THE APPALACHIAN RURAL
SYSTEMIC INITIATIVE (ARSI)

A REPORT FROM THE FIELD

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I. INTRODUCTION

For the past four years we at Inverness Research Associates have served as external evaluators of the Appalachian Rural Systemic Initiative (ARSI). In this role we have made annual site visits to observe firsthand the districts, schools, teachers and students involved in the work of ARSI. This evaluation report covers our most recent fieldwork and examines the progress of a sample of six school districts with which ARSI has been working for the past several years. More specifically, this report assesses:

- how ARSI has contributed to local district and school capacity for sustaining the process of math, science, and technology reform; and

- the quality of classroom practice in "ARSI" classrooms within ARSI catalyst schools and ARSI districts.

Background on ARSI

Now in its fifth year, the Appalachian Rural Systemic Initiative provides direct assistance to over 50 of the Appalachian region's economically poorest school districts.[1] In working with these districts, ARSI has followed a model which consists of the following key elements:

- selecting, training, and supporting a multi-state network of "Teacher Partners – leading teachers who are released from the classroom to provide support for their colleagues as they learn about mathematics, science and technology reform;"

- focusing on the improvement of science, math and technology education within a designated "catalyst school;"

- providing a range of professional supports as well as curricular assistance to the districts through the establishment of "Resource Collaboratives" housed at higher education institutions in the region;

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[1] There are 87 districts that are officially eligible for ARSI assistance. ARSI has succeeded in establishing "catalyst schools" in over 50 of these districts.

- developing leadership and support for reform at the district level through the work of local administrators serving as "ARSI District Liaisons;"

- helping Teacher Partners (TPs) and District Liaisons (DLs) learn about and gain access to national and regional resources that can support their math, science, and technology reform efforts; and

- building broad-based community support through "community engagement teams."

In short, ARSI focuses on the development and empowerment of local expertise. ARSI's assistance to each district is actually quite limited in scale and is aimed at creating local sustainable systemic improvement for math, science and technology (MST) education. The ARSI model of reform is, in practice, quite flexible and manifests itself differently in each school district depending largely on the time that ARSI was introduced into the district and the individual district's readiness to take on such a reform effort. Some of the ARSI districts have been previous participants in other NSF and/or state-level reform efforts, while other ARSI districts have had little or no access to resources beyond their own school districts.

Over the years, we have come to see ARSI's work with districts as developmental in nature. Just as an educator works differently with children at different stages of development, so ARSI is learning to work with counties and districts that vary tremendously in their readiness for reform. This developmental spectrum was apparent to us again during this most recent site visit when we saw some districts who were "reform rich" – in vision, leadership, commitment to reform, and use of resources – and other districts who were equally "reform poor." The flexibility of the ARSI model is thus essential as the initiative seeks to "add value" to very different communities and MST reform efforts.

The Work of Inverness Research Associates

Inverness Research Associates has served as the external evaluator for ARSI since its inception. In November 1999, we visited six ARSI districts in four states (Virginia, Tennessee, North Carolina, and Kentucky). These districts were selected for the noticeable strides they have made in their math, science, and technology reform efforts. Of the six districts visited four were part of the "first cohort" of ARSI districts, meaning that there has been an ARSI presence in these districts for the last three years, while two of the districts we visited are part of more recent cohorts and therefore, have been working with ARSI for less than

three years. Inverness Research teams had also visited four out of the six districts in previous years.

Our visits this year served two distinct and different purposes:

1) to carefully document the capacities of these districts to implement and sustain science, math, and technology reform efforts, as well as ARSI's contribution to those capacities; and
2) to document the quality of classroom practice within these districts.

During the visits, we interviewed the following key players using interview protocols that had been developed and used in prior site visits:

- Teacher Partners
- District Liaisons
- Superintendents
- District technology coordinators
- Other key district administrators
- Principals
- Teachers
- Students

Our goal in speaking to each of these people was to assess the degree to which and the ways in which the local school system had, in fact, developed the capacity to sustain a high quality effort to improve their math, science and technology programs.

In addition, we sought to understand the quality of instruction in these rural districts. Hence, we observed 54 math and science classes at the elementary, middle and high school levels. These classrooms were chosen because they were designated to us by the Teacher Partner and District Liaison as "ARSI" classrooms. To be an ARSI classroom two criteria had to be met: one, the teacher had to have been influenced directly or indirectly by the work of ARSI; and two, the classroom practice had to be seen as representative of the kind of instruction promoted by ARSI.[2]

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[2] In some cases the classrooms were designated as ARSI classrooms, not because they were ideal in any way, but rather they felt the teacher was "moving in the right direction" as a result of ARSI-related experiences.

Overview of This Report

This evaluation report examines the progress of a sample of the school districts with which the Appalachian Rural Systemic Initiative has been working for the past several years. This report is divided into four major sections.

- In the first part of the report, A Summary of Findings, we present a brief summary of the major accomplishments and remaining challenges of ARSI at two levels: in terms of building the local district capacity for reform, and in the quality of classroom instruction.

- In Appendix A, we detail the ways in which ARSI has contributed to the capacity of rural Appalachian districts to initiate and sustain their own process of improving mathematics, science and technology education.

- In Appendix B, we describe in detail our study of the quality of classroom instruction in ARSI districts.

- Finally, in Appendix C, we include the ARSI Framework instrument which we used in our study.

II. A SUMMARY OF EVALUATION FINDINGS

A. Building Local District Capacity For Reform

It is important to note that the findings we present here are based on our visit to six districts. While we believe the findings presented in this section represent well the six districts we visited, we also believe they are "best case" findings. The six districts we picked to visit include some of ARSI strongest districts, as well as more typical districts. Hence, the accomplishments described in this report portray well what we believe is the demonstrated <u>potential</u> of ARSI to serve the rural districts within its service area. While we believe the ARSI model is succeeding in most of the districts involved in the initiative, we caution readers not to assume that all ARSI districts are achieving the same degree of progress as the ones that we portray here.

In order to assess the capacity of each district to continue a sustained effort to improve its own science and mathematics education programs, we used a framework that we had developed earlier out of our study of many school districts involved in long-term math and science reform efforts. Using this framework we evaluated the capacity of each district along several key dimensions. In what follows below we provide a few highlights of our findings within each of the key dimensions we studied. (For a more detailed description of what we did as well as of our findings about the districts, please see Appendices A and B.)

Vision and Reality

ARSI has provided districts with ways of understanding the realities of their current math and science program, while at the same time providing them with assistance in formulating a vision for the future of their math, science and technology programs.

Developing capacities

- Participation in ARSI has made districts become much more cognizant of the nature and quality of their existing math, science, and technology programs. They have done this both through the work of Teacher Partners visiting local classrooms as well as through the more structured Program Improvement Reviews (PIRs).

- More specifically, the ARSI Program Improvement Review process has provided schools with feedback about the current MST program status as well as a framework around which to shape improvement planning. Equally important, the PIR process has involved other ARSI participants and thus has served as a powerful learning opportunity for the whole ARSI community.

- Participation in ARSI has provided district leaders with an overall knowledge of the national standards as well more specific exemplars with which they can begin to articulate a vision for their own math and science programs.

Remaining challenges

- We found that for many districts we visited the high-stakes assessments used for state accountability purposes were still very much the 'guiding star' that defined needs and motivated improvements. Raising test scores then becomes an end in itself, preferably by the quickest, most direct means. We found districts did not often have a clear vision of a multi-faceted instructional program, and the associated instructional supports, that would help them achieve the goal of improved test scores, not to mention enriched classroom instruction.

- Many districts lacked a system for gathering and using a range of data that would be useful in helping them improve their overall district programs.

- In many Appalachian communities the local community school is seen as the fundamental educational unit. This view is now heightened by the states' shift to site-based management in their statewide reform and accountability structures. While in many places the county Superintendent is still a powerful figure, either formally or informally, the district as an entity lacks the kind of centralized control that it typically has in some urban and suburban areas.

Leadership

ARSI has made the greatest contribution to local districts by helping to develop within them local leadership that is knowledgeable about and committed to math, science and technology reform.

Developing capacities

- In the best cases, ARSI has now become a 'grassroots' initiative working from the inside out. The Teacher Partner is at the core of the effort to develop local

leadership. This person, in turn, works with the District Liaison to build more support for math and science reform at both the district and school levels. And, again in the best cases, we found that the Teacher Partner and the District Liaison came to serve as the 'heart and soul' of the reform movement, gaining along the way the critically important support of other key players (such as principals, the Superintendent, and school board members).

- In almost all the districts we visited the Teacher Partner had grown into a role of strong leadership, not only at the school level, but district-wide as well. In addition, ARSI has helped to create a strong network of Teacher Partners across the region so that they can provide important mutual support and education for each other.

Remaining challenges

- There is a real need to "institutionalize" the structures that ARSI has helped to create, and, in particular, to sustain the network of Teacher Partners and the work of the Resource Collaborative directors so that the Appalachian districts they serve are ultimately less isolated. Through structures created by ARSI these local leaders can now be connected to each other, to state resources, and to other national programs and institutions – a connection that is essential to sustaining local reform efforts. But to maintain that momentum the structures created by ARSI will have to be sustained.

- ARSI has been less successful in its efforts to build local community support for math and science reform. There needs to be more effective ways to connect the vision that ARSI promotes with the ongoing economic and educational concerns of local citizens.

Reform Infrastructure

ARSI has helped districts to realize the importance of, as well as begin the process of, building their own "reform infrastructure" – a set of critical supports that provide the foundation for future improvement efforts.

Developing capacities

- ARSI has had a positive influence on the professional development that districts are offering locally as well as putting local teachers in contact with state-level and national-level professional development opportunities. ARSI has: 1) emphasized the need for sustained, ongoing professional development; and 2) helped to move the focus of that professional development away from what we call a "hunting and gathering" mode and

more towards a larger vision of "good instruction" as envisioned in the national standards.

- ARSI has helped districts become more savvy at gaining additional resources that can be used to support reform work in math, science and technology education. For example, several of the districts we visited had learned about and taken advantage of such programs as the Exploratorium Institute for Inquiry and the NSRC LASERS program.

- ARSI has helped bring a focus on the alignment of resources with math, science and technology improvement plans. Districts are doing a better job of allocating their financial resources (for materials, professional development, etc.) according to needs identified through their interactions with ARSI.

- ARSI has influenced the districts' knowledge of and exposure to exemplary curricula and curricular programs. Many districts had little or no previous knowledge of curricula such as *Investigations in Number, Data and Space for Elementary Mathematics,* or the *FOSS* elementary science kits.

- Technology is evident in all schools – there are a lot of computers and some graphing calculators available to students. ARSI has made some progress in helping districts use this technology – mostly for communication and professional development purposes.

Remaining challenges

- Most districts lack a programmatic vision. Hence, they tended to gather a wide array of resources, materials and assistance without a larger vision driving their acquisitions.

- In a similar vein, no district we visited had adopted a curricular program. Rather teachers were using a variety of instructional materials from a range of sources to create lessons.

- While the rural schools we visited had acquired computers, and even connected themselves to the internet, we found little evidence of efforts that would help them use this technology intelligently in the service of improving mathematics and science instruction.

- While the professional development offerings have improved in most of the districts we visited, none of the districts have adopted any long-term policies or coherent district-wide visions of professional development for their teachers. None had put together an approach that linked professional development to curriculum implementation.

District Policies, State Contexts, and Other Influencing Factors

ARSI is only beginning to have an influence of the priorities and policies of the districts it works with.

Developing capacities

- Those districts who are further along in their reform effort are becoming more thoughtful and more proactive in regard to district policies and their effect on the reform effort. For example, we saw in one district a review of the textbook adoption process as well as a reconsideration of the district's stance toward curricular programs.

- Many of the district we visited have new policies that are generally supportive of reform (block scheduling, common planning time, etc.). In some places we found these policies connected with and supportive of the work done by ARSI.

- The school Program Improvement Reviews (originated in Kentucky and then adopted by ARSI) have helped schools systematically examine their math, science and technology programs, and have led some schools and even districts to begin making adjustments in their curricula to lead to a more coherent program.

- We found that the cultures of the districts we visited were professional and largely positive. Teachers who teach in these schools are most often long-term members of the community; they know and care about their students and wish to do well by them. Accordingly, we found teachers who were interested in, open to and willing to participate in a range of reform activities.
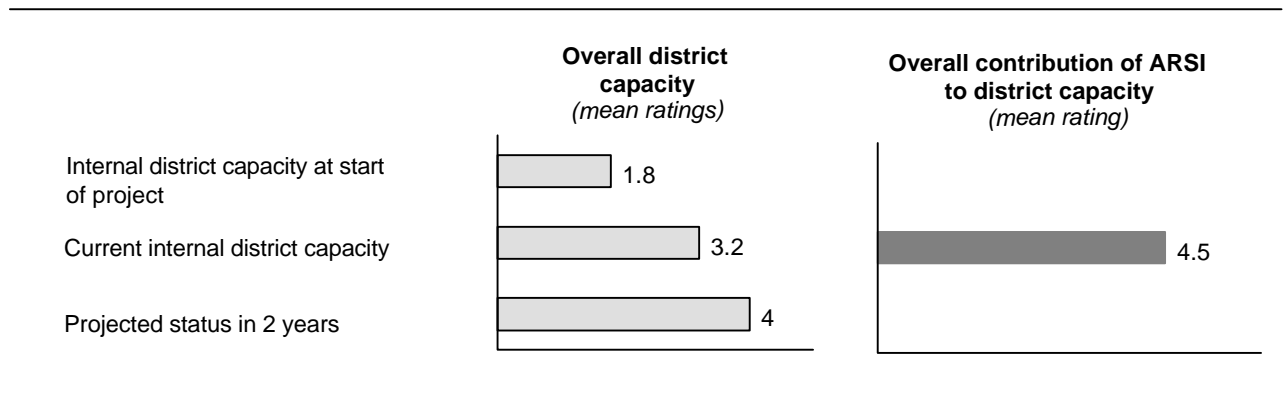
Remaining challenges

- None of the districts we visited had instituted their own standards, assessments or policies specific to math and science education. Rather, they took the lead from the state they were located in. Consequently, the ARSI influence on broader policies that affect math and science remains quite limited in these districts. For most districts state policy is the driving policy.

- State-level testing and accountability remain very large forces that shape the entire educational endeavor, not just mathematics and science education. Many teachers are confused about how ARSI efforts and "teaching to the test" can co-exist. Consequently, the pressure on these rural districts to do

well on state tests was largely seen inhibiting the kinds of reforms promoted by ARSI.

Summary Judgments About the Contributions of ARSI to Local Capacity

ARSI has clearly made a significant contribution to the internal capacity for reform in the six districts we visited.

FIGURE 1: OVERALL CONTRIBUTIONS OF ARSI TO DISTRICT CAPACITY

	Overall district capacity *(mean ratings)*	Overall contribution of ARSI to district capacity *(mean rating)*
Internal district capacity at start of project	1.8	
Current internal district capacity	3.2	4.5
Projected status in 2 years	4	

- Again, we saw a range of capacities for reform in the districts we visited. In general, however, most of the districts we visited are making progress with their reform efforts. And all exhibited a strong positive trajectory in building the capacities that are needed for science, mathematics and technology reform.

- ARSI's most significant contribution is the development of local capacity, particularly in the form of indigenous leadership that has both the ability and commitment to pursue further improvements in mathematics, science and technology education.

- The districts and communities we visited have shifted in their attitude – they have become more serious about math, science and technology reform as a result of being involved in ARSI.

B. THE QUALITY OF CLASSROOM INSTRUCTION

ARSI promotes teaching and learning that reflect the specific standards and frameworks of the states in which it works. The underlying vision, though, is that of the NCTM math standards and the NRC science standards. This vision involves rigorous content, multiple approaches, a high dose of inquiry, student-centered learning, a chance for teachers to interrogate student thinking, and a chance for students to communicate with each other. The question that arises, then, is: to what extent has ARSI been able to identify, support and move instruction in this direction? That is, to what extent and in what ways has ARSI reached the classroom?

We visited six ARSI districts knowing full well that ARSI is primarily focused on leadership development and the building of a local infrastructure that can support reform. Consequently, we did not expect to find excellent instruction in all of the district's classrooms or even in all of the ARSI classrooms we visited.

We observed 54 classroom lessons (30 science, 24 math) in six districts. In what follows, we present a very brief summary of our data that will give the reader an overall picture of the quality of math and science teaching and learning in ARSI classrooms.

Overall, the most common lesson we saw (40% of all lessons) was rated a '3' – at the beginning stages of effective instruction.[3] These were classrooms where teachers were beginning to use cooperative learning, beginning to have student-centered instruction, and perhaps beginning to use a curriculum more in line with standards-based practices. Eleven percent of the teaching we saw displayed "exemplary instruction" (i.e., at the highest rating of 5). These teachers' lessons were highly effective in promoting student understanding, as well as embodying the ARSI vision of teaching and learning. These teachers were doing wonderful lessons and were well supported by ARSI.

It is also important to point out that 43% of the lessons we observed were still below the beginning stages of effective instruction – 26% had some elements of effective instruction (rating of 2), but not enough to impact student learning; 17% were ineffective lessons altogether (rating of 1).
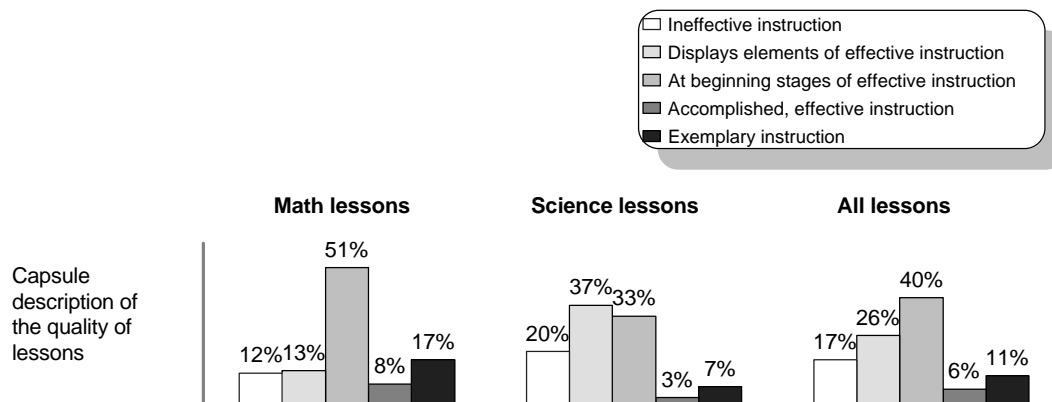
In general, our findings reveal that there are good examples of high quality instruction in these districts. However, there was a wide range in the quality of the classroom teaching we observed, and that there is still plenty of work to be done at the classroom level. However, knowing that ARSI districts are faced

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[3] We used a five-point scale that is part of the protocol used in evaluating classrooms involved in the NSF-funded Local Systemic Change initiatives. For more details, please see Appendix B.

with challenging circumstances, we were impressed to find so many visible examples of good teaching; we were also encouraged to know that these teachers are being recognized and supported by ARSI.
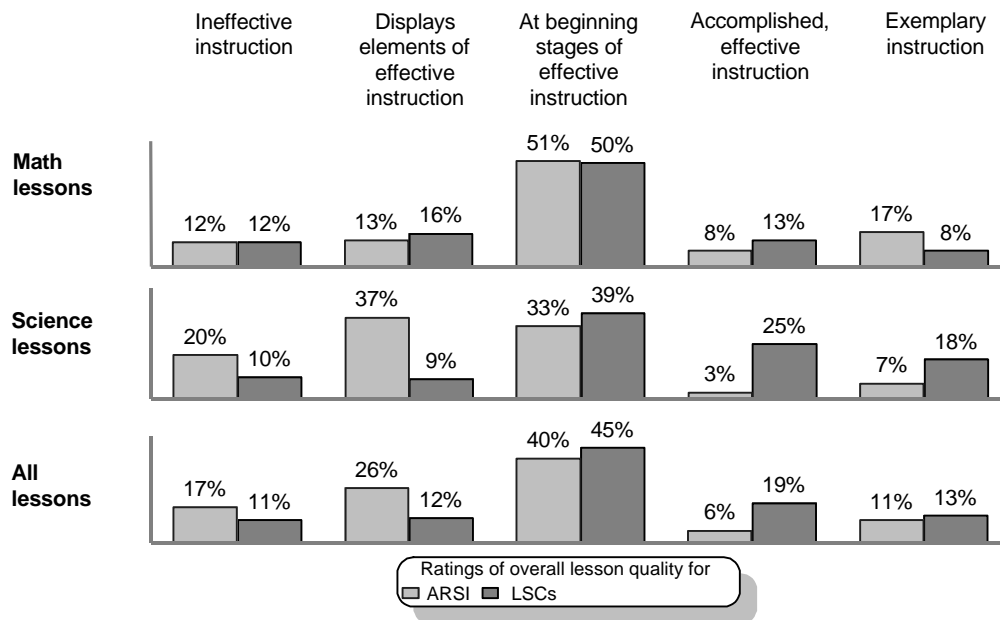
FIGURE 2: CAPSULE RATINGS OF OVERALL LESSON QUALITY

Legend:
- Ineffective instruction
- Displays elements of effective instruction
- At beginning stages of effective instruction
- Accomplished, effective instruction
- Exemplary instruction

Math lessons: 12%, 13%, 51%, 8%, 17%
Science lessons: 20%, 37%, 33%, 3%, 7%
All lessons: 17%, 26%, 40%, 6%, 11%

Capsule description of the quality of lessons

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A total of 54 lessons were observed (24 in math and 30 in science). Ratings are based on a five-point scale where "1" = "ineffective instruction," "3" = "beginning stages of effective instruction" and "5" = "exemplary instruction."

To get a sense of how the ARSI classrooms were doing vis-à-vis other reform efforts we compared our observations to the national sample of classrooms that are observed as part of the evaluation of the NSF Local Systemic Change (LSC) initiative. This is meant only to be a rough comparison and is intended merely to provide some comparative frame of reference for judging the quality of the ARSI classrooms.

FIGURE 3. COMPARISON OF THE OVERALL QUALITY OF LESSONS FOR ARSI AND LSC DISTRICTS

A total of 204 LSC lessons presented by "non-lead" teachers were observed (102 K-8 science lessons, 52 elementary mathematics lessons, and middle and high school lessons. For science we only have K-8 data for comparison.) Ratings are based on a five-point scale where "1" = "ineffective instruction," 3 = "beginning stages of effective instruction" and "5" = "exemplary instruction."

- Overall, we found the ARSI classrooms we observed to be roughly comparable to the ratings for LSC classrooms. Again, it is important to remember that the ARSI classrooms we were directed to were more "best case" classrooms, while the LSC classrooms were selected randomly. Thus, the best classrooms that ARSI guided us to were rated just slightly below the randomly selected classrooms in LSC districts. This is quite positive given the fact that the level of the ARSI investment in these districts is much lower, and much less aimed at the classroom level, than the investments made in LSC districts.[4]

- Thus ARSI, even though it has been aimed primarily at the professional development of lead teachers in these districts, has helped to identify and promote a quality of instruction that is promising. The overall lesson quality and the nature of teaching and learning in the best ARSI classrooms is not dissimilar from what one sees in the LSCs. Because local ARSI leaders directed us to these classrooms, these ratings indicate that these districts may

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[4] The LSC initiatives provide approximately $3000 for every teacher served; the ARSI investment is on the order of a tenth of that amount.

well be developing themselves into more critical connoisseurs of standards-based teaching as well.

Summary Judgments About the Contributions of ARSI to the Quality of Classroom Instruction

While many challenges remain for these districts vis-à-vis the quality of science and math instruction they offer their students, ARSI has demonstrated its ability to make a difference at the classroom level. Teacher Partners and District Liaisons could both recognize and direct us to classrooms where the instruction was aligned with the vision promoted by the national math and science standards. In addition, it was also clear from our interviews that these teachers are supported both directly and indirectly by ARSI.