

Greene Middle School Science Greene Central School District

School Context

The town of Greene lies on the Chenango River approximately 15 miles upstream from where the river flows into the Susquehanna in Binghamton, New York, in the region known as the Southern Tier of New York State. The Greene Central School District serves the Village of Greene and several surrounding communities in three buildings serving the primary (preK-2), intermediate (3-5), and the middle and high school levels.

The middle school, in particular, has a long tradition of success in science education. Since the state has been assessing middle-level science, 93-98% of Greene Middle School students have scored at the level of proficient or above (level 3 or 4), with no students in any year scoring at level 1 (no proficiency).ⁱ

Student Demographics 2007-2008: Greene Middle School, Greene Central School Districtⁱⁱ

	Greene Middle School	Greene Central SD	New York State
% Eligible for Free Lunch	30%	30%	36%
% Eligible for Reduced Lunch	8%	12%	8%
% Limited English Proficient	0%	0%	7%
Student Ethnic/Racial Distribution			
% African-American	2%	2%	19%
% Hispanic/Latino	0%	0%	21%
% White	97%	0%	52%
% Other	0%	98%	7%
% Students Meeting or Exceeding State Standards on Intermediate-Level Science Examination	97%	96%	71%
Total Enrollment	284	1,205	2,741,385

Like other areas of Upstate New York, Greene has been experiencing a population loss, a drop in real estate values, and increasing budget constraints. Although school poverty levels are slightly below the New York State average as measured by qualifications for free or reduced-price lunches (38% in the middle school, 42% overall, compared with 44% statewide), median household income is approximately 72% of the state median, although the cost of living is 85% of the state median.ⁱⁱⁱ

Both teachers and administrators voice concern about the budget and note areas where it is already having an impact – not enough opportunities for students to accelerate, less

support for teachers to seek professional development outside their local BOCES (Board of Cooperative Educational Services) program, lack of technology such as smart boards, and fewer field trips to expose their rural students to the wider world, to name a few.

In spite of that, they still benefit from relatively small class sizes (the classes we observed had just under 20 students in each) coupled with spacious and well-equipped science classrooms. The latter were inherited when the middle school took over the former high school classrooms and include a general seating area as well as lab space with counters, sinks, built-in Bunsen burners, hoods, and cabinets. They continue to offer a strong science program, and both teachers and administrators say, “If it’s not broken why fix it?”

A Closer Look

The standards are a good guideline, but I like to go beyond. I think they’re a good basis to start from.

If you just teach standards, you water down, or down play them. I try and hit for the grade level above. I try and challenge students to hit the higher standard and hope that they hit the state standard at least.

I think what we’ve tried to do is build a solid strong basis, content and skill wise, so they’re ready for high school -- to be ready for the Regents courses, so they can be successful in the high school.

No ability grouping in classes, even in inclusion classes. They’re mixed within that class.

Students in Greene Middle School study earth science in grade 6, physical science in grade 7, and life science in grade 8. One teacher at each grade level teaches five sections of completely heterogeneous classes. All special education students are included in regular science classes, some with the support of a special education teacher, some without. As described in more detail below, the overall goal of the middle school science program is for students to enjoy science and to prepare them to enroll and succeed in science courses in high school. The curriculum is well coordinated and integrated. All teachers report using the standards for guidance and focus but looking well beyond the state standards and assessments in their expectations and instruction.

Following a two-day visit to the school, which included interviewing teachers and administrators and observing science classrooms, four themes stand out as helping to explain the middle school’s success in science education:

- A strong, coherent, and coordinated curriculum
- Communication across all subjects and grades
- A highly professional atmosphere
- Paying close attention to and engaging every student

Strong, Coherent, and Coordinated Curriculum

Both teachers and administrators credit a coherent curriculum for providing a strong foundation. As teachers say:

The basis [for our success] is that we have a strong curriculum.

The standards have provided us with expectations that are well thought out, grade-level appropriate. They give us a place to start.

Each teacher realizes their place and how effective it can be to other teachers. For example, the kindergarten teachers see how they affect the high school teacher.

And an administrator explains one of the processes for ensuring coherence across grades and departments:

At curriculum council meetings all leaders come together and update what is going on in each department, and we see how things are going.

Ongoing curriculum coordination. For over a decade, the school district has followed a planning process that, according to an administrator, “has been instrumental in our program and student achievement plan.” Over time and through this process, the district “has established goals and objectives that help support student achievement in all content areas and for special education and regular education students. It’s the overall guiding force for every year.” She continues describing the process:

When we were developing the curriculum over the past years, [we began with] where we were at the moment, and asked, Where did we need to be? It took a long time [to do the] curriculum mapping, [determining] what needed to be done, aligning textbooks with the standards, curriculum, and textbook and aligning them all together. It took the longest with the science. It’s probably still not completely done. Coming up with examples, activities, suggestions, etc., was essential for the new teacher [we hired this year].

A teacher leader provides more details:

The curriculum that we created -- teachers were involved in that. Each grade level had some input. We have binders K-2, 3-5, 6-8, etc. This year we’re focusing on putting in assessment pieces. With each binder, we took our textbooks, got input from teachers about activities, etc., and [with the] scope and sequence part, broke it down chapter by chapter. We decided to have a direct correlation from each chapter, each lesson plan, how it plays into the core curriculum. . . .

We wanted to be able to hand a binder to a new teacher or next grade level teacher so they can see what they [students] should be able to do, what words they should know, suggested activities etc. so they have something to start with.

Teachers are using this binder. Kids are coming to the next grade level with some familiarity with certain words.

I was assigned this the second year of my being at the school. We had a time line to work on this – 5 years of working on these binders. . . . We still have to add specific skills that we want at each grade level. We think we need to have a list of the skills that will be covered in each activity. We have our own activities in our textbooks, etc. . . . The binders are generic enough to be used we think with other books.

The result of this process is that at every grade level, every teacher knows what the students have studied in the prior years. As the principal explains,

It's a work in progress. When curriculum is worked on, it's worked on K-12. Each grade is making sure the transition is fluid from year to year, including the year before and the year after. It helps . . . because it's done K-12 together.

As the principal notes, special attention is paid to transitions. For example, fifth grade is not departmentalized but sixth is. Although fifth grade is in the intermediate school, it is considered middle school, so fifth-grade teachers attend both intermediate and middle school meetings and with the department came up with a plan to coordinate the fifth- and sixth-grade programs.

A decade into the process, teachers can see the difference. As one teacher reports, “Students are coming into fourth grade with better skills, where before they didn’t know what to do. They are much better prepared coming into the fourth- and eighth-grade levels.” Another reports, “We used to work more with the lower grade teachers, but not so much anymore because now we know what each grade is doing, what they expect, what they’ve taught, what topics were covered. So we’re not seeing those gaps we used to see. We just build upon the skills each year.”

Integration. Another result of the planning process is that teachers are able to identify when particular content, as required by state standards, is “covered” elsewhere. Life science provides an example, as reported by one teacher:

When we first looked at our curriculum and the state curriculum, a lot of it was similar. . . . Some stuff was taught in health and in home and careers, so I skipped that stuff [in my course].

Believing that, “If you want to cover your curriculum, especially for testing, you have to integrate,” the science teachers report working with their colleagues across disciplines. A special emphasis is a focus on writing, with the lower grades stressing elaboration, and the middle school science teachers working on learning to “write down the pattern they see in science.”

Materials. Care has been taken to ensure that textbooks align from level to level. As an administrator reports,

We take a great deal of time researching the textbooks. We want to align it with the elementary and secondary schools. We want to make sure it's not too overwhelming. The science teachers . . . look for free resources, reading materials, hands on materials. . . . Regardless of the levels, there's lots of sharing going on with the materials. If something is costly, we share a lot – the elementary, middle school and high school.

Communication across All Subjects and Grades

One reason that Greene educators are able to coordinate their curriculum and activities is that the school and district are organized to support communication, and it has become part of the culture. As an administrator explains,

Communication has been an asset to our program. We have our team leaders, department chairs, they talk and meet regularly. Other schools don't have after school without students. We have 2:30 -3:15 pm with no students, so we can meet regularly. At the secondary level, teachers don't have extra duties, so they can work together more.

Of course teachers can meet with students during that 2:30-3:15 slot, but on days when they have meetings, they do not.

Formal structures. Committees and teams are organized to foster communication both throughout any department, K-12, as well as across any grade level. For example, administrators, department chairs, team leaders, and special area liaisons serve on a curriculum council that meets regularly (bimonthly). Members bring issues to it and communicate its concerns back to their colleagues. In addition, departments meet once a month on average, and middle school teachers report meeting frequently in grade-level teams -- three times a week or more, often daily. Special education teachers are included in both department and grade-level meetings. As one teacher reports:

Three out of five days, we have a scheduled period where the whole grade team meets. Special ed is included in that. We talk about all the kids who need help, across the curriculum, about the curriculum. The whole team gets involved. It's beneficial. Whoever is giving the state test, the rest of the classes will lessen up on homework and also remind students in each class for that one test. For example, the English teacher reminds kids about a science test. We can meet all five days if we want to, or it's a prep or parent conference. . . .

[We – my special education partner teacher and I -- meet] pretty much every day. If not formally, it will be informal. We have lunch duty together and we'll talk about the lab, etc., and usually the team meetings, too. We had a conference planning day recently. We have plenty of time at those team meetings.

Special and regular educators also work closely together, with “the entire team aware of the IEP [Individual Education Plan]” and with access to that plan for classified students. In addition, according to the principal, the special education resource room is “now a teaching, re-teaching, pre-teaching tool, not just doing homework. For example, special ed would pre-teach DNA before it's taught in class.”

Other opportunities. But communication and integration take place beyond the formal structure and planning process. An administrator reports that last year the high school chemistry teachers worked with second grade teachers and had their high school students choose a skill to teach to second graders. “They all loved it!” and plan to do it again.

Other activities bring together teachers, students, and families across the grade levels; these have included science fairs and exhibits, and family math/science nights. “Last year,” reports a teacher leader, “family math/science night combined the nights together. The high school physics teachers, chemistry students, middle school students, teachers, etc. all volunteered to do stuff together and did demos in rooms and had an exhibit in the gym. The gym was filled. High school students came to help.”

A Highly Professional Atmosphere

Administrators praise the professionalism of teachers:

The teachers raise the bar themselves. They set goals for themselves. They have high expectations for themselves and for their students. We try to practice what we preach.

They sit as a department and decide what to do.

Surround yourself with good people -- that's where the rubber meets the road. Hire good people. Hire good teachers. If teachers aren't doing good, you have to help them meet your expectations. Hire excellent teachers and the rest will be taken care of.

Top-down/bottom-up. Both teachers and administrators voiced similar overall goals for science education at the middle level: They want students to find science fun, look forward to taking science courses in high school, and be prepared to be successful in those courses. Within those broad goals, teachers set their own goals, and have unique ways of enacting them. Their classrooms are set up differently, and some offer more hands-on activities than others, but in every class observed, all students were engaged, and all were using student-generated materials.

Teachers use a variety of materials – lab kits, teacher made, structured games, web sites – and report more or less use of the textbook – from always available for reference to using the book “a lot.”

Because of the coordination and shared goals around student achievement, teachers are working toward shared outcomes. According to the principal, “Nothing is mandated, but it is highly encouraged. For example, the teaching of metrics – in technology, home and career, science, math. Everyone [should be] speaking the same language, should be able to convert in the same style.” She adds “that if teachers are given time to communicate, and not *told* to do something, but are given opportunities,” she sees better results.

Assessment. Teachers also report constantly assessing student understanding – both in the minute-to-minute looks at students’ faces to more formal means:

[I use] mini labs, paper and pencil assessment. I look at programs at other middle schools. I give 4 tests a year, one at the end of each unit, mini quizzes, activities, lots of hands on assessment, having kids work in groups or with partners. I can talk to them individually to help assess how they’re doing.

Everyday I assess. There’s the pretest, the questions they’ve answered for lab exercises, math results, why they got what they got, lots of discussion, and talking to them. Of course there’s the test, the formal assessment. The lab grade is a big chunk. There are a few projects. There’s one end-of-the-year project that they’re going to have to put together themselves.

For the state assessment, in Greene, those who grade the assessments prepare a T-chart indicating areas of strengths and weaknesses. An administrator explains:

One thing that helps us is T-charts. Each department chairperson is responsible for collecting T-charts after each of the assessments. They do a summary of how students responded. For example, in science, elementary, middle school and high school science teachers that score that [assessment] fill it out, give it to [the department chair], and she gives it out to the science department. They review it for strengths and weaknesses, looking for commonalities and patterns. [Recently] the big [gap] was measurement, even though it was taught. So they evaluated it, and made an improvement and corrected the weakness. Science vocabulary was a similar case. What teachers should be introducing at each grade level [was looked at]. This has helped. The second-grade rep would go back to second-grade teachers and tell them what words they should focus on. Teachers are good at communication.

There is no district-level assessment. As the principal explains, “The science department is *not* in favor of district testing; they do their own.”

Professional learning and responsibility. Although budget constraints are limiting the opportunities that teachers can currently take advantage of, many mention previous course work or summer institutes at colleges and universities, in particular, Cornell, which is approximately an hour away.

Another aspect of professionalism is the attitude teachers display toward colleagues, students, and families. One says, “It’s very professional. Most of the teachers highly regard their job. They’re here on time. They’re here early, putting in extra work. . . . It’s a close fabric. Everybody knows everybody. We have a common planning time, so we take advantage of that. Some kid needs help in all areas, so we call the family, etc.” An administrator adds that when there is trouble, whether with adult or child, they “come together to help . . . [and try] to figure out how to fix [the situation]. Instead of yelling at them, [we] try to find out the root cause.”

Paying Close Attention to and Engaging Every Student

Teachers try hard to relate to their students:

If you can find a way to get them interested, the kids will work to their best ability. We're really trying to do that.

Success is defined . . . one student at a time. . . . Success is moving each child up the ladder.

Making connections about what is going on in the kid's life. You have to make that connection, especially in middle school. You have to find what keeps them interested.

It has to be something they relate to, something that excites them, something they can latch on to. . . .

Try and make it as exciting and interesting as you can. Give them a story. Give them something they can take home, something that is relevant in their life.

Purposeful fun. Many of those interviewed, especially the teachers, mention that for middle school students, science needs to be “fun.” But from their descriptions and classroom observations (and students results), it is clear that the fun is purposeful. For example, a teacher explains how and why she approaches a geology unit:

Sixth graders are very active. We're the transition between a self-contained classroom and moving around. So we work on organization, measurement skills, metrics. I'm teaching geology right now with a survivor theme. They're writing a "rock song." I'm really big on constructivism to help guide them to their knowledge. They're so involved in their survivor game. I really don't even have to teach sometimes because they're self-guided, learning about the rock types when they're writing their song. We discuss why we're doing different things. Everyone learns differently.

She goes on to describe other units, each of which involves hands-on activities and innovative assessments while including the standard features of a good lesson – clear objectives, background information, etc.: “[I use] lots of hands on, moving around games, interactive. With earth science content, they're much more interested when they're doing something.”

Another teacher posits that

To get them interested, you really have to be creative. We have had some training in . . . techniques that can be used to help kids focus better and to get both hemispheres of the brain working together; different multiple intelligences learning styles; and how to teach to the kids who are “acting out.”

Yet another teacher shares some of the ways that she ensures that she teaches the right

thing and how she engages the students:

[I give] a pretest with agree or disagree statements and explain why. That way I know what they're starting with and that way I know how to reinforce or tailor the lesson to make sure they understand. I have them exploring. Sometimes they don't know why they're doing it, but they're having fun exploring and then we come together and put together what they're learning. So they think they're teaching the teacher, and not the other way around.

A colleague who teaches eighth grade must prepare students to transition into high school. He mentions using a lecture format in addition to hands-on activities. He wants to ensure that his students can use the scientific method to prove or disprove a hypothesis. Colleagues praise him for the way he engages students and provides a wealth of materials for students to handle, and students in his class were observed to be thoroughly engaged and interested in what he said. In his own words:

I like to follow the Regents Bio, Part 2. I want them to have a background by the time they get to high school. We make up a lot of our own stuff. A lot of textbook labs aren't good and not fun. I wouldn't use them. I take stuff from everywhere. . . . The standards really guide what we're teaching, but I try to use the high school Regents bio guidelines, too. I'm really trying to prep them. Some kids now could probably pass the Regents bio exam.

But his students are still in middle school, and so, while he sets and holds high expectations for them, he also stresses the importance of ensuring that middle school students “know they’re a person, not a number,” even as he prepares them for high school. For example, he breaks up listening and hands-on work by interspersing mini lectures (less than 10-15 minutes) throughout a lesson or lab. Not only does this break up the listening time, it provides clarity as students move through the lab and helps to give direction and structure.

All teachers and administrators mention field experiences and the ability to tap local resources to help make science relevant. For example, in 8th grade, they go to Chenango Valley State Park to see the bog, streams, rivers, and landforms they can observe. And the nature trail behind the campus, although still being revived, is used by classes at many levels, from observing plants to studying and marking the trees or studying the wetlands within it.

One teacher reports introducing students to a website with science games, which they sometimes play in study hall. And, “If parents say ‘OK,’” she provides directions for labs that they can do at home.

And some would credit the attitudes of the teachers themselves for students’ success in science. As one administrator says, “The science teachers in the middle school are “crazy” into their content. . . . Teachers love what they do, so they go above and beyond. They enjoy science themselves,” and this inspires the students.

Individual attention. In addition to the regularly scheduled ninth period when students can seek extra help, teachers make themselves available to students who need assistance during lunch. Although this practice is “not frowned upon,” it is also “not encouraged.” And students do take advantage of it. Teachers report:

We have that extra period at the end of the day, so extra help is offered after school. Kids eat lunch when I'm free so we can go over things then. I let them correct assessments and tests so they can understand how to improve. If we had more time, they'd have no homework.

Generally I ask them to come in during lunch or ninth period. Some kids eat lunch with me everyday, and I try to restate information in a different way. I try to start with what they know and build from there. I am surprised how many kids come in for this extra help.

For the state test, we watch that everybody can do it. Years ago without testing, we wouldn't watch everyone so carefully. But now we watch everyone.

In a Nutshell

Teachers and administrators in Greene engage in constant collaboration, pay attention to progress of every student, and provide a curriculum that is both rigorous and relevant. They ensure that their curriculum is aligned within and across the district as well as with state standards, and teachers work across grades and levels so that they know what students in the earlier grades should know and be able to do.

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<http://www.greenecsd.org/middle/msindex.htm>

ⁱ <http://www.emsc.nysed.gov> for the years 2002-4; <https://www.nystart.gov/publicweb> for the years 2005-8.

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 Data are for 2007 from <http://www.city-data.com>.