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ABSTRACT

This case study examines the history and current circumstances of education in Rockcastle County (Kentucky) in the context of its participation in the Appalachian Rural Systemic Initiative (ARSI), which aims to improve science and mathematics achievement through systemic reform. Background is presented on the county's history, demography, and economic condition. The county is characterized by a sense of isolation, poverty, low educational achievement, and general feeling of low self-esteem. The school district serves approximately 2,900 students in five elementary and secondary schools. Despite good facilities and the district's involvement in several reform efforts, the dropout rate is high. Math and science scores on standardized tests are quite good in third grade but decline considerably in later grades. State accountability data showed some improvement in math and science from 1993 to 1998, but in 1998, less than 38 percent of students reached the "proficient" level or higher in math and less than 18 percent reached that level in science. ARSI attempts to build on local efforts to improve math and science education by providing professional development, technical assistance, and connection to "resource collaboratives" at regional universities. In this district, ARSI had provided guidance for development and improvement through program audits in math and science. The case study team evaluated district progress in terms of the "six drivers of educational system reform": implementation of standards-based curriculum, supportive policies, convergence of resources to support math and science programs, broad-based parent and community support, improved student achievement, and improved equity of achievement. The district received moderate to strong ratings on all six drivers, acknowledging the concerted efforts of local educators in the face of limited results. (SV)

A Case Study of Rockcastle County (Kentucky) School District and Its Role as a Partner in the NSF-Supported Appalachian Rural Systemic Initiative

Prepared

for

The NSF Rural Systemic Initiatives Evaluation Study

by

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Foreword

On behalf of The Evaluation Center at Western Michigan University, I want to thank the Rockcastle County (Kentucky) School District for its willingness to be a part of the Rural Systemic Initiatives Evaluation Study for the National Science Foundation. Especially, I want to thank school district officials-Mr. Shelby Reynolds, Ms. Terry Parkey, and Mr. Larry Hammond-for their efforts to improve the educational opportunities in science and math for the students of Rockcastle County and for their willingness to serve as primary hosts for the visitation team.

It was a pleasure to serve as the leader of the visitation team, and I thank the other members of the team (Drs. Brian Lotven, Steve Oliver, and Craig Russon) for their dedicated commitment to the purposes of the study and to their untiring pursuit of information that will enable NSF and other decision makers to understand the strengths, the barriers, and the progress that is being made in local school districts as a part of the Rural Systemic Initiative. Finally, I want to thank members of The Evaluation Center staff, including Ms. Sally Veeder and Ms. Mary Ramlow, for their assistance in editing and preparing the several drafts and final version of the case study report.

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A Case Study
of
Rockcastle County (Kentucky) School District and Its Role as a Partner in the NSF-Supported Appalachian Rural System Initiative

Rockcastle County is located in east central Kentucky and covers a land area of 318 square miles with an estimated population in 1997 of 15,744 persons. The topography of the area would appropriately be described as picturesque with wooded hills and valleys. About one-fourth of the county is in Daniel Boone National Forest. The most interesting geological feature is probably the Great Saltpeter Cave, which produced an important ingredient for gunpowder in the War of 1812. The county seat of Rockcastle County, Mt. Vernon is located just off Interstate 25 at the intersection of U.S. Highways 25 and 150 and 54 miles south of Lexington, Kentucky; 119 miles north of Knoxville, Tennessee; and 128 miles southeast of Louisville, Kentucky. Named in honor of George Washington's home, Mt. Vernon had an estimated population of 2,607 in 1996.

Once known as the Great Wilderness and described as a "dark and gloomy forest with rushing mountain streams, acres of tree trunks laid low in a tangled mass by blow-downs and where log cabins were built and lived in temporarily by Indians" by Dr. Thomas Walker, the first white man known to visit the area in 1750, there is an interesting and rich history that led to the settlement and development of what we now know as Rockcastle County, Kentucky. Walker discovered the Cumberland Gap and associated trails that opened the area for hunters and other explorers. However, according to John Lair in his book *Rockcastle Recollections* (1991), it was some 13 years before the area would again be visited by white men. The next groups were hunters, one of whom was Charles Cox, for whom a prominent ridge is named, and Henry Skaggs, who is reported to have pursued a buffalo across Rockcastle River and found a creek that was later named for him. Other groups who followed the Elisha Walden party of hunters from Henry County, Virginia, included Squire Boone, Alexander Neely, Daniel Boone, and John Stuart. Daniel Boone, probably the best known of this group, made several trips into the area and on one trip stopped off at a new settlement being established at Harrodsburg. It is here that he acquired a lot in what is considered the first settlement in Kentucky. According to Lair, "In the Boone Hollow and Red Hill section of Rockcastle County are to be found many legends concerning Daniel Boone and his presence there, at one time or another. Although many of the early efforts to establish settlements failed because of skirmishes with unfriendly Indians of the area or for other reasons, it is believed that the first house built and occupied by white men in the boundaries of the now Rockcastle County was about 1790."

Life was difficult in those frontier years, and survival in the wilderness depended upon one's ability to find enough food by hunting or fishing to support a family throughout the year. But the settlers made do with what they had, and some developed special skills and crafts that would lead to income from the making of barrels, churns, spinning wheels, shoes, etc., in addition to farming small plots of land carved out of the forests. However, as the levels of literacy and achievement dropped well below those of other parts of the country, the belief continued to grow that these mountain people were a "shiftless and inferior class of people" who happened to have settled here because their

wagons had broken down on the trail and that, rather than go to the trouble of repairing the damage, they would just build a pole cabin and settle permanently. Actually, according to Lair, these early settlers were from some of the "most important families of the Old South" (p. 27), and the educational deficiencies could be attributed to "lack of good roads and good schools and consequent [lack of] opportunities rather than lack of good bloodlines and heritage."

Coming by water (the Ohio River) and land through the Cumberland Gap and on other trails used by the earlier explorers and hunters, the area became populated with white settlers from various parts of the country. On June 1, 1793, Kentucky became a state; and by an act of the Kentucky legislature in 1809 to set up the county, Rockcastle County was approved on January 8, 1810. The first county courthouse was built of logs, but it and several other structures used for this function were destroyed by fires. These catastrophes destroyed many of the official records of the county and surrounding area, which may be the reason that there is no official written history of Rockcastle County.

Although there were other settlements, the towns of Mt. Vernon, Brodhead, and Livingston seem to be the most prominent over time. Renfro Valley also emerged as an entertainment and tourist area in the late 1930s, and it continues to be recognized as that even today. Mt. Vernon, the county seat of Rockcastle County, is reported to have been founded at its location because of "Spout Spring," thought to be discovered by an unknown rider headed west in the late 1700s. Although the spring was touted for its purity and its attraction as a gathering place and was used for drinking water for many years, it was later found and reported in the 1900s that its source was surface runoff. According to an April 24, 1986, newspaper account of the Health Department's findings from testing the water, it "contained enough animal life to make an excellent soup by the addition of a little salt and pepper."

Although there are a number of churches in the county today, practically all of the older churches were Baptist, a religious faith that predominates the area today. Lair's book indicates that a Reverend John Lythe of the Church of England was supposed to have conducted services in Boonesville, but it was the Baptists who were first to proselyte in Kentucky. As early as 1776, a Reverend William Hickman traveled the area on behalf of the Baptists, and later the "traveling church" concept further solidified that religious belief in the region. Today, the predominant religious faiths in the area are Baptist, Pentecostal, and Christian.

From its beginning largely as a hunting, fishing, and small acreage-based farm source of subsistence and revenues, the economic base of Rockcastle County included firms employing 3,381 persons in 1996, of which 785 were in manufacturing, 657 in wholesale and retail trade, and 903 in the service industry; local government employed 685. In the labor market area, it is estimated that there are 45,666 persons available for industrial jobs, with 19,467 persons becoming 18 years of age between 1999 and 2003 and potentially available for industrial jobs. In 1990, it was estimated that 2,250 Rockcastle County residents commuted out of the county for work, while only 675 commuted into the county for work.

In 1997, the unemployment rate of Rockcastle County was 5.8 percent, compared with 5 percent for the larger labor market area. Of the estimated 86,000 nonagricultural jobs in the market area (defined as the base county, adjacent counties, and any other major commuting counties), about 28 percent are in the wholesale and trade area, 21 percent in manufacturing, 21 percent in services, and 18 percent in state and local government.

Based on 1996 statistics, the average weekly wages of industry in Rockcastle County were $316/week, compared with the Kentucky statewide figure of $465 and the U.S. average of $550. Per capita personal income of country residents was $13,309 compared with $19,773 for Kentucky and $24,436 for the U.S.

Some other facts about the people of Rockcastle County have been extracted from 1990 U.S. census data.

There are:

1785 households with a married couple family with children under 18 years.
1790 households with a married couple family without own children under 18 years of age.
67 households with male householder and no wife present with children under 18 years.
259 households with female householder and no husband present with children under 18 years.

8178 persons report single ancestry.
1935 persons report multiple ancestry.
544 persons report as unclassified .
3 persons report their race as Black.
17 persons report their race as American Indian, Eskimo, or Aleut.
14 persons report their race as Asian or Pacific Islander.
9 persons report their race as other than those listed above.

There are 5958 housing units of which 91.7 percent are occupied and 8.3 percent are unoccupied.
The lower value quartile of owner-occupied housing units is $17,500.
The median value of owner-occupied housing units is $31,100.
The upper value quartile of owner-occupied housing units is $44,300.

Kitchen Facilities (number of housing units)

Complete kitchen facilities.....5728
Lacking complete kitchen facilities.....230

Plumbing Facilities (number of housing units)

Complete plumbing facilities.....5418
Lacking complete plumbing facilities.....540

Number of Persons Identified by Marital Status by Age

Never Married
- 15 to 24 years.....657
- 25 to 34 years.....122
- 35 to 44 years.....32
- 45 years and older.....114

Ever Married
- 15 to 24 years.....464
- 25 to 34 years.....1014
- 35 to 44 years.....1021
- 45 years and older....2502

Place of Birth

- Born in Kentucky.....13099
- Born in other state in U.S.
  - Northeast.....55
  - Midwest.....1153
  - South.....365
  - West.....30
- Born abroad of American parent(s).....9

Residence in 1985 (persons 5 years and over)

- Same house in 1985.....8260
- Different house in 1985.....3571
  - Same county.....1260
  - Different state:
    - Northeast.....30
    - Midwest.....349
    - South.....293
    - West.....30

School Enrollment and Type of School (persons 3 years and over)

- Enrolled in primary school.....156
- Enrolled in elementary or high school.....2823
- Enrolled in college.....356
- Not enrolled in school.....10935

Educational Attainment (18 years and older)

Less than 9th grade	3613
9th to 12th grade, no diploma	2041
High school graduate (includes equivalency)	3610
Some college, no degree	802
Associate degree	159
Bachelor's degree	287
Graduate or professional degree	283

Income in 1989 Below Poverty Level (number of persons)

Under 5 years	419
5 years	53
6 to 11 years	489
12 to 17 years	543
18 to 64 years	2390
65 to 74	312
75 years and over	292

The area enjoys a temperate climate with an average annual temperature of 56.30 degrees, 49.67 inches of precipitation, a prevailing southerly wind, and a relative humidity reading of 60-80 percent. There is an average annual snowfall of 20.70 inches, with a total of 140.90 precipitation-free days.

According to local accounts, official records of early Rockcastle County education do not exist because of fires that destroyed the courthouse in 1873 and 1928. However, a former superintendent of the Rockcastle schools from 1987-1995, Bige Towery, provided a wealth of information about the history of education in the county and the more recent developments that led to its involvement in a number of reform initiatives. Mr. Towery also credits a master's thesis (University of Kentucky) by E.F. Norton, a principal of Brodhead School from 1930 to 1935, for much of the early accountings of schooling in the county.

During the same year that Rockcastle was established as a county (1810), an academy/seminary was authorized for the county. This academy was incorporated under a board of seven trustees and was authorized to survey and sell 6,000 acres of vacant and unappropriated land anywhere in the state of Kentucky, with certain exceptions, and use the proceeds to erect a schoolhouse and purchase books. According to information provided by Mr. Towery, the first recorded sale of this land was 100 acres located in Cumberland County for $1.00. The last recorded sale was 229 acres in Adair County, which sold for $300 in 1865. In total, it is thought that sale of the land raised $937. Although there is little information available about the academy, sale of the Rockcastle Seminary property was authorized in 1873, and the $900 of proceeds was invested in the Mt. Vernon Collegiate Institute, a private academy, for nine annual full scholarships for pupils of Rockcastle County. According to

Mr. Towery's historical report, "these scholarships were intact until 1910, when a public high school was begun in Mt. Vernon."

Not until an act by the Kentucky legislature provided a state school fund in 1837-38 was there a system to support free schools in each county. Rockcastle County was the only county to respond to a request from the state superintendent in 1939 for an accounting of the number of persons between the ages of 7 and 17 who were unable to read. The illiteracy in that age range was estimated to be 53 percent. In 1848, the citizens of Rockcastle County voted in favor of a 2-cent property tax to be levied for school purposes. By action of the state legislature in 1851-52, the State Board of Education was given power to regulate the government of the common schools, to determine the course of instruction, and to select the textbooks.

In 1853, Rockcastle County's school census was 1,206, with an average daily attendance of 518. Schools were in session for 3 months per year, and 36 districts had been established in the county. From the beginning, teachers were required to be certified, and each teacher was required to first pass an oral and later a written examination on an annual basis to renew his/her license. Although standards were quite low, there was a minimal level of competence/knowledge required to be a teacher. In 1893, there were 3,872 school age children, with an average daily attendance of 1,500, in 60 school districts, and the school year had been lengthened to 5 months.

In 1908, the state legislature changed the method of control of the public schools and dictated that each county in the commonwealth would compose one school district except for cities or towns that might maintain a separate school district. Additionally, this legislation provided for establishing high schools in each county and authorized the fiscal court to levy a tax to support the schools. In compliance with the establishment of a county school district, the governance structure was redesigned to be constituted by a county board with an elected county superintendent. Action in 1920 changed the superintendent's position to one that was appointed by the board and, although some changes occurred over the years, this arrangement prevails today.

At least three towns (Mt. Vernon, Brodhead, and Livingston) retained their own school districts until around the 1950s when they joined the county system because of increasing costs and declining school enrollments. Further consolidations included the rural elementary schools that began with the several one- and two-room schools. Roundstone School was built to accommodate the rural students from the surrounding communities, and additional busing was established to transport students into Brodhead, Livingston, and Mt. Vernon.

In 1969, a county vocational school was opened in Mt. Vernon; and in 1972, the three county high schools graduated their last students. After that, all high school students attended the newly constructed county high school in Mt. Vernon. The former high school facilities at Brodhead, Livingston, and Mt. Vernon were converted for use by elementary school students. Shortly after 1992, the middle school concept was established in the county, and a new high school complex was constructed on the outskirts of Mt. Vernon. At the Fall 1999 school count, the following enrollments were reported at each school.

Brodhead Elementary (Grades 1-5)	430
Mount Vernon Elementary (Grades 1-5)	767
Roundstone Elementary (Grades 1-5)	243
Rockcastle Middle School (Grades 6-8)	792
Rockcastle High School (Grades 9-12)	767

In summary, a county school system provides primary and secondary education and 3 universities, 5 senior colleges, and 2 community colleges within 55 miles of Mt. Vernon. Vocational-technical training is available at the secondary level at the Rockcastle County Area Technology Center in Mt. Vernon and at the postsecondary level at the Laurel County Technical College in London, some 22 miles from Mt. Vernon. Together, these vocational-technical centers enrolled approximately 400 secondary students and 250 postsecondary students in 1996-97. Fewer than 100 students complete vocational-technical programs at these institutions each year.

Today, the Rockcastle County School District is governed by a 5-member board with a chair and an appointed superintendent of schools. Each building has a 5-member, site-based decision-making council that is composed of 3 teachers and 2 parents. These councils have considerable power and authority over the curriculum and other important matters. The school district has principals for each school, a superintendent, and a curriculum director.

The Rockcastle County School District has a current enrollment of about 2,900 with a pupil-teacher ratio of 15.4:1 and had an annual per pupil expenditure of $5,029 in 1996-97. About 40 percent of the high school graduates attend college. Area colleges and their distances from Mt. Vernon include Berea College (26 miles), Somerset Community College (26 miles), Eastern Kentucky University (29 miles), Union College and Cumberland College (49 miles), and Lexington Community College and the University of Kentucky (54 miles). Adult education programs are available to develop new academic skills, improve basic skills, or earn a high school equivalency diploma. In Rockcastle County, adult basic education and adult literacy classes are administered through the Christian Appalachian Project in Mt. Vernon.

Mt. Vernon reflects days of the past as well as signs of the future. Buildings along the "main" street are of mostly brick construction, several reflecting years of minimal care and attention. Interspersed in the downtown area are recently remodeled or newly built, mostly public, buildings. Homes in the towns and in the countryside include small, frame houses in need of considerable improvement; well-cared-for homes on nicely kept grounds; dilapidated, almost "tar paper-type" houses at the end of the road; estate type houses on small acreages; and the ever present manufactured and mobile homes sprinkled across the county. Local cafes provide foods that are characteristic of the area and a bountiful amount of news and gossip about the community. Strangers are noted when an outsider enters the door, as the conversations halt and all eyes watch unknown persons as they find a place for themselves. After a brief pause, the conversations begin again, but there is seldom more than minimal interaction with visitors. Yet, service personnel in these establishments are responsive to your questions and seem willing to engage in light conversation if initiated by the outsider. In response to team members' questions, we did not get a feeling that they wanted to hide anything or

were reluctant to provide information as requested. Even school personnel tended to joke with team members about the high percentage of them who had grown up in the county and never really left except for brief periods when they might have attended colleges less than 100 miles away. In the main, the citizens of Rockcastle County were born, raised, and continue to live here. They appear to be content with their surroundings, yet recognize the relatively low standard of living of many families, the low level and general lack of public support for anything more than a basic education, and the need for better paying jobs in the area.

Development of a broadened and improved road is under construction for the short distance from Mt. Vernon to I-75, along with an increasing number of businesses catering to travelers and visitors to the area, including a McDonald's, Taco Bell, Dairy Queen, Denny's, motels, and bed and breakfast establishments. Renfro Valley, promoted as "Kentucky's Country Music Capital," is immediately across I-75 from Mt. Vernon, and it offers entertainment to local residents as well as to others who may attend as many as 12 weekly shows, special events, and festivals and/or visit the historical cabins and craft village that attract thousands to the Renfro Valley Entertainment Center. Headline entertainers for 1999 included Trace Adkins, the Oak Ridge Boys, Ray Price, Lee Ann Womack, Bryan White, the Statlers, Glenn Campbell, Charlie Daniels, Connie Smith, Loretta Lynn, and Charlie Pride.

The focus of this study is the status of the systemic reform efforts in the areas of mathematics, science, and technology in the context of the rural community of Rockcastle County, Kentucky. As noted above, one might describe the community as diverse, but yet homogeneous in many respects. There are few members of minority races or ethnic groups in the community, and most residents have their roots in this area if not the county itself. For this school district to participate in the NSF RSI project, by definition the students must be poor; i.e., at least 30 percent of the students must be eligible for the USDA free or reduced lunch program provided through the school.

At the Rockcastle Middle School, 59 percent of the students are eligible for this program, and 62 percent of all of the children in the county are eligible. This compares with eligibility figures of 43 percent for the state. In addition to the conditions associated with low incomes and resulting poverty status of many of the families of the county, there is a sense of cultural isolation that is possibly as much an artifact of history as it is a fact related to the mountainous/hilly terrain and poor secondary and tertiary roads. In inclement weather, many of the country roads are reported to be almost impassable, which affects school buses bringing children to and from school (which may require 2 hours or more in good weather) as well as private and public forms of transportation.

Although common (free, public) schools have been available to the citizens of this county for many years, the education level of the adult population is low. In addition to a relatively low percentage of high school graduates who are enrolled in college in 1997, i.e, 39 percent for Rockcastle County, 51 percent for Kentucky, and 67 percent for the U.S., there are few adults seeking advanced education. Further, the school dropout/attrition rate of the youth of Rockcastle County is quite high. As reported in information provided to the study team, 31 percent of 16-19 year olds in Rockcastle County were not high school graduates in 1995-96, which is more than twice the rate for Kentucky

(13 percent) and three times the rate for the U.S. (9 percent). While not likely to be totally reflective of the dropout problem, we noted the following enrollment levels in grades 9-12 in Fall 1999:

Grade 9	252
Grade 10	214
Grade 11	185
Grade 12	175

Put another way, the enrollment in the 12th grade is only 69.4 percent of the enrollment of the 9th grade. At the same time, there are 234 fifth graders and 217 eighth graders, which is about 1.3 times the number of 12th grade students.

One person's explanation of the high dropout rate for secondary schools is that the "GED is too easily available and most jobs in the county require only a high school diploma or its equivalency," and there is little chance of substantial rate increases above a standard rate for all employees. If this is true, then a person dropping out of school after the ninth grade who enters the work force would essentially have three more years of potential employment in his/her lifetime at a comparable rate of pay.

The dropout/attrition problem is well recognized in the county, and this formed the basis for a partnership program with Berea College known as GEAR UP. This middle school (6th and 7th grades) program, kicked off with a community meeting and a well-known national entertainer during the on-site visit, will help coordinate the efforts of community groups, implement new programs, and provide quality services to better address the educational needs of the community. The following services are to be provided:

- parent involvement activities to familiarize them with the educational system and assist them in planning for their child's educational future
- activities for middle school students with strong academic experiences that will better prepare them for high school and postsecondary education and will enable them to perform at a higher level on state and national assessments
- opportunities for access to telecommunications and technology for students and their parents, with emphasis on services that will prepare students and parents for postsecondary education
- high quality, continuous, and substantive professional development for Rockcastle County educators

While not widely reported, there is an operant Migrant Education Program in the county. The purpose of the program is to help students who qualify as migrants: i.e., children whose parents have moved across school district lines in the past three years seeking employment in the area of farming, fishing, timber, and harvesting. Program administrators estimate that there are more than 300

students in the county who qualify for this program, which included some special summer programs in math and science.

It is worth saying that Kentucky has been engaged in major statewide educational reform for almost 10 years. This legislative effort, known as the Kentucky Education Reform Act (KERA) and developed in response to landmark court decisions about the inequities of funding and educational opportunities in Kentucky schools, has had an impact on schools and communities. Even today, they are struggling to incorporate the changes and meet the challenges that are a part of this sweeping legislation. However, it is difficult for words or even legislation to reverse the conditions and context of this rural community. From the GEAR UP program description, the following statement is reflective of some important considerations.

> The problems of Appalachian Kentucky are deeply rooted and are both attitudinal and pedagogical. The curriculum of home and community is frequently in diametric opposition to the curriculum of the schools. Too many students are held in contempt because of biases and prejudices against their family backgrounds. Too many students take a psychological beating when they enter school and never quite recover. It is not surprising that Appalachian students become alienated from school - as their parents did - and as their persistently high dropout rates indicate.

While much of the country has immediate access to the world through a variety of electronic media, it is reported in the GEAR UP document that about 75 percent of the homes in the community are equipped with telephones, but only 15 percent have computers and 5 percent have Internet access. These conditions provide further evidence of the community's real or perceived sense of historical and current isolation, poverty, low educational achievement, lack of value and support for educational attainment beyond elementary or middle school levels, and general feeling of low self-esteem and inferiority.

As we look at the community, we see considerable effort that focuses on improved opportunities for education and increased levels of achievement, but there are not corresponding results. As mentioned earlier, there are three feeder elementary schools, a middle school, and a high school complex. These facilities are clean and attractive, and the newer buildings are as well designed for effective education as one can find across the country. Especially, the current high school is well designed with laboratories and other rooms to accommodate specialized programs. Conversations with teachers revealed their satisfaction with the facilities. The library offers an attractive setting, but there appears to be a considerable need to continue the collections and resources for math and science. Since so many of the families do not have Internet access in their homes, it puts an added responsibility on the schools to provide this access. Students in classes are attentive and appear to be well behaved and focused on learning. The evaluation team attended the kickoff meeting for the GEAR UP program at the middle school and a parents' night at the high school during its on-site visit. It was observed and confirmed by several individuals that, while the turnout of parents was quite good at both events, many parents of the poorer families and of the children deemed most at risk of failing academically were not in attendance. While this is not an uncommon finding, it merely confirms the fact that poor

educational achievement is often associated with a low level of parental support and involvement with the school. Of course, one must wonder which comes first, and is there a cause-and-effect relationship or is it associational?

The district has about 250 certified staff members, with an 8-10 percent annual turnover plus a 5 percent transfer rate within the district. Sixty to 75 percent of the teachers are from this county and received their training at Berea College or Eastern Kentucky University, both within 30 miles of Mt. Vernon. The annual salary schedule for certified staff includes 5 ranks/levels, each with 5 experience steps: 0-3, 4-9, 10-14, 15-19, and 20+ years. For this schedule, the annual salary ranges from $20,368 to $41,699 based on a 185-day school calendar.

After buses arrive by 7:55 a.m., with breakfast served until 8:05 a.m., classes begin at the high school at 8:10 a.m. During the day, there are four blocks of approximately 1.5 hours of instructional time. From reviewing the fall schedule for the high school, it appears that teachers teach three of the blocks and the other is used for planning purposes. In general, most teachers have no more than two different preparations per day.

Achievement test data for Rockcastle County School District students are available in the form of CTBS/TN "mean normal curve equivalent" scores in Grades 3, 6, 9, and 10 for 1996-97 through 1998-99 and KIRIS performance measures for Grades 4/5, 7/8, and 11/12 for 1993 through 1998.

For an interpretation of these results, a representative of the evaluation team sought the consultation of an assessment specialist in the district. First, participation in the Kentucky accountability testing program is required as is limited testing using another nationally recognized, standardized assessment instrument, i.e., the CTBS/TN. However, the Rockcastle County School District chose to go beyond minimal testing requirements, i.e., use of the full CTBS/TN battery and testing at additional grade levels.

A summary of the reported "mean normal curve equivalency" in math and science on the CTBS/TN for three years (1996-99) is shown in Table 1.

As you examine the results of the CTBS/TN, it seems clear that the third grade students in Rockcastle County do very well in science and math, in comparison with their nationwide counterparts. The "mean normal curve equivalencies" are all above 60, with the exception of the math results in 1998-99. As an interpretation, these results are above the mean scores of more than 50 percent of the other students across the country. Although not the same students, there is a troubling decline in the results for Rockcastle students on the CTBS/TN in both science and math from third to sixth grade and through the tenth grade, with the exception of the tenth grade science results. To further emphasize this precipitous drop, the high dropout rate in this county school system is greater than the state and the country; therefore, the tenth grade is in reality a more selective sampling of students. Yet, their math scores are considerably below those of other tenth grade students who took this test.

Table 1

Rockcastle County Schools–Nationally Normed Math and Science CTBS/TN Test Results*

Year	Grade Levels			
	3	6	9	10
Math Total				
1996-97	63.1	41.4	41.3	41.4
1997-98	65.2	46.9	42.6	45.1
1998-99	56.4	45.0	42.6	47.9
Science				
1996-97	66.9	49.0	49.9	52.0
1997-98	64.4	51.5	48.2	53.0
1998-99	60.7	52.5	47.2	55.8

*Expressed as Mean Normal Curve Equivalent

It is also noteworthy that the tenth grade science scores are better than those found at the ninth grade level, and the tenth grade math and science scores improved each year (1996-99). There were some improvements in the other years for both science and math, but it is not clear that any trend is developing.

As noted earlier, Kentucky embarked on a large-scale educational reform agenda with corresponding statewide testing in the early 1990s. While not fully realized, according to many observers, there were lofty goals established for expected test results. In the main, the testing program resulted in perceived indications of teacher and school effectiveness as opposed to the tracking of individuals or groups of students. Rewards and negative consequences emerged in this controversial high-stakes testing program. Local school districts had no alternative but to participate as directed by the Kentucky Department of Education.

In our study, officials of the Rockcastle County School District provided the visitation team with the Spring 1998 summary test results for the Kentucky Instructional Results Information System (KIRIS). A matrix-sampling procedure was used in administering KIRIS, which resulted in not all students at each grade level taking the same examinations. Students in Grades 4, 5, 7, and 11 completed batteries of open-response and multiple-choice questions (referred to as the KIRIS On-Demand Assessment) in selected content areas for each grade. For example, the mathematics test was taken by Grades 5, 8, and 11, while the science test was taken by Grades 4, 7, and 11. The multiple-choice questions were developed for each content area and distributed across 12 test forms.

Each student completed only 1 test form consisting of 4 common and 2 matrix-sampled open-response questions and 16 common and 8 matrix-sampled multiple-choice questions for each area. While this sampling procedure seems rather complex, it is reported in the performance report to each school that "Matrix-sampling produces highly reliable results at school and district levels, while reducing testing time for all students."

The KIRIS Accountability Score is based on the entire battery (excluding pretest questions) of open-response questions. An "Academic Index" by grade level and content area as well as the percentage of students achieving the various "performance categories" (novice, apprentice, proficient, and distinguished) are among the modes for reporting KIRIS results. The Academic Index (AI) ranges from 0 to 140, with 100 being the AI if all students were at the "proficient" level or if they all averaged at that level. The distributed weighting of the levels are 0 for novice, 0.4 for apprentice, 1 for proficient, and 1.4 for distinguished. Further, it is expected that all schools will develop and move along a growth plan that will result in an Academic Index of 100 for each content area by 2014.

Selected results extracted from the Spring 1998 KIRIS Performance Reports are presented in Table 2.

Obviously, the student scores were quite low in 1993 for both math and science. However, since that time, there has been a continuous trend of improvement in math scores with the exception of 1997 and 1998. With regard to science scores, there are mixed results. A positive trend of improvement is reflected in Grades 4 and 11 since 1993, but it is much weaker or possibly nonexistent in Grade 7. The expected index is 100; therefore, there is still considerable improvement that must occur before the goal index of 100 is reached in either math or science.

Another way of looking at the achievement results is related to the percentage of students whose math and science scores are such that they can be designated as "proficient" or "distinguished." While the index goal is 100 by 2014, which is equivalent to all students having a designated average rating of "proficient," no single grade level reaches even 50 percent in any year. The highest is 38 percent for 8th grade in mathematics and the lowest is 1 percent for 7th grade science. These test results are disturbing to external visitation team members, since they indicate a considerable gap between expectation and reality and the impact of the Appalachian Rural Systemic Initiative (ARSI) and the several other projects introduced by this district over time to improve academic achievement of its students.

As a part of the KIRIS testing project, students are asked some questions about the instructional formats of their classes in the various subject areas. In Table 3, summarized results of selected data are presented for math and science classrooms, as perceived by students.

Table 2

Selected KIRIS Performance Report Data for Mathematics and Science for Rockcastle County School District

Subject and Grade Level	Academic Indices by Year					
	1993	1994	1995	1996	1997	1998
Mathematics						
Grade 5	18	51	52	58	46	62
Grade 8	17	38	39	44	50	60
Grade 11	11	19	35	44	39	37
Science						
Grade 4	21	30	42	42	48	50
Grade 7	20	25	23	19	25	28
Grade 11	29	36	41	40	47	49

	Percentage of Students Whose Scores Reached the Level of "Proficient" or "Distinguished" by Content Area and by Year					
Subject and Grade Level	1993	1994	1995	1996	1997	1998
Mathematics						
Grade 5	4	23	25	28	18	34
Grade 8	12	30	22	25	29	38
Grade 11	4	8	14	22	16	18
Science						
Grade 4	1	3	11	9	16	18
Grade 7	1	1	1	0	1	1
Grade 11	5	5	7	6	14	16

Table 3

Instructional Activities in Math and Science as Perceived by Students in Rockcastle County School District

Content Area, Activity, and Grade	Reported Frequency (Percentage) of Occurrence				
	Never	About Once a Month	About Once a Week	Almost Every Day	Invalid Response
Mathematics					
A. Work on mathematics projects					
Grade 5	6	26	32	35	0
Grade 8	8	43	29	18	2
Grade 11	1	48	38	13	0
B. Use a calculator					
Grade 5	0	8	22	68	1
Grade 8	1	5	13	80	1
Grade 11	0	3	6	89	3
C. Use hands-on materials other than books or work sheets					
Grade 5	5	20	42	33	0
Grade 8	3	30	43	22	2
Grade 11	11	15	46	28	0
D. Discuss different ways to solve problems					
Grade 5	0	10	31	58	0
Grade 8	2	7	21	69	1
Grade 11	5	5	20	67	3

Content Area, Activity, and Grade	Reported Frequency (Percentage) of Occurrence				
	Never	About Once a Month	About Once a Week	Almost Every Day	Invalid Response
Science					
A. Read from textbooks or work on work sheets					
Grade 4	not asked	not asked	not asked	not asked	not asked
Grade 7	3	7	22	59	9
Grade 11	3	29	26	59	4
B. Work on science projects					
Grade 4	4	32	44	20	0
Grade 7	not asked	not asked	not asked	not asked	not asked
Grade 11	14	53	23	10	0
C. Study science, using ordinary objects from everyday life					
Grade 4	8	24	35	34	0
Grade 7	8	33	30	26	3
Grade 11	17	26	38	17	3
D. Watch the teacher give a science demonstration					
Grade 4	7	18	39	36	1
Grade 7	7	33	39	19	2
Grade 11	12	32	35	19	3

Content Area, Activity, and Grade	Reported Frequency (Percentage) of Occurrence				
	Never	About Once a Month	About Once a Week	Almost Every Day	Invalid Response
E. Have a hands-on activity to help learn science					
Grade 4	9	27	39	24	1
Grade 7	7	34	41	14	3
Grade 11	9	32	38	19	1
F. Do a science experiment in class					
Grade 4	1	29	43	26	0
Grade 7	4	55	30	9	3
Grade 11	14	36	36	12	3

Accountability continues to play a major role in public schooling in Kentucky. House Bill 53, passed in 1998, called for a redesign of the testing and accountability system. As a result, the Commonwealth Accountability Testing System (CATS) was designed to improve teaching and learning. From a tabloid distributed by Kentucky Department of Education, entitled Testing in Kentucky: Keys to Understanding Accountability, it is stated that the CATS includes

- National basic skills tests in reading, mathematics, and language arts
- Kentucky Core Contents Tests—multiple choice and open response questions in six subjects
- Writing portfolios and writing tests
- Alternative portfolios for students with moderate to severe disabilities
- Nonacademic indicators of dropout, retention, attendance, and successful transition to adult life
- Accountability—how the pieces "count" in a formula to promote school improvement

Districts that are deemed successful in this effort will receive rewards. With this new assessment and accountability system, schools that fail to successfully move along on a customized growth plan to the designated goal will become eligible for a scholastic audit. Appropriate assistance for schools falling below their "assistance line" may include:

- A scholastic audit process to determine the appropriateness of a school's classification and to recommend specific assistance
- School improvement plans
- Eligibility to receive Commonwealth School Improvement Funds
- Education assistance from highly skilled certified staff
- Evaluation of school personnel

As reported by the current and most recent superintendents and other administrative officials, the Rockcastle County School District has been actively involved in a number of reform and program improvement efforts over the past decade. Obviously, there has been an active building program, the establishment of site-based decision making as a management tool, and active engagement in obtaining state and federal grants to support professional development and student programming, all with the idea of leveraging resources to meet specific needs as a major goal. The district's curriculum director works with principals and teacher groups to align curriculum with both district and state expectations. The district's 1998-2000 goals/plans for mathematics and science are summarized below.

Mathematics:

Goals- Establish an aligned written, taught, and tested curriculum. Reduce the number of novice students by 10 percent and increase the number of proficient students by 10 percent. Reduce by 10 percent the number scoring 0 and 1 in the test sections on Data and Geometry.

Plans- Improve the library's math-related inventory. Provide professional development related to textbook usage and curriculum alignment. Use technology and

manipulatives more frequently with lessons. Participate in the 4-12 mathematics network. Participate in the Appalachian Rural Systemic Initiative.

Science:

Goals- All students, regardless of socioeconomic status, will perform at a high level on assessment. The number of novice students will decrease by 20 percent and the number of proficient students will increase by 10 percent.

Plans- Provide professional development to realign curriculum, implement hands-on activities at each grade level, and provide inquiry-based activities in each science class. Integrate instruction with math to improve graphing skills and experiment design.

Rockcastle County School District is one of 44 counties in 6 states that participate as a part of the Appalachian Rural Systemic Initiative (ARSI). ARSI's three strategic goals are listed below:

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

2. 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.

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

Descriptive information about ARSI states:

> . . . ARSI builds on local efforts and coordinates people and resources to the fullest advantage of the students. Keeping local educators in the driver's seat, ARSI adds value to reform efforts through its **Resource Collaboratives**, **Community Engagement**, and **Resource Awareness** activities as well as on-going partnerships with local and national mathematics and science initiatives.

The Resource Collaboratives, located at five partner institutions (Clinch Valley College at the University of Virginia, Marshall University, Ohio University, University of Kentucky, and the University of Tennessee), are described as the "foundation of ARSI." Collaboratives partner with the teachers, schools, and communities that drive the effort to enhance mathematics and science instruction and improve access to resources. As a part of this effort and with support from ARSI for part-time release from other duties, a Teaching Partner is designated in the Rockcastle County School District (and other participating school districts) to

- acquire more in-depth knowledge about mathematics and science
- plan and implement research-based instructional practices in their classrooms

- provide hands-on learning opportunities for their students
- serve as mentors with other teachers in their school and district
- provide valuable resources for their colleagues

Other forms of assistance and support through ARSI's Resource Collaborative element include use of national and local mathematics and science experts to provide Teacher Partners with localized professional development opportunities; almost unlimited access to standards-based curriculum activities and educational materials through World Wide Web sites; help for Teacher Partners to develop classroom lessons for their unique circumstances; and specific strategies for adopting instructional materials, aligning curricula, and analyzing students' needs based on mathematics and science assessment results. It is said that "Teacher Partners, in turn, broaden ARSI's impact by sharing lessons learned through hands-on experiential opportunities with other teachers in their district."

According to ARSI descriptive materials, its (ARSI's) "value to the region lies in the solid commitment to addressing issues at every level, from the student to the state. This perspective enables ARSI to develop system-wide improvements and, with the aid of its five Resource Collaboratives, produce long-term, sustainable improvement in mathematics and science instruction and learning." This takes the form of coordinating mathematics and science program improvement reviews, helping districts develop educational improvement plans that identify strengths and weaknesses in each school along with recommendations for improvement, and providing opportunities for communities throughout the region to exchange innovative ideas and network among peers, as well as assistance to develop local school level web sites.

In its efforts to partner with communities, ARSI reports that it provides Community Engagement Teams with the tools and knowledge to investigate the status of mathematics and science education in their schools.

According to ARSI officials, there are four most important aspects of its approach to systemic reform in the region:

- provision of localized assistance
- ability to draw on the strengths of higher education
- encouragement of higher education to "get into the schools of the region"
- use of nonthreatening interventions

In each district, catalyst schools are established to be model schools. While there do not appear to be any "hard and fast" criteria for catalyst school designation, there must be a supportive principal and a Teacher Partner selected and arrangements made for him/her to focus on improvements in that school. In Rockcastle County School District, the middle school and high school were designated

as catalyst schools. The role and specific responsibilities of the Teacher Partner are mutually determined by the Resource Collaborative director or representative for the area, who in this case is Kim Zeidler. Important considerations in selecting the Teacher Partner are candidates' reputations in the district, ability and willingness to work at the level(s) of the catalyst schools, and commitment to the goals and objectives of systemic reform exemplified in this project as compatible with local district needs.

In Year 1 of the Teacher Partner arrangement, ARSI provided $12,000-15,000 toward release time. For full-time release time, local districts match ARSI funds. This furthers the notion of a partnership between ARSI and the local school district and likely increases the potential for sustaining the effort—i.e., Teacher Partner—beyond the time frame of NSF funding.

The first Teacher Partner in Rockcastle schools (Cindy Ham) was a high school biology teacher who was also chair of the science department. During her first year as Teacher Partner, she did not have release time; she was trying to carry out ARSI responsibilities along with a full-time teaching load. During the second year, she was given one-half time as release time, which permitted her to begin work in aligning the local curricula in math and science with the state framework and national standards and develop and teach demonstration lessons. From her perspective, the first year was not very productive, since there was a need to define the responsibilities, organize files, attend information/training sessions, etc. But, with release time, she began to make progress at the local level. She thinks that the desired characteristics of a teacher partner include high energy level, flexibility, and good people skills. After the second year and for both personal and professional reasons, she returned to a full-time teaching assignment in the high school.

The person who replaced her is Terry Parkey, a middle school teacher with several years of experience in the school district. With a full-time assignment as resource teacher, she has defined her responsibilities to be primarily that—a resource to other teachers. Conversations with her reveal a high degree of commitment and hope that the math and science programs in the district will develop according to established standards and be responsive to the results of program/curriculum audits or reviews. Both she and the former Teacher Partner, Cindy Ham, indicated that the availability of ARSI resources and the cooperation and support of the collaborative representative, Kim Zeidler, were quite positive.

According to the curriculum director, Shelby Reynolds, and the superintendent of schools, Larry Hammond, Rockcastle had a history of involvement with reform efforts and participation in externally funded projects. Discussions with the former superintendent, Bige Towery, gave a historical perspective of how this condition might have developed.

It is also important to note that Mr. Hammond and Mr. Reynolds were a part of Mr. Towery's administration, which began in 1987. He indicated that he had a vision for the Rockcastle schools that included the following:

- a building program that included both new construction and renovation of older buildings

- rasing expectations both within the school and in the community
- upgrading the quality of instruction at all levels

The Kentucky Education Reform Act (KERA) helped reduce the influence of "politics" and required the development of organized planning efforts. In 1990, local plans had to be integrated with KERA requirements. As a result of local efforts and with state-level direction, major changes occurred in education, not the least of which was an equalization of resources across the state. Since Rockcastle is a poor county, this resulted in more money for the school, but also in an increased tax burden on the citizens.

With all of the changes, including the decentralization of the school district, school-based decision making, the prospects of rewards and sanctions related to accountability requirements, etc., some teachers who were not supportive of the changes or willing to commit to the plans chose to take early retirement. However, there has not been a problem in the district's success in attracting new teachers from area colleges/universities.

When Mr. Towery retired for health reasons in August 1995, the leadership for the district was assumed by Mr. Hammond. From the visiting team's perspective, the current administration has continued along the same aggressive path of school improvement, and the appearance of ARSI was a nice match with these goals and efforts.

ARSI staff found that many local schools did not know what good science and math programs looked like. To develop this level of understanding and appreciation, it was necessary to offer and conduct program reviews/audits and to conduct training for administrators. After adopting a curriculum audit model developed by Fenwich English and employing Steve Henderson, ARSI instituted a major effort for reviewing/auditing curricula. Although Mr. Henderson and others had been conducting such studies within the context of other organizations, this gave the presence of a strongly accepted arm of assistance to local schools. The results of two such reviews for the Rockcastle schools were presented to the visitation team. The middle school program audit for mathematics was conducted in Fall 1997 under the direction of Ron Pelfrey, and the "Science Program Improvement Review" was conducted in Spring 1999.

The Pelfrey audit report includes an extensive and rather specific list of conditions or expectations:

Curriculum:	Uses problem-centered content that develops students' conceptual understanding of mathematics, appreciation for its applications, ability to communicate mathematically, and proficiency in computational skills.
Instruction:	Engages students in a variety of learning experiences designed to promote mathematical exploration and reasoning.

Thinking Processes:	Develops students who are problem solvers, critical thinkers, and effective mathematical communicators.
Developmental Diversity:	Provides instruction and resources to meet students' diverse learning needs.
Attitudes:	Fosters positive attitudes about mathematics and encourages and recognizes students' accomplishments.
Relevance:	Relates mathematical knowledge to students' interests, experiences, and future goals.
Collegiality:	Inspires collegiality among the faculty and the administrative staff who work together to implement responsive mathematics programs.
Community:	Involves the parents and the community in a collaborative effort to promote student competency in the development and use of mathematical knowledge.
Continuing Assessment and Redesign:	Continually assesses student achievement, evaluates program effectiveness, and uses the results to determine if there is a need for improvement.
Organization:	Facilitates effective and consistent mathematical instruction.

Although numeric ratings were made of the several subitems under each major category (see above), a clearer picture of the mathematics audit for Rockcastle County Middle School might be reflected in the "Summary of Recommendations."

1. Provide funding to support the mathematics program, e.g., to purchase a projector to be used with a computer, more library books in mathematics for student use.

2. Consider adopting a strong middle school mathematics textbook program that is aligned to Kentucky's Core Content for Assessment and, at the same time, provide additional curriculum options to students, i.e., 7th grade "general math"or "pre-algebra" and 8th grade "general math" and/or "pre-algebra" and "Algebra I."

3. Develop and incorporate the use of lessons that involve cooperative learning and the use of manipulatives.
4. Consider adding an additional computer lab for instructional use (or more computers in each classroom on a distributed network) as funds become available.

5. Provide teachers with on-going professional development on developmental diversity to include strategies on teaching students of differing abilities as well as differing learning styles/multiple intelligences.

6. Conduct an item analysis of the KIRIS mathematics questions in order to begin to identify if there are problems with either gaps in the curriculum or with ineffective instruction.

7. Schedule a series of meeting between the teachers at all three levels (with an effort to have 100% attendance from teachers at grades 4-10 and at least representatives from the other grades) to examine the district curriculum in order to establish instructional focuses for each grade level or course–including recommended "exit" criteria for primary, elementary, "pre-algebra"–in middle school.

8. Provide professional development training and, if possible, classroom follow-ups (modeling, teachers observing another teacher, etc.) on technology, the use of manipulatives, and problem solving.

The Science Program Improvement Review, conducted by Stephen Henderson, included a site visit to the schools, review of school documentation, data analysis, and the development of a data summary and recommendations. Similarly, there were broad categories of practice that served as the focus of the review. These areas, with a partial and abbreviated statement of recommendations, are listed below.

- Organization—The school should develop a long-range plan for science program improvement based on the needs of students . . . Science should be taught from an inquiry basis at all levels . . . Develop plans for increasing parent/community involvement in the science program.

- Leadership—Principals who have not done so should participate in leadership training sessions related to science . . . Principals should make a conscious effort to monitor the science instructional program through frequent visitation to science classes, etc.

- Curriculum—Develop and implement a countywide K-12 science curriculum that is aligned with the Kentucky Core Content for Assessment . . . Provide the necessary professional development at each school to insure implementation of the aligned curriculum . . . Develop and implement a system for monitoring the science instructional program based on a sound, implemented curriculum.

- Instruction—Opportunities for student inquiry should be increased for students at all grade levels . . . Quality student work in science should be recognized and rewarded through public displays, press releases, etc. . . . Parent/community programs focusing on science should be encouraged.

- Training and Development—Each school and the district should develop a long-range plan for professional development and leadership training in science that emphasizes inquiry-based science teaching . . . Teachers need professional development time to identify and adapt resources to support the curriculum.

- School Climate—Schools need to develop plans to further promote school/community activities in science . . . Additional opportunities should be provided for students to observe and investigate interactions among living organisms.

- Evaluation and Assessment—Continue the expansion of open response, portfolio, student projects, and other types of "non-traditional" assessment strategies . . . Students should be challenged through additional science inquiry and higher level thinking strategies.

Conversations with teachers and administrators revealed that the audits/program reviews in mathematics and science were valuable for gaining an external perspective of these programs and for providing guidance for development and improvement. The value of these efforts in Rockcastle County School District and elsewhere is also recognized by ARSI officials as it partners with local schools and school districts.

Further assessment and evaluation of the science and math programs in the district are reported in a document entitled *Rockcastle County Science and Mathematics Survey Results*, Fall 1999. In this survey, teachers of math and science at the elementary, middle, and high school levels were asked how comfortable they were in teaching specific concepts identified for their particular teaching area and school level. The purpose of this survey was to help identify topics and areas for which professional development work is needed. The response options were from a 1 (low) to 5 (high), and the report includes an average of the responses. Although no statistical comparisons were done, it appears that the elementary school teachers are a bit more confident in their abilities to teach math than they are to teach science. One somewhat surprising result is the relatively low level of comfort in some areas of life science at the high school level. Overall, most of the ratings of all areas and grade levels were from about 2.75 to 3.25. While a survey that asks individuals to identify their weaknesses might have questionable validity, it does demonstrate an effort by the school district to tie in-service/professional development to needs, as perceived by major stakeholders, the teachers themselves.

Progress and/or Presence of the Drivers of Educational System Reform

Evidence of the presence or progress toward fulfilling the intent of the Six Drivers for Educational System Reform, as disseminated by the National Science Foundation, was a major focal point of the visitation team's work. In the following section, these findings are summarized.

Driver #1: Implementation of comprehensive, standards-based curricula as represented in instructional practice, including student assessment, in every classroom, laboratory, and other learning experience provided through the system and its partners.

It is evident that across the curriculum of the Rockcastle County schools there are clear and concerted efforts to coordinate a standards-based, high quality curriculum. Though it is not always clear that all staff persons know what a standard is (i.e., a criterion used to measure quality), evidence to support the assertion above includes documents (e.g., Code of Conduct and Rights and Responsibilities, high school mathematics scope and sequence, ARSI District Implementation Dimensions), observations, teachers and administrators (interviews), and discussions with ARSI staff.

Our data suggest that the elementary schools are most active in the ARSI-led reform with regard to issues such as understanding the K-12 curriculum, planning across disciplines, etc. Elementary school teachers report that they have frequent meetings that allow them to examine topics of the curriculum and to coordinate efforts across grade levels.

It is clear from all discussions with teachers that standards, especially state standards, are foremost in their minds as curriculum reforms are put into place. Teachers understand that the state standards play a large role in the whole picture of accountability, and they do not see that as a negative influence.

Particular strength is evident among middle school teachers with regard to their ability to articulate instructional standards, reference standards in the curriculum, describe use of standards, and identify activities that were designed to improve the curriculum. Discussions with middle school teachers revealed a sense of unity of purpose and mission with regard to both the need for and best practices to improve science and math education for all children.

High school teachers of science and math report a considerable amount of time devoted to align curricula with national and state standards. They also mentioned the usefulness and need for continued use of program audits/reviews to guide improvement efforts.

All teachers report an increase in in-service or professional development activities. There is difficulty differentiating who or what group is responsible for this activities, i.e., is it ARSI or some other group within the school district or the state? It was interesting to note that some ARSI staff persons thought that early professional development activities had too much emphasis on technology, while the teachers mentioned that these workshops were "particularly good."

Driver #2: 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 each mathematics and science teacher (including all elementary teachers); and administrative support for all persons who work to dramatically improve achievement among all students served by the system.

The central office administration of Rockcastle County School District shows particular strength in the understanding of and actions to develop a coherent set of policies that encompass all students, assure adequate time for professional development, provide adequate financial and administrative

support for professional development, and the need to constantly review and revise policies to support the improvement of opportunities for student learning and teacher development.

While not a formal policy, central administration has taken the position that it will try to "scrape up the money" to support any proposed professional development activity that is related to one or more of the district's initiatives. The impact of KERA is clearly evident in the district, and it, along with others such as ARSI, seems to be in a favorable position among priorities. The district's policy related to site-based management puts much of the decision making in the hands of the individual school, and this opens the door for focused efforts to educate all children.

In the middle school, high school, and elementary schools, it was clear that the principals are instructional leaders, but they also seem quite willing to share this leadership with individual teachers. We heard discussion among teachers about aligning the curriculum with state standards and "connecting" the curriculum across grade levels. This is done formally through committee work, but we also saw it occurring on an individual basis.

In response to the program audits/reviews and the efforts of ARSI, principals have participated in workshops and other professional development activities that help them in their leadership role and in support of the systemic reform efforts.

Teachers at the middle school report that a large share of the success of the reform efforts is related to ARSI and the resource teacher. Since ARSI provides only $15,000 for the resource teacher, the district's administration and school board must be supportive of the effort and willing to provide continuing support for this position as well as other cost-sharing projects. While not a large district with excess monies, it has been able to find the resources to do what was necessary to fulfill its commitment to ARSI requirements.

Since the arrival of ARSI, the teachers of Rockcastle County School District think that in-service and professional development activities are greatly improved and more focused on the improvement of instruction and curriculum and that there is a greater collaboration among the teachers with courses, across disciplines, and across grade levels. ARSI is but one effort among several interventions in this school district; while the teachers think all of the projects are helpful, they sometimes wonder if there are too many projects that compete for their time and attention.

Driver #3: Convergence of the usage of all resources that are designed for or that reasonably could be used to support science and mathematics education–fiscal, intellectual, materials, curricular, and extra-curricular–into a focused and unitary program to constantly upgrade, renew, and improve the educational program in mathematics and science for all students.

The Rockcastle County School District has been deeply involved in reform efforts for ten or more years. Beginning with the former superintendent and continuing to the present, the efforts directed toward systemic reform have been evident and the ability to support the effort has been refined.

Although formal documentation was not presented, discussions with faculty and administrators as well as direct observations supported the findings.

The presence of computers in each classroom, internet access in each classroom, graphing calculators, computer networking, distance education, and satellite capabilities provide excellent math and science education. Although these capabilities exist, there does not appear to be a lot of utilization of the technology. Inquiries to central district administrators confirmed this perception.

The district has a long and ongoing involvement with a number of funding entities. As a result, it is difficult to specify percentages dedicated to RSI efforts. Anecdotal reports from district and building level administrators seem to reflect a strong and laudable integration of the various initiatives.

Although no specific budget figures were viewed, reports from district administrators regarding budget increases for math and science were confirmed both by building level administrators and classroom teachers. Their statements, along with direct observations of technology and curriculum materials, support what was uniformly reported by the aforementioned individuals.

Faculty at all levels in the Rockcastle schools report readily available resources for work beyond the traditional school year. They further report that, as a result of the RSI staff, the quality and focused applicability of what has been provided has increased participation.

Driver #4: 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, based on rich presentations of the ideas behind the program, the evidence gathered about its successes and its failures, and critical discussions of its efforts.

The organizational structure of the schools insures coordination between the initiative and other stakeholders. The site councils are given broad policy and budgetary powers. Membership on the councils includes parent representatives.

Broad-based support for program goals is engendered through a variety of means. The aforementioned site councils, outreach programs that serve the traditionally underrepresented and open the school building to all constituents, close and constant communication with parents and parent groups, and collaborative efforts with area colleges and universities all work to elicit understanding and familiarity with the program. This understanding and familiarity result in broad-based support.

The desire to improve achievement of all students is evidenced by two major factors. First, the affiliation with ARSI indicates a desire to provide a math and science program that is congruent with national standards. The "good faith" of the district is observable through the willingness to participate enthusiastically in all activities linked to curriculum improvement. Second, with the desire to increase standards comes the risk of leaving some students behind. In addition to what appears to be a strong monitoring process for all students, the Migrant and Family Resource Youth Service

programs are specifically aimed at helping those students who are traditionally the most at risk. The support observed at the middle school program to "kick off" the new initiative provided very strong evidence of helping all students.

The PTA and other parent groups, the Migrant Program, the Family Resource Youth Service, and Berea College (GEAR UP Program) are all involved in collaborative efforts that support reform and improvement in this school district. Although no direct evidence of major involvement of business and industry was observed, the direct involvement of the former superintendent in economic development efforts infers the possibility of such a relationship. It was reported that the Pizza Hut provided some form of reward for students with perfect school attendance.

However, there is a considerable span of family education levels and general support for schools in this area. The extent to which the poorer, less educated, and historically less supportive families are actually involved in meaningful dialogue or development activities is not totally clear but, as a group, the visitation team predicts that it will be quite low. On the other hand, it may be unfair to even consider such a common grouping, since there are economically poor parents with little formal education who are strong supporters of education and who will do all they can to assist their children to achieve more than themselves.

Overall, there seems to some agreement that "lack of parental involvement and lack of value for education are the most critical barriers to the total success" of the schools in this county. Regardless of the good things we observed, we sense that there is still a considerable gap to be closed between actual parental involvement and support and that thought to be acceptable. One elementary school principal reported that he had created a Parent Network that meets once a month to "just talk about school," and that effort had grown and was considered to be an important way to communicate with parents and to hear their concerns.

Driver #5: Accumulation of a broad and deep array of evidence that the program is enhancing student achievement, through a set of indices that might include achievement test scores, higher level courses passed, college admission rates, college majors, Advanced Placement Tests taken, portfolio assessment, and ratings from summer employers, and that demonstrate that students are generally achieving at a significantly higher level in science and mathematics.

Certainly, Kentucky is widely known for its high stakes testing program and the associated rewards and punishment. Various test scores were presented and discussed earlier in this report. The district has gone beyond the minimal state requirements for student testing, and the results of a survey of science and math are reported in a document dated Fall 1999. Two tracks of math courses are available to students, and there are advanced courses in both and math and science that may be elected by students. Responses to inquiries about college attendance, success in college by recent graduates, other potential indicators of student achievement, and other forms of accomplishment were rather vague and elusive. Approximate numbers or rounded percentages were as specific as administrators and teachers responded. If more and better information is available, then it is not widely used by officials in the schools.

As stated earlier, the residents of this community, like many others, do not have a history of academic achievement and educational attainment; therefore, lofty goals or expectations at this stage may be unrealistic. On the other hand, the teachers and administrators with whom we talked are committed to "raising the bar" in this school and community.

Based on the evidence that was presented to us, there is simply not the improvement in student achievement test scores that are acceptable or indicative of major improvements. This is not to say that improvements in test scores, discussed earlier, are not indicative of progress. Possibly, there are other measures of achievement that have not been utilized to measure the impact of the RSI and/or the many other reform efforts attempted by this school district. It appears that "they are doing the right things, but the results are not there." We sense that this situation is as haunting to local school personnel as it is to outsiders.

Driver #6: Improvement in the achievement of all students, including those historically underserved.

As discussed earlier, there have been improvements in the achievement test scores of students in this school district. The extent to which this improvement can be attributed to participation of individual teachers or the school as a partner in ARSI activities is unknown. This district has a record of involvement in a variety of educational reforms/programs designed to improve schooling at all levels and in specific subject areas. It has targeted programs for families in need of special support and for children of migrant families. Just as an achievement score of a 6th grade student is not solely the result of his/her instruction at that one grade level, neither can one attribute improvements in any subject area to a particular program in a school in which there are many ongoing interventions. Clearly, this is not to demean or to detract from the potential impact of ARSI or any other single intervention. It is simply a statement about the reality of the situation. More importantly, there remains a large gap between the current achievement scores of students in this school (K-12) and the target level established by the Commonwealth of Kentucky. While there is evidence of progress, there is still a long way to go.

The dropout rate is far too high in a community in which there is limited employment and for which a large number of the residents must find employment outside the county. For them to receive a livable wage, a high school diploma and an ability and willingness to continue to learn and develop saleable skills are essential. Among all citizens, not just school officials, there is a need for greater concern, support, and expectations for educational achievement for all persons living in this community and region.

In this community, there is a fairly homogeneous population with regard to race and ethnic origin, and one could argue that an underserved group does not exist. The schools in a small rural community are open to all children and youth, and often there is only one school serving a large geographic area. This county is served by only one middle school and one high school. Therefore, it is hard to argue that one particular societal group is favored over another with regard to the quality of school they are required to attend. Since most families in this community are poor, there are

ongoing social assistance programs to help them meet their nutritional and clothing needs. Free and reduced cost breakfast and lunch are available, and we saw no evidence of resistance to participation in these programs or discrimination on the part of peers or adults in the schools.

An educational program for children of migrant workers exists. Thus, to make judgments based on disaggregated achievement data for such a few students who represent historically underserved racial or ethnic groups is probably not realistic or valid. For example, the KIRIS performance report for 11th and 12th grade students in Spring 1998 showed only one non-White (non-Hispanic). Likewise, there were only two reported non-White students in the 5th grade report.

In looking at gender differences on the KIRIS, mathematics scores appear to be quite similar at the 5th grade level, while a somewhat higher percentage of male students achieved at the Proficient or Distinguished level in science (24 percent vs. 16 percent). Eighth grade females exceeded their male peers in mathematics (42 percent Proficient or Distinguished for females vs. 34 percent of the males), while there are no differences between the performance of 7th grade males and females in science; and there are virtually no differences between the scores of males and females at the 11th and 12th grade levels in math and science.

In this community, it appears that this driver is of relatively little significance, except in regard to gender and possibly the very poor. There is no evidence that there is a notable trend with regard to achievement based on the gender of the students, and we do not have data disaggregated by economic levels. However, it should be noted that there has been a pattern of low academic achievement among K-12 students in this county and low educational attainment among the adult population. It might be most appropriate to think in terms of an underachieving community, but not suffering from a school that is either poor or consciously providing a less than satisfactory educational opportunity for K-12 students.

Based on a set of indicators for each of the drivers that were developed and validated by the Resource Advisory Team of the NSF RSI evaluation study being conducted by The Evaluation Center at Western Michigan University, the overall rating of each driver in the Rockcastle County School District is shown in Table 4. The rating of each driver is a consensus based on the evidence found during the on-site study/visit and the independent ratings of the four members of the visitation team.

Table 4

Rating of Educational System Reform Drivers

	Driver	Rating*
1.	Implementation of standards based curriculum . . .	2-3
2.	Policies supportive of quality math and science programs . . .	3
3.	Convergence and usage of resources to support math and science programs . . .	3
4.	Broad-based support and involvement of parents and others . . .	2
5.	Accumulation of broad and deep array of evidence that the program is enhancing student achievement . . .	2
6.	Improvement in the achievement of all students, including the historically underserved . . .	2

* 0 = Not present/no evidence; 1 = Weak evidence/beginning but sporadic; 2 = Moderate evidence/developing but visible success; and 3 = Strong evidence/operationally consistent and widespread

In summary, the Rockcastle County (Kentucky) School District is an active participant in the Appalachia Rural Systemic Initiative. The district has enjoyed reasonable and strong leadership over the past several years, and yet the students have not met satisfactory criteria for academic achievement. The issues and problems related to schooling in this rural area are of considerable magnitude and importance, and there is sincere concern about addressing these in a timely and effective manner. The RSI is but one effort to reform the schools and to reverse a pattern of low academic achievement that has existed for far too long in this area. The evaluation team acknowledges concerted efforts and shares in the frustrations that educators and others must be experiencing feel in this ongoing struggle.

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