys in which their perceived relative importance and value were indicated by RSI local stakeholders.

The status of innovation/reform within selected communities was determined by on-site case study visits at 15 sites. Further, factors that support and those that tend to serve as barriers were determined as a part of these visits and from data derived from interviews, focus group meetings, survey data, and direct observations.

Impact of the RSI experience has been determined through analyses of achievement test data, surveys, and direct observations. The importance of the drivers as a measure of this impact has been validated and reported.

We determined that there have been some changes in student assessment practices, such as direct observations, use of written narrative, performance testing, etc., but there have been little, if any, noticeable changes in the way teachers are evaluated as a result of RSI participation.

An array of factors within local schools and communities seem to be associated with active involvement and systemic reform. These include the identification and training of a local resource person/coordinator, external pressures to align curriculum and perform on high stakes testing, professional development that provides the skills and knowledge to align curricula, creating new and creative instruction, use of available resources to purchase needed materials, support for professional development, and sustaining initial grant-related ventures, etc. The myth that rural communities in themselves are barriers to reform has not been confirmed, and rural communities and schools serving rural areas seem as willing as any other community to accept change and improvement in their schools.

Partnerships, as represented by the large RSI consortia, are fragile and can be too large and diverse to be effective. One failed largely because of multiple jurisdictions, different cultures, and the vast area it was designed to cover. Early involvement in the planning and organization of the

partnerships builds ownership and a sense that their needs are included. In essence, there is a need for common interests, a feeling that efforts and investments are producing benefits, and that students are the benefactors. Time is a valuable commodity, and that is a paramount concern for teachers.

Technology, while included in the goals and objectives of the RSI program and the individual projects, is a secondary consideration in programming and used very little in the administration or coordination of the RSIs. One project took on technology as a major focus and decided at the end of the first year that this was a direction that was not appropriate or had little potential for success.

Some critical issues from the perspective of important stakeholders generally summarize their involvement with the RSI program. As a part of a survey conducted in 2002 and after considerable years of involvement with an RSI, school administrator contacts, building principals, and local facilitators were asked to indicate the three most significant changes, the three greatest challenges, and the three most important indicators of reform. Their responses are summarized on the following pages.

Summary of Open-End Responses to Critical Issues

Issues/Questions		
Three Most Significant Changes		
Administrative Contacts (N = 79)	**School Principals (N = 45)**	**Local Facilitators (N = 56)**
Instructional techniques	Alignment and improvement of the curriculum	Use of different and varied instructional strategies and assessment techniques
Science and math emphases	Professional development opportunities and results, i.e., increased participation, awareness, attitudes, and competence	Alignment and changing curricula
Teachers' attitudes, perspectives, and awareness	Instructional techniques	Increasing course requirements
Teachers' abilities and involvement in process		Improving course offerings
Alignment of curricula		Teachers' attitudes, confidence, teamwork, and involvement
Three Greatest Challenges		
Teacher attitudes, work habits, and involvement	Teacher and union attitudes	Teacher attitudes and abilities
Teacher qualifications and turnover	Time	Poor teacher qualifications
Attitudes of parents and community	Parent and community attitudes	Time
Poverty mind-set in the community	Lack of community awareness, support, and involvement	Inadequate teacher recruitment and retention of qualified personnel
Lack of highly skilled and qualified teaching force		Work required to obtain training in technology, align curricula, and design new lessons
Lack of opportunity for higher education		
Lack of science, math, or technology-related jobs in the community		
Getting higher education involved		

Issues/Questions		
Three Most Important Indicators of Reform		
Alignment of curricula to standards	Inquiry-based lessons with more hands-on and laboratory work	Improved student achievement
More and more challenging course offerings	New and varied instructional practices	Greater participation of students in science and math fairs and challenge activities
Use of the laboratory	Improved student achievement	Increased enrollment in more challenging STEM courses
Use of technology	Improved teacher attitudes	Student interest and pursuit of studies and careers in science, math, and technology areas
Improved teacher attitudes and work habits	More teacher involvement in planning and improved work habits	Percentage of students taking qualification exams and enrolling in higher education
Student achievement scores	Students acceptance of challenges	Improved student attitudes and attendance in school
Student participation in science fairs and other forms of competition		Greater use of technology
Student enthusiasm and requests to enroll in upper level or more challenging courses		Appearance of the classrooms
		Types of courses offered
		Teacher attitudes and awareness

While the RSI program was designed with lofty goals and anticipation of major changes with resulting gains in achievement scores, some would conclude that it has fallen short. However, one must recognize that (1) the approach required by NSF to accomplish these outcomes was virtually untested in the practical world, especially among schools so defined by the RSI regulations; (2) change occurs over long periods of time, and with changes in tests and testing times, data may simply not be reflective of the objectives of this program; (3) relatively little monies were set aside for local utilization, and no commitment for continuing support for significance changes was assured; (4) the parameters for participation targeted some of the most educationally, socially, and economically deprived segments of this country's population; and (5) systemic reform and improvement in the educational experiences in science and math may not necessarily be compatible.

Finally, we discovered conditions and situations that are very real in poor, rural communities involved in these six RSIs, and they are probably present in other areas as well. First, the need for improvement in math and science education is far greater than we assumed, and there are simply not enough certified and qualified teachers to meet the

needs. Administrators make decisions, maybe by necessity or maybe because of outside pressures, that possibly meet the "letter of the law" but not likely the "intent of the law." For example, the common practice of hiring persons with emergency certificates is not in the best interests of children, but it does meet the requirement that there must be a "certified" teacher in each classroom. Teacher evaluation procedures are not of the quality that differentiates between effective and ineffective teachers, and there are instances in which continuing employment of a teacher is a socioeconomic issue (for him/her and others supported by this salary) as opposed to a good educational decision.

In rural communities, such as those we studied, there are few employment opportunities for high school graduates, much less for those with college degrees that require an emphasis on math or science. In other words, there are very few visible incentives for students to pursue secondary or postsecondary studies in math or science. Strong ties to families prevent many high school graduates from leaving the community for work or further education.

Perhaps one of the most prominent observations or at least a perception on the part of several researchers associated with the project is the low level of expectations for educational achievement among students, teachers, administrators and other community members. While they may verbalize strong support for education and express their interest in students and schools achieving at high levels, there seems to be a disconnect between this and action. These people are poor, and they don't seem to know how to overcome the difficulties of the past or to accept the challenges of the future. The status quo seems to be an acceptable condition for some, and as they see more and more repressive education mandates without being given the knowledge or resources to respond, there likely will be a continually revolving door of teachers through the system. Is there a need for improved science and math education in these rural, poor communities and will they accept new and different approaches? We think the answer is an overwhelming YES. Did the RSI program do what it promised or what was hoped? The response would have to be NO, but it did uncover and help identify the depth and breadth of the challenges that lie ahead.

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