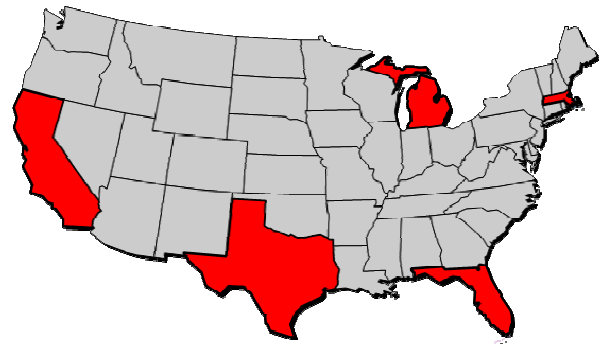# Core Practices in Math & Science:
An Investigation of Consistently Higher Performing Schools in Five States

Tampa Bay Technical High School

School District of Hillsborough County
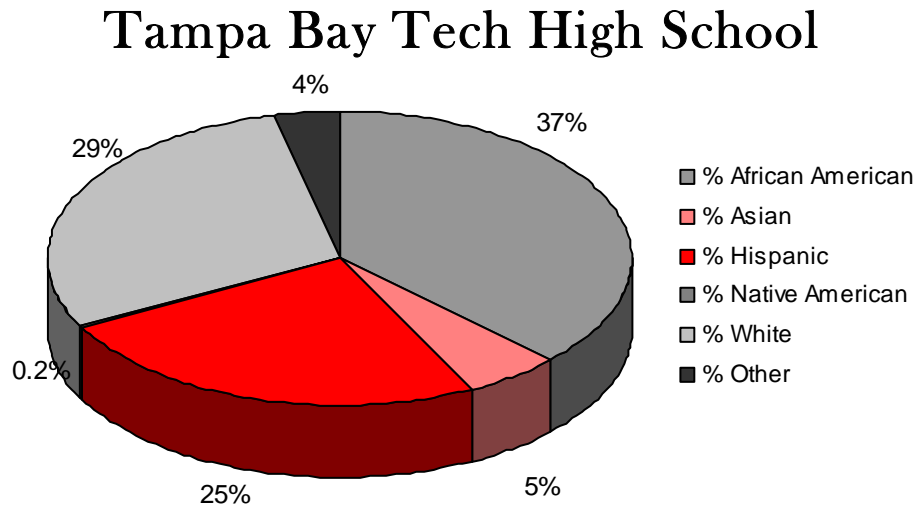(Florida)

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.

[1] For more detailed information about the school identification process and the list of higher performing schools included in the study, please see the full cross-case report at http://www.nc4ea.org.

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Figure 1: Student Demographics

Tampa Bay Tech High School

- ■ % African American
- ■ % Asian
- ■ % Hispanic
- ■ % Native American
- □ % White
- ■ % Other

District and School Profile

Serving approximately 190,000 students, the School District of Hillsborough County manages more than 200 schools. In addition to 136 elementary schools, the district operates 42 middle schools and 25 high schools. The eighth largest school district in the country, the School District of Hillsborough County in Florida serves a rather diverse student population, comprised of 42% White, 27% Hispanic, 22% African-American, and numerous other groups of students from a variety of ethnic and racial backgrounds. The district has experienced many changes in the student population, including growing numbers of English language learners (currently at approximately 11%) who speak over 100 different languages, and socio-economically disadvantaged students who qualify for free and reduced-price lunch (50%).

Established in 1969, Tampa Bay Technical High School, known as Tampa Bay Tech for short, enrolls about 2000 students from a nearly even mix of ethnicities. Approximately 65% of the students are eligible for free and reduced-price lunch. Slightly less than 3% of the students on campus are English language learners. *US News and World Report* has recognized Tampa Bay Tech as a silver medal school for its students' academic performance.

Tampa Bay Tech offers a wide variety of vocationally focused technology programs and two magnet programs: the Academy of Health Professions and the Architectural Academy. To attend Tampa Bay Tech, students must complete an application process. Able to start their enrollment in the chosen programs in their freshman year or a later year, students apply to attend Tampa Bay Tech from all over the schools district, and many ride the bus for an hour daily to get to school.

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 Tampa Bay Technical 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 Tampa Bay Tech, particularly based on the percentage of economically disadvantaged students.

Table 1: Performance Trends based on Proficiency Standard

	2004			2005			2006		
Grade	9	10	11	9	10	11	9	10	11
Mathematics	65%	68%	Not Tested	73%	78%	Not Tested	77%	79%	Not Tested
Science	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	34%	Not Tested	Not Tested	44%
State Average for Similar Schools (Math)	47%	58%	Not Tested	52%	58%	Not Tested	53%	60%	Not Tested
State Average for Similar Schools (Science)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	25%	Not Tested	Not Tested	28%

Table 2: Performance Trends based on Advanced Standard

	2004			2005			2006		
Grade	9	10	11	9	10	11	9	10	11
Mathematics	34%	36%	Not Tested	39%	44%	Not Tested	38%	45%	Not Tested
Science	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	5%	Not Tested	Not Tested	5%
State Average for Similar Schools (Math)	20%	30%	Not Tested	23%	29%	Not Tested	23%	33%	Not Tested
State Average for Similar Schools (Science)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	4%	Not Tested	Not Tested	3%

Theme 1
Student Learning: Expectations & Goals

Focusing on student achievement, educators in the School District of Hillsborough County strive to equip students with post-secondary readiness.

- Educators in the School District of Hillsborough County embrace a continuous and steady focus on high student academic performance and the ultimate

goal of post-secondary readiness. Recognizing "the need to teach and work with the whole child," one district leader observed, "Our focus has always been on academic achievement." To prepare students for pursuits beyond high school, educators institute programs of study that include, for instance, coursework aligned with college entrance requirements and vocational preparation for skilled careers. Students can earn college credits through dual enrollment in local higher education institutions. The focus on post-secondary success is also evident in the district's sponsorship of the PSAT for all 9th-grade students to supplement the state-funded administration of the test in the tenth grade.

- At Tampa Bay Tech, educators align their efforts with the district's goal of post-secondary success. As educators on a campus formally known as a technical preparation school, adults at Tampa Bay Tech engage in a two-pronged approach to prepare students for both skilled careers and college by establishing rigorous academic and graduation requirements for various courses of study. Educators aim "to lessen the gap between high school and post-secondary education," and opportunities abound for students to "understand college," for instance, through presentations and college campus visits. Additionally, targeting students whose family members did not receive a college education, educators support potentially underserved students through programs such as "Take Stock in Children" and provide scholarships and mentors from the faculty and community businesses. The structure of the school, according to a science teacher, allows students to "graduate with technical skills needed for employment straight out of high school, while we try to get as many students to college as possible…Students know that's the high expectation being set for them."

Curriculum development and revision processes in the School District of Hillsborough County are standards-driven and emphasize alignment.

- Educators in the School District of Hillsborough County engage in curriculum processes to address their achievement-centered goals. For more than two decades, educators have promoted curriculum materials that "challenge and support all students" as well as provide consistency in all subjects. Further impelled by the state accountability system, the district administration involves committees of experienced teachers in the curriculum process, using the state standards as "a road map" for skills required of students at a particular grade level. Examples of materials developed include curriculum guides, curriculum-aligned semester exams, and pacing calendars for both the curriculum and assessments.

- To better guide classroom instruction, the district's curriculum materials include standards-aligned practical information and resources. For example, in science, with a focus on effective lab lessons, the curriculum provides ancillary resources, textbook correlations, and activities for hypothesis

development and the scientific process. A science teacher at Tampa Bay Tech shared, "Standards are broad, and curriculum is very concrete and manageable…This is how you're going to teach that standard." In addition, the pacing aspect of the curriculum further narrows the scope of the state standards, through prioritization based on assessment timelines and the frequency of each standard's appearance on the state tests. Math teachers at Tampa Bay Tech observed, "The district does a good job of breaking it down by chapter, by section, and by what standard is being met…There's a timetable for what days should be spent teaching what, and you can lesson plan from it very nicely."

- With much teacher involvement, educators review curriculum materials to determine the need for revision and focus on alignment. During curriculum reviews for strengths and weaknesses, "if we see something consistent at a grade level, then it drives us to go and look at the curriculum at that grade level and the one before." Every summer, during district-wide planning, educators, for instance, ensure vertical articulation or rewrite district assessment items. In addition to district-initiated reviews, educators conduct curricular revisions based on state-level modifications to maintain alignment with state expectations and adequately prepare students. For example, when the state department changed science testing from tenth grade to eleventh grade, curriculum leaders modified the pacing schedules.

- Within the district's framework, school-level educators enhance the curriculum. At Tampa Bay Tech, curricular augmentation efforts concentrate on increasing subject specificity. Since they are "trying to rear well-rounded students academically, socially, and as community members," educators at Tampa Bay Tech include a community service component that is specific to the students' courses of study. Students in their last year also must demonstrate mastery through field-relevant research and completion projects to demonstrate mastery. With a clear post-secondary focus, Tampa Bay Tech educators, assisted by district leaders, create additional field-specific programs that incorporate both the district's standards-based core-subject curriculum and occupational completion points.

Theme 2
Staff Selection, Leadership, & Capacity Building

Staff recruitment in the School District of Hillsborough County focuses on meeting areas of needs and expanding candidate pools.

- Administrators in the School District of Hillsborough County take an active stance in teacher recruitment. In addition to job fairs and the district's online presence, partnerships with local teacher education programs strengthen candidate pools. Through these sources, district leaders receive resumes of

new teacher trainees and of those seeking advanced degrees in specialized non-education fields. Moreover, the district office offers a variety of venues for non-education majors in order to effectively address shortages in critical fields and on high-need campuses. For example, the district office develops candidate pools through in-house programs such as the Alternative Certification Program (ACP) that offer career changers school-based training and mentoring. Via partnerships with local colleges and financial sponsorships, administrators coordinate programs such as Paraprofessional Transition to Teaching and Title I Associate of Arts Degree. The programs target participants who are committed to a set number of years of service in the district. The district's job fair attracts qualified candidates as well.

- Recruitment of school administrators focuses on addressing district needs. Embracing the objective of succession planning with a visible career ladder, district leaders create internal development opportunities. For example, assistant principals in charge of student affairs at secondary schools have access to workshops that prepare them for assistant principalship in curriculum. The two-year Preparing New Principals program encompasses "all the facets of principalship" through monthly sessions. The program has produced nearly 100% of the district's principals who possess strong knowledge regarding the district's goals. With the high percentage of internally developed principals, administrators do not exclude out-of-county candidates and recruit those with the experience and qualities that meet the district's needs.

Collegial collaboration and available support allow the staff to augment curricular consistency.

- Collaboration among teachers in the School District of Hillsborough County enhances curricular alignment and consistency. The district office's investment in professional learning communities enables regular cross-grade meetings and facilitates vertical alignment "as teachers look above or below them in terms of the knowledge base needed for future success." A district leader observed that "sharing lesson plans and worksheets has become engrained" at school sites. At Tampa Bay Tech, while scheduling difficulties preclude designated collaboration periods, teachers take the initiative to work with their colleagues. Math teachers, for instance, collaborate daily during lunch to share "what we've done that day and how it worked" and plan lessons together. Teachers also collaborate before and after school, during planning, or during class periods. For example, "[operating] on a team player idea," science teachers "drop in on each other's classes. Teachers never feel unwelcome in anyone's classroom. No one wonders what you're doing in the back of the room. It's nice to elaborate on what you're teaching, to get feedback, and to share ideas."

- Cross-curricular teacher collaboration at Tampa Bay Tech strengthens instruction. On a regular basis, technical and shop teachers communicate learning topics to core subject teachers to reinforce the connection among the students' classes. In addition, senior research and completion projects bring vocational and English teachers together to assist students. To familiarize teachers with the available programs of study on campus, every summer leaders at Tampa Bay Tech direct the teachers' focus to one technology or magnet program so that, for instance, "core teachers learn to infuse architectural lessons into their classrooms."

- Committed to providing instructional support, leaders in the School District of Hillsborough County ensure consistent curriculum implementation. Beginning with newly hired teachers, district leaders organize orientation activities that focus on strategies, content knowledge, and components of the curriculum such as pacing. Each new teacher also has access to job-embedded mentoring from an assigned veteran colleague. Additionally, designated personnel are available to work with all teachers in the district. In math and science, district supervisors and resource teachers establish their constant presence on school campuses and offer assistance so that teachers feel "comfortable and familiar with the material." In addition to supporting classroom teachers in curriculum implementation, leaders provide opportunities for bilingual paraprofessionals to increase their competence by shadowing instructional coaches.

Administrators in the School District of Hillsborough County stress capacity building by providing staff development and leadership opportunities.

- In a climate that supports professional growth and academic achievement, staff development activities address the district's priority in quality instruction. One district leader expressed, "The staff development agenda of improving teachers and all of our staff to realize academic success is particularly important." The district office particularly concentrates on "building subject expertise, which makes teachers comfortable with their subject so that they can be creative and engaging." Content-area supervisors also survey teachers for input about subject-specific training. Furthermore, for the release of new programs, district leaders present extensive training and invest "a lot of time and energy into the teachers knowing how to roll it out from day one." Instructionally focused professional development opportunities are also available to site administrators. For example, during monthly administrative meetings, district leaders include training on topics such as instituting classroom walkthroughs and understanding high-quality instruction.

- Administrators in the School District of Hillsborough County create opportunities for skilled teachers to assume instructional leadership roles. A district administrator expressed, "It's important to develop strong leadership teams at the district and site level." One way for teachers to exercise their

instructional leadership and expertise is through involvement in the curriculum process. A math teacher at Tampa Bay Tech observed, "We have a lot of experienced people that have a pretty good idea of what the students need and how it interrelates with everything else." In addition, after identifying effective math and science teachers, the district office promotes them as mentors to "create cadres of experts at the different schools so that teachers become a network of support."

Theme 3
Instructional Tools: Programs & Strategies

As part of equipping students for post-secondary success, educators ensure student access to rigorous instruction via course offerings and placement.

- To help students attain post-secondary readiness, Hillsborough educators strive to offer high-level courses. With "a focus on higher level coursework at every school," high school students in the district have access to, for instance, approximately 20 AP courses on each campus. At Tampa Bay Tech, student interests and post-secondary preparation drive educators' decisions to expand course offerings. One administrator shared, "If enough students express interest in an AP course and the school has a qualified person to teach the course, we offer it. If we don't have a teacher, we look for one to come in for a period to teach it." A science teacher further observed, "The school tries to offer as many upper level sciences because many of the students are going into medical and health-related fields or architecture where AP physics or AP environmental science would be very beneficial." The district's virtual school further provides students with access to upper level courses in a variety of subjects.

- With the availability of upper level courses, educators actively place students in rigorous and challenging courses. With the data-based guidelines and student profiles established by district leaders, school-level educators push students to "the highest level class possible." At Tampa Bay Tech, educators place students "based on data, not on ethnicity or other reasons…to make sure we put students in rigorous coursework." When students request to be in advanced courses, educators "won't deny students the chance…We will never say 'you're not qualified.'" Educators also "find students who might not otherwise sign themselves up because no one in their neighborhood has ever done it or no one in their family knows what it is." By placing students in high-level courses, a science teacher at Tampa Bay Tech shared, "Students get used to the type of class that AP classes are, so when they get to college, it's hopefully not a shell shock to them." Similarly, math teachers "get [the students] into a higher level so they can have that experience for college or

career. It forces them to reach their highest capability, whereas other schools may limit the students' going into Honors classes."

Instruction in the School District of Hillsborough County stresses student participation, employing relevance and diversity in techniques.

- Instructional practices in the School District of Hillsborough County emphasize student engagement and content relevance. Strategies advocated by district leaders, such as placing agendas on the board and six-minute Bell Work, focus on "good procedures in the classroom…[that] build a culture of time on task and are a great predictor of increasing achievement." At Tampa Bay Tech, teachers further enhance student participation by helping students see how the work is relevant to real life. "The students have to see why they are learning it, which is a big part of student buy-in," observed an administrator. In the math and science departments, teachers focus on strengthening the "correlation between what students are learning in the academic class and how to apply the information to their daily lives and to their career/tech education classes." The school requirement of community service learning hours also allows students to connect their academic and vocational courses "to what they will do in the community. That relevance is really important to what we do and our success."

- Educators at Tampa Bay Tech diversify their instructional approaches to further encourage student engagement. A school administrator commented on the importance of "a more well-rounded venue of expressing information to the students. No one single method will work for everyone." In math, teachers stress "diverse techniques. You have to change how you present the material to the students; you can't do the same thing throughout the day or the classroom. It can't just be one thing. For example, pairing students works, but not everyday." Expressing that "teachers can't just lecture," the science teachers "find creative ways" for students to "see and feel the concept" and reach better understanding. For instance, teachers involve students in designing experiments, discussing phenomena such as plants' simultaneous growth and weight loss. Furthermore, the district administration provides resources such as manipulatives, technology, and lab equipment to help diversify instruction.

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

Student performance monitoring is constant and data-based, with the involvement from multiple participants.

- To determine learning results, educators in the School District of Hillsborough County engage in constant data-driven monitoring of

student performance. With easily accessible data systems, educators at the district, school, and classroom levels can identify specific areas for improvement through information disaggregated by school, class, objective and question, or student. Furthermore, using multiple data sources, district leaders examine student progress longitudinally to establish "what's constituting success here and how those same students are doing at the next level." Similarly emphasizing multiple measurements of student achievement, educators at Tampa Bay Tech continuously review student progress. For instance, school counselors analyze students' records, including those from off-campus and online coursework, and conference with the students "to make sure that they are heading in the direction needed to follow their course of study requirements."

- With a variety of assessment strategies, educators expand the available data sources for student monitoring. For instance, the district office administers formative tests every 9 weeks in elementary grades and semester exams at the secondary level that constitute one third of the student's grade. At Tampa Bay Tech, classroom teachers further increase the frequency of student performance monitoring with tests, assignments, and activities such as reflection and group work. In addition, half way through each quarter, teachers generate academic updates on current student performance in each course.

- Parents in the School District of Hillsborough County receive opportunities and information to become involved in performance monitoring. The district office hosts community meetings for parents with information regarding programs of study. At school sites, Parent Nights educate parents about "how to extend the classroom at home," for instance, in reading and math. As part of the 9th-grade transition, educators organize Open House nights to increase parents' familiarity with high school academics and expectations. At Tampa Bay Tech, in addition to holding informational meetings, educators maintain parental contact using grade reports, phone calls, and listservs in order to monitor student performance and address student struggles effectively. Taking into consideration that many students are the first in their families to consider college and that many parents lack English proficiency, Tampa Bay educators provide bilingual information and create handouts that include tips such as regular reviews of post-secondary goals, examination of progress reports, and constant communication with the school staff.

In an attempt to ascertain their provision of quality education, administrators in the School District of Hillsborough County constantly monitor instruction and programs.

- To ensure effective education, administrators familiarize themselves with classroom instruction. One district leader shared, "It's absolutely critical to

have a pulse of what's happening in each classroom." By regularly spending time at school sites, district instructional leaders ensure faithful curriculum pacing and implementation. At Tampa Bay Tech, in addition to formal teacher evaluation procedures, each administrator conducts a minimum of twenty 3 to 5-minute walkthroughs each week to discern "the level of teaching." The informal walkthroughs focus on topics including student engagement, variety in instructional activities, and district-advocated practices such as writing objectives on the board. Regarding the administrative presence in their classrooms, science teachers expressed, "The school administration is very supportive. You don't feel they're obtrusive although they're in there watching all the time." The school administration also depends on department heads to ensure that teachers appropriately teach to the curriculum. Students further assist the school administration with instructional monitoring by honestly communicating "what's happening in class. Students will tell the principal if they're not learning anything."

- Instructional monitoring in the School District of Hillsborough County includes constant data-based reviews of implemented programs. One district leader shared, "The district studies every instructional program to death to determine whether to continue investing in the program or whether students are making faster gains. The district tries not to fall asleep at the wheel with its programs." The same focus on data-based evaluation is present for programs that provide students with extra academic support. At Tampa Bay Tech, for example, educators consult performance data and progress reports "to make sure the tutoring is working."

Theme 5
Recognition, Intervention, & Adjustment

As part of instructional monitoring, district and school administrators initiate interventional measures for schools and personnel in need of support.

- For schools with overall lower student achievement, district-level personnel rally support to enable improvement. Through data analysis and monitoring, district leaders identify "focus schools" that are in need of the most support. Meeting bi-weekly with the focus school staff, district leaders provide assistance "to determine the direction" for areas such as the campus leadership, instructional staff, and "anything the school needs to accomplish the task of student progression and achievement." For instance, district administrators work with the school staff to institute a site-based administrative team approach to leadership. Based on the district's analysis of

the focus school's goals, "any weaknesses are used to choose teacher level in-service training and select new teachers and additional support services," such as student intervention programs.

- Based on administrative observations in the classroom, leaders provide support that targets teachers' areas of concern. For new teachers, "any areas that need improvement are addressed with a mentor." School administrators and department chairs also provide needed support to all faculty members on a campus. In the School District of Hillsborough County, professional development is one important resource in teacher intervention. Through an analysis of teaching quality and past staff training, administrators in the district "[steer] the teachers towards professional development in the appropriate area."

To ensure academic performance, educators in the School District of Hillsborough County provide students with ample access to extra support to help them remain on track.

- Prioritizing academic achievement and conducting data-based student monitoring, Hillsborough educators emphasize providing support to meet student needs. The district office "targets programs for schools to respond to the needs of each student." For instance, with computer software, students "extend the classroom so that they don't have to stay after school." The district office also funds staffing for interventional opportunities such as the after-school Extended Learning Program and Saturday programs. In addition, the district administration facilitates school partnerships with community organizations and places teachers at those sites "because sometimes it's easier for students to take a bus home and receive tutoring after school near their home."

- At Tampa Bay Tech, students have access to support that complements district-provided programs. Embracing the philosophy that "promoting student achievement is the number one thing to create a better student," educators encourage students to take challenging classes and support those who struggle with rigorous coursework. For example, in math and science, teachers coordinate tutoring opportunities for struggling students within their departments after school or during lunch and electives. Individual teachers, along with student peer tutors, also regularly provide one-on-one assistance. During instructional time, teachers constantly make adjustments based on student weaknesses. For instance, science teachers review concepts "that were broadly missed" on homework, quizzes, or district assessments. The goal of supporting students, according to a school administrator, lies in the principle that "if the students have a weakness and we can address it, then they can move forward."

- A major focus for educators in the School District of Hillsborough County is early intervention to keep students on track. A district administrator shared, "If 9th- and 10th-graders are successful, then the percentage of graduates increases. So the district has invested time and resources into ensuring that those students make it." For instance, because district assessments are predictive of student performance on the state tests, educators can provide early support to students whose assessment results indicate they may struggle to meet state graduation requirements. At Tampa Bay Tech, in addition to developing an individual improvement plan for every freshman with low scores on the 8th-grade state tests, educators constantly monitor progress and initiate early conferencing to bolster students at risk of failing courses. To help students remain on track, educators create opportunities for credit recovery through, for instance, adult education programs at night or self-paced computer-guided instruction. With federal Title funds, educators at Tampa Bay Tech offer additional credit-recovery opportunities for core subjects during the school day.

Summary of Findings

Student Learning: Expectations & Goals

Concentrating on student achievement, educators in the School District of Hillsborough County focus on preparing students for post-secondary success in college and skilled careers. To address their achievement-driven focus, educators continuously direct steady efforts to the process of developing and refining a standards-based and resource-rich curriculum.

Staff Selection, Leadership, & Capacity Building

To address areas of need in the school system, administrators in the School District of Hillsborough County actively recruit qualified staff and expand candidate pools, frequently through career programs for internal candidates. In addition, educators strengthen their capacity professionally and instructionally through collegial collaboration, accessible support, staff training, and leadership opportunities.

Instructional Tools: Programs & Strategies

Educators in the School District of Hillsborough County strive for post-secondary student readiness by allowing students access to rigorous coursework and emphasizing active student participation in the classroom. In particular, educators constantly expand course offerings, place students in challenging classes, increase content relevance, and diversify instructional techniques.

Monitoring, Compilation, Analysis, & Use of Data

To ensure educational achievement, educators in the School District of Hillsborough County conduct constant and data-based monitoring of both student performance and instructional practices and programs. In addition, educators involve parents in performance monitoring and consult multiple data sources that often provide disaggregated and longitudinal information.

Recognition, Intervention, & Adjustment

Educators in the School District of Hillsborough County provide focused post-monitoring assistance based on available data. School-level staff members needing additional support receive opportunities targeting specific areas for improvement. Similarly, struggling students have access to an abundance of interventional measures to help them improve and remain on track.

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