

Best Practices Case Study

Susan Sherwood, June 2009

Bolivar-Richburg Middle School Science *Bolivar-Richburg Central School District*

School Context

The Bolivar-Richburg Central School District is located in Allegany County in southwestern New York State, close to the Pennsylvania border. In the late nineteenth century the area began successful and lucrative oil production, but recent economic reports for the county indicate financial struggle. According to US Census Bureau estimates for 2007ⁱ, the median household income for Allegany County was \$37,954, the second lowest in the state. The poverty rate for all residents was 16.7%, the fifth highest of the state's 62 counties.

As in most school districts within the county, economic conditions at Bolivar-Richburg Central School District are discouraging: Fifty-one percent of students within the district were eligible for free or reduced lunch in the school year 2007-2008, compared to a state average of 44%. Despite financial challenges, students are still able to make great progress. Ninety-one percent of the students at the Middle School met or exceeded the standards for the state Intermediate-Level Science Examination, and this high performance has been consistent for several years.

Student Demographics 2007-2008: *Bolivar-Richburg Middle/High School, Bolivar-Richburg CSDⁱⁱ*

	Bolivar-Richburg Middle/ High School	Bolivar-Richburg Central SD	New York State
% Eligible for Free Lunch	25%	35%	36%
% Eligible for Reduced-Price Lunch	13%	16%	8%
% Limited English Proficient	0%	0%	7%
Student Ethnic/Racial Distribution			
% African-American	1%	1%	19%
% Hispanic/Latino	0%	1%	21%
% White	98%	98%	52%
% Other	0%	0%	7%
% Students Meeting or Exceeding State Standards on Intermediate- Level Science Examination	91%	91%	71%
Total Enrollment	455	841	2,741,385

A recent two-day research visit to the middle school included classroom observations and interviews with teachers and administrators. From these data, several themes emerge to explain continued academic success within a struggling economy:

- the presence of key faculty members;
- a focus on engaging and maintaining student interest in science;

- emphasis on addressing the needs of lower-performing students;
- a district-wide reform effort to establish “The Thoughtful Classroom” model; and
- use of assessment data to modify programs.

As the principal of the Middle School/High School related:

Supposedly, Bolivar is the poorest town in the county. Anytime there is poverty, it presents a lot of unique challenges. Home lives are difficult for a significant number of our students. I don’t know if there is a real strong support for our educational system. Again, in a lot of the homes, a lot of the parents probably didn’t graduate high school or only graduated high school and didn’t aspire to higher education, which is, of course, what we want for all of our students. So I think that presents a challenge right there.

Although inherent problems exist, the Bolivar-Richburg Middle School has been finding ways to overcome them.

A Closer Look

Key Faculty Members

The principal has high praise for the faculty:

You need the right people. . . . You have to have the right people who are willing to, one, look at data and take it for what it is; not just say, “Well, this class is just a bad class, so that’s why,” or “This is a poor student, so they’re going to struggle.” You need to look at the data and analyze that and be willing to make adjustments to your teaching style based upon that, especially once you see a pattern starting to develop. That’s hard if you’ve been teaching fifteen years and think, “I’ve always done it this way.” To be willing to step back and say, “Well, maybe I’ve been doing it for fifteen years like this, but it’s not getting through to the kids in this particular area.” I think we have the type of people here who have done that. We have dedicated, very, very dedicated people. . . . I think it comes down to the people. The character of the people you have.

The science teachers also recognize the importance of having a dedicated, caring staff. As one teacher said, “First and foremost, you’ve got to care. You’ve got to come into that classroom every day; every kid has to be on your mind. What do they need? How are you going to get it to them? If they don’t get it this time, what are you going to do to make it better for them? The achievement of any individual is based on the effort that you put in. You can’t give up.”

One experienced teacher in particular was mentioned in almost every interview as being essential to the success of the science department, both in his interaction with students and his curriculum work. The district director of curriculum and instruction observed, “He is extremely involved with the students. He is dedicated to the students. He tries to make the science and the learning fun. . . . The kids can relate to him; they have a relationship with him. They like him. He’s very involved in the school; that’s also contributed to his success.”

During an interview, that teacher shared some of his teaching philosophy, which emphasizes reaching students in a way that is relevant for them, so that they will make an effort to succeed:

I really don't like teaching by the book. I think anybody can teach from a book. . . . I believe you have to do things that interest students in the first place, capture their interest. You want them to see the relevance; "Why do I even bother doing this?" "If we're doing density, who cares?"

I have an aquarium. We throw objects into the water, and they predict what is going to happen. A hard concept is: if I cut an object in half, the density doesn't change. That doesn't make sense to them. Well, it does when I show them the math, but they don't care about that. So I bring in a big piece of wood; I bring in a saw. I make a production out of it. I saw the board in half, and I throw it in. Lo and behold, the pieces float the same way the board did. So how are we going to teach them? We're going to teach them with things that make sense . . . and I think you have to be on top of applications. You have to be continually looking for sources.

During an observation of this teacher's class, I saw students given the opportunity to work cooperatively, assess information, and create hypotheses, all with a goal of each student coming to a personal conclusion about the causes of global climate change. As the teacher reminded the students, "One of the things I like you to do in this class is tell why you do what you do or think what you think. You're going to go to other groups and talk to them about it, then you're going to make an informed decision." The class was in the process of discovering how climate change touches their lives; next up would be drawing conclusions on the source or sources of the problem.

This teacher's influence is not limited to the classroom. He has been essential in the development of the K-5 science curriculum, collaborating with the elementary school teachers to ensure students come to middle school with specific fundamentals. As the principal explained, "He's gone down and worked over the summer with elementary teachers to help organize lessons, teach objectives, things like that. There's been a lot of alignment throughout the district, particularly at the elementary level. When the students now arrive in our building, they've learned what they're supposed to learn so that we're ready to pick up at that point. We know the information that they're coming to us with. That helps the science teachers up here do their job. They don't have to go back and do a great deal of re-teaching or cover content that should have been covered at the fifth grade level. They know it's been covered."

The teacher himself described the extensive process of working with the elementary teachers:

I worked on that project for seven years. . . . One of the things I found out is that elementary teachers, through no fault of their own, don't understand science. They just didn't take a lot of science. So one of the things I did for years was to sit down with them and figure out, what do you want to teach? How are you going to fit it in? We looked at what high school teachers want for Regents, and what teachers want in the middle school. How are we going to make it happen?

The elementary teachers taught no physical science -- none -- because they didn't understand it. For example, states of matter. One of the things that elementary kids didn't

understand was that there is water in the air. They don't see it. They don't know it's there, and there's no purpose to it to them. We figured out what it takes to teach them, and I did a science show once a month for every grade, K-4. . . . For example, I'd put ice into a pan and then be shocked that, when I looked in, it'd be water, which is liquid, of course. That's what we talked about, but the important part was, of course, that it went into the air. We watched it, we talked about where we see it, and then I got it back [through condensation] with a mirror. We talked about what's in the air, and now every kid coming out of elementary school knows that water is in the air; that's something that doesn't have to be taught. That's just one example.

We took almost all the concepts. We took every grade level and said, "What do we want them to learn? How are we going to teach it?" We bought some equipment for five years in a row. Not science equipment; we went out and bought things, toys. I'm big on toys. If you come in my physics class, eighth grade, toys are going down the table. Well, that's what we did for every grade level. We determined what it takes to get to the fourth-grade exam. The fourth-grade teacher had been teaching everything. Had to.

They all grew plants; they all measured plant height. Butterflies, they love butterflies. We said, "Why are you doing what you did?" Then each butterfly unit had to be different from the ones before. There was a different point to it. We covered all the material by the fourth-grade test. Then we said, "What's it going to take for the eighth-grade test?"

But it also has to do with trying to figure out what the elementary students need to know and how we are going to teach them. Elementary teachers don't usually use textbooks. We found out that elementary students can be taught incredibly difficult concepts. For example, Newton's laws: I never thought that second graders would really get the laws. I just happened to be teaching something one time, and I explained something from eighth grade. The elementary kids got it right off. They got it right off that the object in motion stays in motion. They understood that. I probably should have known they would, but I just hadn't thought about it because we hadn't taught it to second graders before.

Student Interest

Toys, plants, butterflies . . . all these can be used as tools to pique students' interest and make it more likely for them to engage in science class and want to enroll in upper-level courses. The superintendent of schools declared, "Everything you do on a daily basis probably involves some form of science. . . . I think it's a teacher's job to get them hooked on science and excited about science, then provide the interesting daily lessons to reinforce that excitement. . . . I think you tell the teachers, 'Hey, listen, tests aren't the number one thing in the world. I think the student being successful and enjoying the subject is more important.'"

The teachers at Bolivar-Richburg Middle School adhere to this belief; it was cited as essential during each interview. Sparking student interest in science is done through providing 'hands-on' experiences, demonstrating connections to students' lives, and selecting engaging materials. As one teacher conveyed: "We use a lot of interactive materials; we use a lot of technology here. We have the monitors and the projectors in every room, and we use a lot of films." Novel approaches emerged as well, as she continued: "I also have the students do a lot of the teaching. They just finished five to ten minutes each teaching a part of astronomy. They had a planet; they had

different things in the solar system like black holes or constellations. They had to be the teacher and provide handouts or whatever materials they were going to use.”

Teachers are concerned with maintaining the interest of learners at all levels. One teacher stated,

You’ve got to make it fun. They want to be here. If they’re interested, it’s amazing. You’ll watch what we’ve coined a ‘low-achieving student’ become a high-achieving student if they want to become involved. Most of the low-achieving students just haven’t been reached; they haven’t been touched. They don’t care to participate . . . because they’ve been deemed as a low-achieving student.

The class that you observed this morning, that’s my inclusion class. This was my special ed inclusion class, and these guys are one of my top-performing classes. Their study skills, their study habits are good because they’ve had to work.

This observed class focused on the circulatory system. During the 80-minute block, the teacher continually tied learning directly to the students. To illustrate the tremendous work of the heart, he challenged students to flex their arm muscles as often as their heart beats in one day. Students’ scraped knees were connected to blood coagulation. Finally, students worked in groups to create questions (e.g., multiple choice, short answer) they considered valuable enough to be placed on an upcoming test.

Special education teachers, most of whom bring their students into the general education classes, concur with their colleagues: it is essential to reach students through their personal interests: “In science we try to make it interesting. In a lot of the experiments he [the science teacher] will try to incorporate sports. We’ve done friction, and we’ll have students pick a sport that they like: ‘Where do you see friction? How does the turf on the football field [provide friction]?’”

It’s not enough just to prepare interesting lessons. Many teachers consider it essential to vary teaching strategies to address specific needs of learners. Another special education teacher clarified: “As best I can, to gear it to make it relevant to their lives. I assess their learning styles, too. I have one student who does better with hands-on. I might have one student who is a visual learner, one student who is an audio learner. I try to incorporate a little bit of all of their learning styles into a unit so that it becomes relevant for them and easier for them to understand and apply what they’ve learned.”

Lower-Performing Students

The needs of special education students are a prime concern at the Bolivar-Richburg Middle School. A special education teacher detailed the current educational model:

We have a direct consultant teacher for every grade level. I take my students with IEPs [Individualized Educational Programs], and I go with them to every single class. I help them in their classes. If they need, I take notes for them; I provide any accommodation in class. For testing I pull them from the classrooms to come in here [to my room] to test.

In science, we do some team teaching. . . . I know that unlike our school, a lot of schools don’t have the direct consultant model. A lot of schools have maybe one special ed

teacher for three or four grades. But I definitely see that [consultant teacher model] as a plus. I think it has really helped. Because a lot of times I will do the daily opener for the science teacher, and then he will do some of the lesson. If he's ever not there, I know the material, so I can teach it to the kids. Also, being in the class, I can reinforce that during my advisement.

Consultant teachers meet regularly, both formally and informally, with their grade-level team. Discussions include content, teaching strategies, discipline, and students.

A minority of special education students in Bolivar-Richburg are in self-contained rather than inclusion classrooms. These students, however, are occasionally integrated into general education classes, as reported by another special education teacher: “There are times, especially before the state exams, we actually go into . . . [the eighth-grade class] and do some lessons together. I try to incorporate that as much as possible. Any time we have the opportunity to work with the regular ed in their classroom, we do that.”

Bringing special education students into the general education science classrooms can be so valuable to learners that special education teachers interviewed identified this as a recommendation for schools seeking to improve that population's science performance. One special education teacher summarized these views:

Definitely become involved with the regular education teachers. That's the most important thing, because as a special education teacher, especially one that has to teach all subjects, a lot of the resources and the expertise aren't available if you choose to be totally self-contained. . . . I do have a background in science, math, social studies and reading, but I'm not necessarily an expert in science. So I wouldn't assume that I would have all the best resources to give the kids. That's why I choose to seek out the general education teachers. They have things to offer the kids that I can't give them myself. I do what's best for the kids, not what makes me feel like an expert. . . . Also, they [special education students] should feel included as a part of the school, not just contained in their own little section. There is a school-wide effort here to improve learning in all areas, including science.

The needs of all traditionally lower-performing students are on the minds of the science teachers at the middle school. Reading science material is difficult for many students, and teachers adapt to that in different ways. As one science teacher recounted: “I always try to pick information that's interesting and try to lower the reading level so that they find success . . . most of science books are written at a higher reading level. I tend not to spend my time having the kids read the books in class or even read through them [at all]. We skim the headings; we talk about it. We use what knowledge they have.”

Careful choice of reading material is beneficial for all students, whether or not they are in special education. Students are not overwhelmed or confused by text, and they remain interested. A special education teacher recalled, “I know our science teacher does a lot of hands on things, and the kids really enjoy that. They learn the material a lot easier than reading a textbook; we don't even have a textbook that we use. We use packets, and they're doing everything themselves.

They're doing experiments, and I think by kids learning that way it makes it a lot more meaningful, and they learn it much quicker."

For any student who is facing specific challenges in a subject, the middle school has a 'study center.' The superintendent described this program: "If you're having difficulty with a subject, or you just want some extra help after school from 3-4, up in the library we have teachers from all different areas of discipline. They're there to help. If a kid is having trouble with his chemistry homework or his math homework, teachers are there to help the students."

The goal here is not just to be successful during the current semester, but also to encourage future study in that subject. The superintendent continued: "I think that if somebody can be successful in something . . . I think there are more chances that they will pursue that particular area." Success for all is critical, as emphasized by one science teacher: "Treat all students on an equal level. There are few students in this school that I don't have. I have students with IEPs and so forth. I don't treat them any differently. They're expected to learn just like the rest, and when you have high expectations for everyone, generally you get them."

The Thoughtful Classroom

To assist teachers with these high expectations, Bolivar-Richburg has adopted "The Thoughtful Classroom" model, a professional development program that concentrates on learning styles and higher-level thinking skillsⁱⁱⁱ. It has been recently introduced into the Bolivar-Richburg district and has met with much support. The director of curriculum and instruction recommended it to the district, and she discussed its adoption, purpose, and importance:

We were able to procure a mentor intern teacher grant two years ago . . . [whose] sole purpose was professional development during the school day to support brand new teachers and their mentors. The fortunate piece of that program is that it also allows us to train the rest of our staff, provided we are helping those new teachers.

We have now, approximately, 60-70% of our staff trained in "The Thoughtful Classroom." . . . By the end of next year we will have full critical mass; all of our teachers, core and specials. . . . We focused heavily this year on special ed, on getting those teachers involved as well.

"The Thoughtful Classroom" is based on the premise that all students learn in different ways. We all have different learning styles. It forces the teachers to take a look at the different learning styles of the students and make sure that they are being taught in all four ways. . . . Research emphasizes . . . the fact that exceptional learners are able to learn or work in all four styles. If we teach students in only the style that they're most comfortable with, they will be successful. But if we teach them to learn in other styles as well, they will go beyond successful to exceptional. And that's really the program that we're focusing on.

This provides tools for every core content area, strategies for them to use. . . . We started out with reading for meaning. Really getting kids when they read any piece of content . . . to look farther and deeper in for more core comprehension. . . . Currently we are working on cracking vocabulary's code, which is how to get essential vocabulary instruction

every day into content areas. The other one that we've been working on is comparing and contrasting. . . . That's something they need straight through college. . . .

Vocabulary development in this area of the state is a very tricky thing. Our kids come into kindergarten knowing very little vocabulary. . . . Generational poverty, we have a tremendous amount of that here. Kids come in with . . . a few thousand words under their belt when they should have tens of thousands of words by the time that they get to kindergarten. We really have to focus on building up their vocabulary so that they are capable of expressing themselves and learning. They have the ability but the vocabulary gets in the way.

During the research visit, two out of the three observed lessons included vocabulary components. In one class, students read an article to review circulation, underlining vocabulary words that were unfamiliar. The students and the teacher then explained the definitions. The second class also read articles, but this time it was to notice the specific definitions of 'global warming' as described by the National Climate Data Center and the Environmental Protection Agency.

Teachers have found value within this program: "We've used so many of the different activities and strategies this year, especially the vocabulary. That was one of the things that the kids really struggled with, with the state exams. We did so many activities from 'Thoughtful Classroom,' and they really started learning the vocab. I think their performance on the state test shows that."

Like many school reforms, "The Thoughtful Classroom" requires a great amount of time and effort from teachers. From the point of view of the director of curriculum and instruction: "It's a tremendous amount of work. We have the teachers meet every other month with [one of the program trainers]. . . . Then, every other month, they're meeting in their own individual learning clubs." One teacher mentioned the interdisciplinary aspect of the learning clubs: "We have our own little learning clubs to work with. Sometimes we get together to talk about what we're doing for 'Thoughtful Classroom.' Those are teachers of all the curricular areas: science, social studies, everybody is involved."

As previously noted, professional development for special education teachers was critical this year, and the director of curriculum and instruction noticed marked student improvement: "The nicest thing about 'The Thoughtful Classroom': it gives our special ed students a voice. Because it scaffolds the questioning, every student has something they can contribute. I've been sitting in classrooms where they've done compare and contrast, comparing and contrasting two things on a series of criteria. The simplest thing can be over-evident to a high-end student. To a special ed student, it's still a key component to what they're looking at, and they're able to offer it. They're starting to interject more and more, and we're hearing more and more voice out of our special ed students. It's so important. They love the strategies."

Use of Data

The final theme emerging from examining Bolivar-Richburg Central School District surfaced in discussions with administrators. The collection and use of data, whether formative or summative, classroom-created or state-imposed, is seen as crucial to each child's success, as expressed by the director of curriculum and instruction: "Look at the student data. It's so easy to let a child slip through the cracks if you're not watching them constantly, like your own child. I wouldn't just

let my son go and just check in with him every month. You have to be watching them.” She recommended regular, purposeful formative assessment: “I would set up formative assessments, regular opportunities to look at student progress instead of waiting for the test to come and then making decisions. I think that the more in-tune you are with where a child is every day, any given day, the better off those kids are going to be.”

More formal, summative assessments and state exams are being scrutinized as well, as the principal related: “[We are] analyzing data and trying to improve our test-taking abilities and skills of our students. We want to see, why are students being successful or unsuccessful for that subject matter?”

The superintendent does not believe that each separate piece of data fully measures student and teacher success: “I don’t go 100% by what happens on a test, because a student may not be having a good day, or maybe he’s not a good test taker.” He does, however, view assessment data as an accurate longitudinal method of monitoring the success of programs and personnel: “But if I see a trend, then I might mention to the teacher that we need to focus on this or that area.”

The district employs a data warehouse to store results, and these cumulative data can be enlightening: “All the grades, test scores can be broken down in different categories. If we find a particular category where, year after year, we seem to have a problem then we will address that particular area with the teacher. . . . Communicate that tests are a way of measuring, over a long period of time, the success of your program. So if, year after year, there’s failure after failure after failure, I would say it can’t just be the students, there has to be something else in there.”

The director of curriculum and instruction has been pleased with the results of their data analysis, especially considering the economic challenges faced by the district: “We look at our state scores, focusing heavily on ELA and math at the 3-8 grade level. We also have very good Regents results in this district. Very high Regents results when you look at our socioeconomic status, our free and reduced lunch rate. Forty percent of our kids are in poverty here, approximately. We get some darn good results. We have a very high graduation rate, and a lot of them Regents, most of them Regents.”

Conclusion

The Bolivar-Richburg Central School district is comprised of small towns and rural areas that face financial hardship. Despite that, the community sustains the district. According to the superintendent,”

I would say that the parents are very supportive of the administration, of the school. I’ve been here since 1990, and, during that time, there’s never been a budget that failed. It’s not that we’ve had 0% increase; some of those increases have been 8, 10%. I think, for the most part, they see that the school is delivering a good education for their child. I think they’re supportive.

If we need to change something, we don’t get much resistance, if any, from community. . . . I guess we’re just fortunate to have a community like that. They’re not a community that

takes a very active role in everything that we do. I've been to some communities where, every time you try to do something, there's somebody that objects. . . . I think that here they look at us as 'that's your job.' As long as we see that the students are being successful, and students are graduating and attending college, then they're happy.

When specifically considering the middle school, several key factors appear to account for student success on the Intermediate-Level Science Examination:

- dedicated teachers, and, in particular, one long-term staff member who has been critical in improving and refining the transition from elementary school to middle school;
- a student-centered approach to teaching with a goal of sustaining student interest in science through high school;
- specific interventions for traditionally lower-achieving students, both in general education and special education populations;
- professional development using “The Thoughtful Classroom” model of instruction, highlighting learning styles and higher level thinking; and
- the employment of formative and summative assessment results to monitor individual student progress and inform program modifications.

In his final recommendation for any district seeking to improve students’ science achievement, the superintendent summarized Bolivar-Richburg’s success: “I would say to support your teachers; make sure that they’re well versed in the subject area that they’re teaching, provide staff development if they need it. For the students, I think you need to provide extra time where students can get extra help. Academic assistance programs: build them into a student’s schedule so that whether it be math, science, whatever, they can go and get that extra help. I think if you show support for the teachers, show the students that you’re willing to help them, I think anybody can have a successful program in any area.”

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<http://www.brms.wnyric.org/education/district/district.php>

ⁱ <http://www.census.gov/did/www/saibe/data/statecounty/data/2007.html>.

ⁱⁱ Demographic data are from the 2007-08 New York State Report Card (<https://www.nystart.gov/publicweb/AllDistrict.do>). This case study was conducted in spring 2009 as one of a series of studies conducted by Just for the Kids-New York since 2005. For the study of middle school science, research teams investigated seven consistently higher-performing and three average-performing schools based on student performance on the New York State Intermediate-Level Science Examination in 2006, -07, and -08. Researchers used site-based interviews of teachers and administrators, as well as classroom observations and analyses of supportive documentation, to determine differences in practices between higher- and average-performing schools in the sample. In 40% of these schools, the percentage of students qualifying for free or reduced-price lunch exceeded the state average. Average-performing schools were matched as closely as possible to the higher performers in terms of student poverty levels, geographic location, size, and student ethnicity. In 2009 Just for the Kids-New York changed its name to Know Your Schools~for NY Kids.

ⁱⁱⁱ <http://www.thoughtfulclassroom.com>.