PERFORMANCE AND PRACTICE

CASE STUDY

Core Practices in Math & Science:

An Investigation of Consistently Higher Performing Schools in Five States

Shelby High School Shelby Public Schools (Michigan)

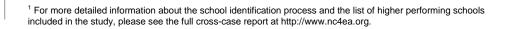


Introduction

Since 1999, the National Center for Educational Achievement (NCEA) and its affiliated research teams have studied over 500 public schools across the country in an effort to identify and disseminate effective practices embraced by higher performing schools that distinguish their campuses from their average-performing peers. Building on the foundation established by this previous research, NCEA sought in the current study to focus specifically on educational practices in the areas of mathematics and science in five states: California, Florida, Massachusetts, Michigan, and Texas.

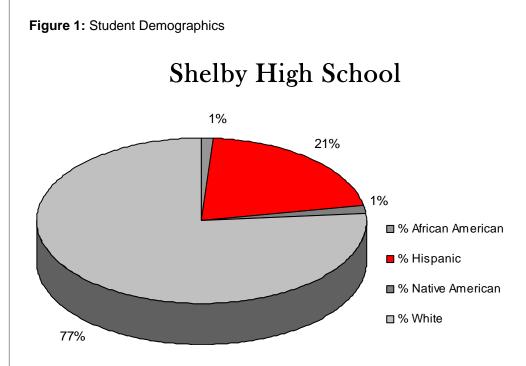
Criteria used in school selection in the current study included three years of state assessment data in mathematics and science (2004, 2005, and 2006), campus demographic make-up, percentage of economically disadvantaged students, school size, and geographic location. In addition, all of the schools selected for participation met the state and federal requirements for Adequate Yearly Progress (AYP) in 2006. Schools categorized as higher performing based on the selection criteria were those "beating the odds" with consistently better student achievement over three years, when compared to peer campuses with a similar student population. Therefore, a list of the state's highest performing schools may contain schools different from those selected for this study.¹

In order to illuminate the roles of different members in a school community, for each selected school, NCEA researchers interviewed district-level administrators, school administrators, and classroom teachers. To supplement the interview data, researchers collected pertinent documents, observed secondary level algebra classes, and invited participants to take part in the NCEA *Self-Assessment* online.





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District and School Profile

Enrolling approximately 1,700 students, Shelby Public Schools operates three elementary schools, one middle school, and one traditional high school in the agriculturally focused township of Shelby, Michigan. Located in a rural area, Shelby has a high percentage of families living in poverty. About 50% of the student population in Shelby Public Schools receives free and reduced-price meals. The town of Shelby is also home to a growing number of non-Englishspeaking residents, most of whom are migrant Hispanic farmers who have settled in the area. Approximately 25% of the district's students are Hispanic, and language is a barrier for many of them.

Serving a total of 481 students, Shelby High School is the traditional high school in Shelby Public Schools. Approximately 41% of the enrolled students are eligible for free and reduced-price lunch. The majority (77%) of the students on campus are White, and Hispanic students comprise the second largest group, at 21%. African American and Native American students are the other major subgroups, at 1% each.

As a strong proponent of higher standards, NCEA recognizes school efforts to move more students to the state's higher standard of achievement by accounting for those students in the analysis of consistent higher performance. Tables 1 and 2 summarize performance at both the state's proficient and advanced standards attained by the students at Shelby High School for the years of 2004, 2005, and 2006. The state averages included in the tables represent student performance among schools with a student population similar to Shelby High, particularly based on the percentage of economically disadvantaged students.

	2004	2005	2006
Grade	11	11	11
Mathematics	72%	66%	66%
Science	87%	72%	72%
State Average for Similar Schools (Math)	56%	47%	52%
State Average for Similar Schools (Science)	56%	53%	60%

Table 1: Performance Trends based on Proficiency Standard

Table 2: Performance Tre	nds based on A	Advanced Standard
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	2004	2005	2006
Grade	11	11	11
Mathematics	16%	6%	6%
Science	22%	5%	5%
State Average for Similar Schools (Math)	8%	4%	6%
State Average for Similar Schools (Science)	5%	3%	4%

Theme 1 Student Learning: Expectations & Goals

Educators in Shelby Public Schools share focused goals for student achievement and ultimate college and career readiness and a commitment to enhancing academic experiences for students.

With consistent overall academic achievement as their target, administrators in Shelby Public Schools establish and update district goals based on annual student performance on the state tests. The goals are small in number and specific in focus to ensure K-12 unification in targeted student skills and areas for improvement. To maintain the district-wide focus, district administrators stress communication and provide frameworks for school-level goal setting. For Shelby High School, for instance, the district office established a threeyear timeframe for students to improve writing proficiency and reading comprehension in all subject areas. Regarding communication, one district leader shared, "Do the best you can to communicate what you're trying to achieve. It's the key to not only receiving input, but also gathering understanding."

- By increasing proficiency in all core subject areas, the ultimate goal embraced by educators in Shelby is for every student to be ready for college and the world of work at the conclusion of high school. The principal at Shelby High School expressed, "While we realize that many things that make the world go around do not require a bachelor's or master's degree, we want every student to be prepared and have the opportunity to go on to college or advanced training." Educators at Shelby High communicate the college and career expectations to students early, beginning with transition meetings when students are in the eighth grade. In collaboration with the staff and parents at the district's middle school, high school educators create an Educational Development Plan (EDP) for each student, a practice instituted by Shelby administrators long before the recent state mandate. The EDP specifies a class schedule and a career pathway based on individual accomplishments in middle school and goals beyond high school.
- Working with students facing poverty and language barriers, educators in Shelby expand opportunities for students to be college and career ready. According to one teacher at Shelby High, students often fail to adopt a college mindset because "many don't have a vision of what kind of life they are capable of living. Trying to give students the confidence and college-related experiences is a priority at the school." Educators at Shelby High School embrace the practice of "increasing expectations and opportunities, trying to grow students to a place where they feel they can succeed and are capable of going to college, so they will consider the options available for them." For instance, in addition to offering AP courses in English, chemistry, and calculus, educators actively encourage students to take advantage of district financial sponsorships to attain college credits through high-level and dualenrollment classes. Students also have the opportunity to attend a career education center not only to learn vocational skills but also, through an application process of articulation credits, to receive college credits at the technical level. In addition, teachers constantly go the extra mile to assist students with finding scholarships and internships to pay for expenses in college.

To promote student achievement, educators emphasize and engage in standards-based curriculum development, alignment, and implementation, involving teachers throughout the process.

With a focus on the academic cores students have to complete, district and school administrators support teachers in curriculum development and specification. The curriculum aligns with standardized state tests and statedefined standards, the Grade Level Content Expectations (GLCEs) and High School Content Expectations (HSCEs). Curriculum materials developed include units of study, pacing charts, and common assessments, all of which add specificity to the state expectations. Teachers at Shelby High also try to enhance the curriculum and supplement adopted textbooks by including, for instance, technology and web resources in science education.

- To increase buy-in and curricular knowledge, district administrators strive to involve all teachers in the curriculum process. By providing release days and substitute teachers, the district office ensures teacher participation in curriculum development. According to one district leader, "with districts our size or smaller, it's beneficial to use the resources necessary to get all the teachers involved. You will have much greater success in changing what you are ultimately trying to do, [which is] instruction in the classroom, because teachers truly have the buy-in to what the district is trying to do." At Shelby High School, every teacher in the department participates in curriculum development for each subject area.
- Curriculum development and implementation in Shelby Public Schools focus on alignment. In addition to assuring their educational materials correspond to the state standards, teachers work on curricular alignment within departments and across feeder patterns. At Shelby High School, teachers conduct constant reviews and departmental conversations to ensure everyone teaching the same subject is on the same page concerning covering standards. So that all schools in the district remain connected, educators in Shelby Public Schools nurture alignment between school levels. For instance, through meetings among high school teachers and their 8th-grade counterparts on "curriculum days," educators achieve curricular alignment between high school and middle school. In subjects such as science, teachers also communicate with the elementary schools. One teacher shared, "We have always been aware of what's going on in the other classes. For example, a few years ago, we found out dinosaurs were taught in elementary classes, but not simple machines. So teachers worked this out."
- Curricular alignment entails continuous, needs-based, and data-driven adjustments in the curriculum. In curricular revision, teachers remove, add, or rearrange topics based on efforts to strengthen alignment within the department, across school levels, and to the state standards. As the state office raises expectations for the entire K-12 school system, for instance, 8thgrade teachers in Shelby revise their curriculum to correspond to the content previously taught in high school, while high school teachers reframe courses to include all state-mandated content requirements. In addition, if student data indicate a lack of alignment, educators conduct curricular revision to address the issue. For example, science teachers at Shelby High School recognized that "based on the test scores and the changes in standards, we weren't hitting certain areas strongly enough. So we revamped the curriculum."

Theme 2 Staff Selection, Leadership, & Capacity Building

Administrators in Shelby Public Schools share a strong commitment in developing staff capacity and providing instructional support.

- Regardless of financial constraints, administrators in Shelby Public Schools seek avenues to continue developing educators professionally to increase their capacity and meet student needs. In addition to involving teachers in the curriculum process, a district leader shared, "We are training our teachers in best practices such as differentiation, and looking differently at how they spend their time in the classroom [because] budget cuts tie our hands in hiring and force us to look at what we can do with the personnel we have available." School and district administrators also search for grant opportunities to support their staff development efforts. In addition to district-arranged training professional development days after each grading period, neighboring Intermediate School Districts (ISD) serve as an important source of workshops for teachers as well as administrators.
- In addition to staff development, teachers enjoy instructional support, particularly essential resources and personnel. One teacher at Shelby High School expressed, "There may not be money, but if you can justify the need, you will get it. We are fortunate here in Shelby because the school board and administrators somehow always manage to find money to get us what we need." For example, math and science teachers at Shelby High have access to projection systems to enhance learning and to electronic devices that students can click to show understanding. Support personnel such as bilingual paraprofessionals are available at each school to assist English language learners and their parents. Every new teacher in the district receives a formally assigned mentor for the first three years. Through a three-year grant obtained by the principal of the district's middle school, a consultant works with teachers to strengthen their understanding of the state standards and guide curriculum development.

Collaboration among educators is prevalent, enhancing curricular and instructional competence as well as services for students.

Educators throughout the district value collegial collaboration as a way to foster teachers' instructional and curricular knowledge. Collaborating formally in departments as well as informally on their own time, teachers at Shelby High School view such collaboration as a form of staff development. In addition to collaborating in monthly departmental meetings, teachers take the initiative to talk in the hall or observe colleagues. One math teacher explained, "The sharing of ideas really makes everybody better." Topics addressed during collaboration include curricular alignment, assessment development, student performance and intervention, and instructional strategies and materials.

- With a high degree of openness among the teachers, collegial collaboration at Shelby High School strengthens staff capacity to provide guality education. Not only do new teachers have access to support from mentors, teachers on the campus also generously open their doors and assist one another. One math teacher expressed, "Since my first day in the department, the other teachers have made me feel welcome and supported. 100% open door policy. I can walk up to them and ask a question without feeling judged." Similarly, in the science department, teachers "keep the door open. If another teacher wants to come in and see what's going on or to talk, they can. It's absolutely working together when you need help." Teachers' doors are also open for cross-disciplinary collaboration. For instance, science teachers assist colleagues in the math department by explaining scientific concepts such in math application problems. To help students with special needs to meet state requirements, resource teachers team-teach with regular education teachers to provide accommodation when schedules permit.
- Educators in Shelby Public Schools have opportunities to work with those outside of their school buildings. With their involvement in the ISD, teachers meet colleagues from the county and collaborate on, for instance, assessments and strategies in elementary level language arts. Principals in Shelby Public Schools also meet regularly to share needs, information, and support to move the entire district forward through the implementation of practices such as professional learning communities. At Shelby High School, educators collaborate with their feeder schools on curricular alignment and student placement processes to ensure adequate student preparedness.

Theme 3 Instructional Tools: Programs & Strategies

Educators in Shelby Public Schools adopt instructional practices and programs that benefit all learners and meet their needs.

Accepting increasing accountability for student performance, educators in Shelby Public Schools stress instructional practices that reach and support every student. One district leader expressed, "The state has raised the bar, so what we have to do is to look at different ways of teaching. We try to make teachers aware of the fact that it's not about what you teach, but what the students learn. If students haven't learned it after you taught it, you have to find a different way to re-teach it...Our goal is for each student get what they need." For instance, adhering to instructional content specified by the state office, educators at Shelby High School embrace the importance of engaging students and accommodating different needs and levels in the same class to ensure that everyone advances. In math and science education, teachers constantly vary their approaches for students with differing abilities and tie instruction to meaningful situations through practices such as math application problems, timely and purposeful science lab activities, classroom competitions, and technology use. In addition, with many students in poverty, teachers "adapt and make sure we give students ample time in class to do work. We have computers in school for students to use, too. You can't expect them to do what they are not able to do economically."

The district's evidence-based textbook adoption process emphasizes proven effectiveness. To ascertain curricular soundness, depth of learning, and accommodation of student needs in potential educational materials, educators in Shelby Public Schools rely on research studies and teacher implementation. Research criteria used by teachers in the selection process include, for instance, endorsement of the Trends in International Mathematics and Science Study (TIMSS) or national councils of teachers. Teachers may also pilot portions of the materials to evaluate aspects such as adaptability for students with special or linguistic needs as well as alignment with state standards and the curriculum materials at feeder schools.

At Shelby High School, scheduling, course offerings, and student placement focus on enhancing student learning and post-secondary readiness.

- To effectively encompass the new state graduation requirements and achieve depth of student understanding, educators at Shelby High School modify scheduling arrangements. From a long-term block schedule, educators switched to trimesters and shortened passing minutes so that students meet all state expectations when they graduate. The scheduling change not only allows a sufficient number of class periods and more instructional minutes, but also permits longer exposure to fundamental courses. For instance, former single-semester classes in geometry, chemistry, and physics now last for two trimesters. Furthermore, the increase in the total instructional minutes enables teachers more leisure in reteaching and enrichment.
- Through defined course sequences and boundaries, educators provide students with the ability to complete graduation requirements on time and capitalize on opportunities to enhance college and career readiness. In math, teachers collaboratively established a sequence that allows students to take Algebra I in the eighth or ninth grade and finish the state-required Algebra II in their sophomore or junior year. In science, the delineated courses, which include a range of college preparatory electives, ensure that "by the time students graduate, they will have covered everything mandated by the state." In addition, by overlapping students' course enrollment, educators help students attain graduation eligibility promptly and take additional courses such

as dual enrollment or advanced coursework. Students can enroll concurrently in different classes in a subject area, for example, geometry in the first and second trimesters and Algebra II in the second and third.

- At Shelby High School, course scheduling and availability center on meeting student needs. Every year, based on student course selections, administrators create master schedules of classes and teacher assignments. The principal expressed, "The schedule is student-selected and based on student needs and demand." In addition, even with limited resources and personnel, administrators strive to expand course offerings to augment preparation for college and skilled careers. For instance, AP courses are available in math, science, and English at Shelby High School. A variety of vocational and industrial education courses expose students to fields such as business, computer applications, and construction. Students in the eleventh and twelfth grades also may enroll in a preparatory class for the ACT exam.
- Course placement focuses on providing opportunities and elevating students to their fullest potential. Based on student interests, needs, and attainment of skills, educators embrace the long-standing practice of encouraging students to choose courses to stretch themselves. One math teacher expressed, "In the district and the high school, there is a strong willingness to push students towards staying in the next class and keeping going whenever feasible." To prepare students to meet the challenges of academic stretches, educators encourage them to take initiative, for example, by tackling AP English reading materials or AP calculus practices in the summer. Educators also persuade students to take advantage of dual-enrollment courses for specialized skills and knowledge that go beyond the high school curriculum.
- While challenging students in course placement, educators at Shelby High School remain committed to giving students a solid foundation. For instance, since algebra is the basis for higher level coursework in math and science, Algebra I and II are both full-year courses. In addition, before moving on to other required math classes, students who took algebra in the eighth grade enroll in the single-trimester Algebra Supplement class to fill gaps in their understanding that exist due to recently modified state expectations.
- Instructional arrangements at Shelby High School emphasize helping students connect to the world of work, with a simultaneous focus on college readiness. For instance, each student has a four-year Personal School Plan of coursework based on requirements and electives aligned with their chosen college or career pathways. In the eleventh and twelfth grades, students have the opportunity to enroll in a work-based learning program that includes apprenticeships, internships, and work-study programs. In addition, Shelby High School seniors create portfolios showing evidence of academic preparation and career exploration.

Theme 4 Monitoring: Compilation, Analysis, & Use of Data

Educators at all levels in Shelby Public Schools collect and exchange information and data for instructional monitoring.

- Instructional evaluation at the district level focus on data-based monitoring of curricular implementation and instructional resources. With assessment tools and data, district leaders measure achievement towards alignment of the knowledge and skills that students need, the district's written curriculum, actual instruction and learning, and evaluation of learning results. For instance, the district office uses assessment data to determine whether adopted materials properly and sufficiently address the curriculum and facilitate instruction. Exit assessments at the fifth, eighth, and twelfth grades further assure that students learn the core curriculum. Surveys administered to former students provide additional data and information as well.
- School administrators ensure instructional effectiveness through constant monitoring. In addition to the formal annual teacher evaluation, administrators regularly collect classroom information. For example, the principal at Shelby High School conducts informal walkthroughs, often returning for follow-up observations to determine lesson connectivity and curriculum flow. After the informal observations, the principal shared, "My feedback to a teacher may be a short note, but I usually try to make a conversation about the lessons." Administrators at Shelby High also look at data to identify achievements and weaknesses within each department.
- Teachers at Shelby High frequently conduct departmental self-monitoring of curricular and instructional practices. For example, through formal and informal collaborative meetings in the math and science departments, teachers keep track of each other's curricular implementation and establish collegial accountability among themselves. One teacher expressed, "Working constantly with the other teachers keeps you on your toes and makes you responsible."

At Shelby High School, educators stress ongoing data-based monitoring of student academic performance and progress toward goals beyond high school completion.

Educators at Shelby High School constantly consult available data to monitor student performance and progress effectively. In addition to having constant computer access to student grades and overall percentages, teachers receive and discuss disaggregated data during staff meetings. School administrators also require teachers to coordinate and develop common assessment tools to generate additional performance data. One school leader shared that, since different instructors teach the same subject, "if they each make up their own tests, it's hard to discuss whether one teacher's students do better in certain areas than another teacher's class." Disparate assessments also hinder collegial discussions of effective strategies that benefit students. In addition to common assessments, as students work toward their chosen post-secondary pathways, educators provide consistent assistance and monitoring. For instance, school counselors conduct regular audits of performance data, coursework sequences, and schedules, with a focus on individual students' career goals.

In addition to using formalized assessment tools, teachers constantly gather student performance indicators in their classrooms. One math teacher described such in-class student monitoring as determining "if students are able to speak 'the language.'" Students to demonstrate their understanding through oral questioning, quizzes, promptly graded daily assignments, and presentations.

Educators in Shelby Public Schools strive to solicit from parents input and participation in their children's education.

- With the goal of making parents an integral part of the education system, educators in Shelby Public Schools create opportunities for parental involvement. Parents can become school volunteers, for instance, to read to elementary students, assist struggling middle school students, or serve on committees at the high school. Established procedures at school sites also keep parents informed of academic differences and transitional needs between school levels. For example, based on a review of student accomplishments in preparation for high school and beyond, parents receive information about the high school curriculum and a recommended four-year course sequence for their children during individually scheduled meetings in the eighth grade. Before students start high school, Shelby High educators organize additional orientation meetings for parents and students to further communicate academics and school structures.
- To help many families facing challenges stemming from finances, cultural and linguistic differences, and education backgrounds, administrators at Shelby High constantly educate their students' parents. School leaders are particularly eager to enlist parent cooperation in keeping their children in challenging courses and in the school system. Through individual conferences, educators inform parents about the benefits of a high school diploma and college preparation through enrollment in higher level classes, both of which lead to advancement towards career pathways and better financial prospects. Upon perceiving parents' concern regarding AP courses and GPA, for example, "school administrators [will] try to conference with students and parents about it, that colleges will refigure the grades and students will get [more] bonus points for B+ in an AP than an A in a basic level

class. It doesn't make sense for students wanting to be in pre-med not to take advanced classes."

To involve parents in student performance monitoring, teachers maintain consistent communication with them. One teacher shared, "We are always open to parent input. If there is a need, teachers will talk to parents to take care of it," for instance, through conferences, phone calls, and e-mails. In addition, parents have easy and frequent access to student data. The online Parent Grade Viewer program allows parents access to their children's performance as tracked in teachers' grade books. Educators also generate regular paper-based progress reports and letters informing parents about opportunities such as dual enrollment.

Theme 5 Recognition, Intervention, & Adjustment

Based on constant monitoring, school-level leaders provide focused assistance and opportunities to teachers.

- In Shelby Public Schools, teachers in need of additional support in daily instruction receive ample assistance. Through Individualized Development Plans (IDPs) for the teachers, school leaders assume a directive stance and recommend measures such as increased collegial support and professional development activities for targeted areas. At Shelby High School, leaders organize additional assistance in coordination with new teachers' mentors or tenured teachers' colleagues. The administration also introduces teachers to professional literature and staff development to help teachers in areas of concern.
- With their focus on curriculum development and alignment, leaders at Shelby High School seek to strengthen teachers' curricular capacity. For instance, as part of the curriculum process, the school administration helps teachers understand the relatively new state standards through collaboration and the availability of a consultant, so they can determine whether their students are mastering those standards. One leader shared, "The focus is on helping the teachers feel comfortable with the standards, find ways to creatively teach to the standards, and get away from the traditional ways of doing things and not be entrenched in the old way of thinking," such as textbook-bound instruction.

Student interventions at Shelby Public Schools align with educators' strong commitment to helping students finish high school prepared for college and work.

 Targeting at-risk students, educators constantly focus on intervention plans to meet student needs. After collaboratively analyzing data and identifying the lowest achieving populations, educators strengthen the delivery of needed support. At Shelby High School, dropout prevention targets low socioeconomic and non-English-speaking students. At the district level, an alternative high school helps students at risk of dropping out to receive diplomas, even as they face special circumstances such as attendance and behavior issues, academic struggles, substance abuse, pregnancy, and parenthood.

- At Shelby High School, intervention efforts focus on keeping students on track. Upon noticing students who appear to struggle or overextend themselves, educators provide extra assistance to allow them to remain in the challenging classes. For instance, by enrolling in the additional Guided Academic Assistance class, students struggling in algebra or failing the first trimester can continue in the regular class and receive additional support to work toward or reclaim credits without having to sit out for a year. Students who finished algebra in middle school also have the opportunity to repeat the class in the ninth grade and stay on track to graduate on time. In addition to the constant administrative effort to develop formalized interventions, teachers offer students ample support before and after school and whenever they have time. One science teacher explained, "Teachers are really good at being willing to spend time with students. The doors are open. Students can come, even if they are not in the teacher's class...It's not competitive. We are here to teach kids."
- For effective career and college preparation, student interventions undertaken by educators at Shelby High School enhance beneficial skills. For instance, considering study skills part of the expectation in college education and the world of work, educators improve students' study habits, such as timely assignment completion, which positively affect GPA as well as help alleviate student anxiety in challenging classes. Recognizing that students may be unwilling to ask questions, one math teacher "[has] told my classes that it's not so much about the math. First, we have to teach how to be a math student. I show my students it will take efforts on their part to share the responsibility with me for their learning." Additional skills emphasized by educators include staying organized and keeping track of tests by using planners.

Summary of Findings

Student Learning: Expectations & Goals

Establishing focused academic goals based on student performance, educators in Shelby Public Schools engage in unified efforts throughout the school system, targeting specific areas and preparing students for post-secondary options. To promote student achievement, educators expand academic opportunities available to the students and emphasize a strongly aligned, standards-based curriculum process within the school system.

Staff Selection, Leadership, & Capacity Building

With a strong focus on continuous staff capacity building and development, administrators in Shelby Public Schools involve teachers in the curriculum process, arrange professional development opportunities, provide instructional support, and emphasize collegial collaboration. Through constant collaboration with a high degree of openness, educators strengthen their curricular and instructional competencies in order to provide quality education.

Instructional Tools: Programs & Strategies

Supporting each student, educators in Shelby Public Schools adhere to state expectations while accommodating individual needs in the classroom and adopting proven instructional materials. In addition, instructional arrangements such as course scheduling, availability, and placement focus on learning augmentation and post-secondary readiness.

Monitoring, Compilation, Analysis, & Use of Data

Relying on available data and collegial accountability, educators in Shelby Public Schools perform constant instructional evaluation and progress monitoring. To ascertain student achievement, in addition to analyzing data, educators develop common assessment instruments, regularly audit students' progress toward postsecondary goals, engage in an array of classroom techniques, and encourage parental involvement.

Recognition, Intervention, & Adjustment

Educators in Shelby Public Schools follow up their monitoring efforts with focused assistance and opportunities. Teachers needing additional support have access to administrative support with clear directives and recommendations for areas for improvement. Similarly, assistance for struggling and at-risk students targets identified areas of need and emphasizes remaining on track for graduation and post-secondary possibilities.



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