Evaluation of the California Subject Matter Project

California Mathematics Project
Case Study

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The California Mathematics Project and Green Hills High School

Introduction

This is a case study of a partnership between the mathematics department at California State University, Bakersfield (CSUB) and Green Hills High School (GHHS)[1]. The partnership began in 1999 with a program in which college students tutored high school students. Concurrent with CSUB's initial work at GHHS, GHHS attracted a new principal. She worked with her staff to improve students' access to college preparatory mathematics courses and to develop a professional community in the mathematics department and the school overall that improved teacher quality and retention. Over time, the work of the CSUB-GHHS partnership shifted to developing the expertise of teachers in the GHHS mathematics department. That story is described here, beginning with GHHS's goals, followed by the partnership activities and programs, and concluding with this partnership's achievements.

Defining a Need

A rural school (Exhibit 1), GHHS historically had difficulty competing with high schools in Bakersfield for qualified teachers and frequently lost teachers who sought to move from Green Hills to more desirable positions within the district. When Rita Duvall, the current principal of GHHS, arrived at the school in 1999, many of the teachers lacked full credentials and student performance was low. School leaders and teachers who were at GHHS then remember teachers (including some in the mathematics department) who believed "that our students couldn't learn because of where they're from." Mrs. Duvall worked to recruit new teachers who "never believed that." Nonetheless, few students took upper level mathematics courses, in part because very few college-track classes were offered and few students were prepared to take them. One teacher who started at that time recalled thinking, "I knew there were more kids out here [who] could do the math, but we didn't have a system in place to move those kids forward." To increase student achievement and access to academic opportunities and to prepare students for postsecondary education and the workforce, GHHS's leaders realized they needed to:

Exhibit 1
Green Hills High School

Green Hills High School, in the Bakersfield area, serves more than 2,500 students. Nearly all (94%) of GHHS students are Hispanic/ Latino, 85% are eligible for free or reduced-price lunch, 46% are English learners, and 31% are classified as migrant. GHHS is part of a high school district that covers over 2,000 square miles. In the community as a whole, approximately 22% of the adults are high school graduates.

[1] To protect confidentiality of participants, pseudonyms are used for the school name, as well as the names of teachers and principals described in this report.

- Set higher expectations for student course-taking
- Increase teacher retention
- Improve teaching quality, leadership, and professionalism.

Partnership Activities and Programs

As a new vision for mathematics education emerged at GHHS, so too did the need for guidance, support, and professional development to reach it. CSUB professors were already connected to GHHS through the tutoring program, and the relationships and receptivity of the mathematics faculty led to an ongoing program of professional development, mentorship, and guidance (Exhibit 2). Professional development activities and cultural shifts within the department over an extended time took many forms and dramatically altered the department and experiences of students and faculty. After years of sustained professional development work with CSUB, GHHS now has much of the internal infrastructure to maintain and continue its work in improving student learning.

Exhibit 2
CSU Bakersfield

The Cal Poly SLO/CSU Bakersfield Mathematics Project is one of 19 regional California Mathematics Project sites throughout the state dedicated to offering programs that strengthen teaching and learning in mathematics. The San Joaquin Valley Mathematics Project served the Bakersfield area until 2001, when CSU Bakersfield began to host their own site, in collaboration with California Polytechnic State University San Luis Obispo.

Building the Foundation for a Strong Partnership (1999–2000)

CSUB and GHHS first worked together in 1999 as part of a countywide tutoring program, under the auspices of CSUB, in which college students from the mathematics and English departments worked with high school students. Although the work with the English department faded after a year, teachers in the GHHS mathematics department wanted to continue working with the CSUB mathematics department because they found the professors knowledgeable and approachable. During this time, a number of GHHS mathematics

Exhibit 3
Mathematics Professional Development Institutes (MPDIs)

California Mathematics Professional Development Institutes (MPDIs) were state-funded programs initiated in 2000 to provide high-quality mathematics professional development. Designed and implemented by mathematicians and educators, these content-focused extended-learning opportunities (2 to 4 weeks in duration) served more than 23,000 K-12 teachers in the first 3 years. Institutes included instruction in mathematics content, activities to integrate this learning into teaching practices, and required follow-up throughout the year. Although statewide funding for the MPDIs no longer exists, programs are offered to schools and districts with other funding sources such as California Mathematics Project; California Math Science Partnerships—CaMSP, AB 466, California Postsecondary Education Commission, Improving Teacher Quality Grants, National Science Foundation, and school and district categorical funds.

faculty also attended training through the Mathematics Professional Development Institutes (MPDI) hosted at CSUB and began to build relationships with faculty there (Exhibit 3).

As the relationships between CSUB professors and GHHS faculty developed, CSUB professors noted GHHS faculty's commitment to the students and receptiveness to making the changes necessary for students to succeed. This commitment, combined with a clear need to address persistently low student performance, high staff turnover, and the large number of non-credentialed mathematics teachers, attracted CSUB to work with GHHS.

Exhibit 4
On-Ramps to Mathematics

In addition to the mathematics faculty's professional development, the GHHS principal and mathematics teachers worked together to increase their students' academic opportunities. Instead of allowing students to take general mathematics throughout high school, GHHS required all students to enroll in algebra by 10th grade. When they found that many students were so far behind that they could not catch up during the regular school year, they created "on ramps," a range of ways for students to get on to the college track. For example, GHHS began offering more mathematics classes in summer school. Unlike many summer school programs, these classes were not focused on remediation for students who had already failed a given class. Instead, they were designed to enable students to take the next class in their sequence over the summer so they could enroll in a more challenging class in the fall. Included in this plan was an algebra class for incoming ninth-graders so they could advance more quickly into higher-level classes.

Before partnering with CSUB, GHHS had an unsupportive mathematics department culture, which had been a major barrier to effective instruction. As one teacher, who was hired prior to the new leadership and this partnership, reported,

> What our mentors told us was, "Here is your textbook. See you at the end of the year. Good luck to you." And they stayed true to it. I didn't really see them except for a couple of department meetings. There was no support. Teachers were doing whatever we wanted. A couple of us would talk to each other to see if we were in the right ballpark, but we really didn't know.

The high turnover rate created an opportunity for CSUB to make inroads with the new cadre of teachers who were receptive to new ideas and looked outside GHHS to find the mentorship and guidance they were lacking within the department. Another teacher hired around this time recalled being "ready and willing to take any advice. I was young and passionate and thought it could be better." CSUB professors were already familiar with the campus and its needs from the earlier work, had developed credibility with the teachers and principal, and were interested in expanding their relationship. As a result, a long-term partnership focused on teacher professional development was born[2].

[2] The focus of this case study is on the professional development and partnership activities specific to GHHS. CSUB and Green Hills faculty were also involved in a number of other professional development activities during this time including a cross-district initiative in which high school mathematics teachers worked with feeder middle schools.

The Active Partnership Years (2000–2007)

From the start, the content and format of the professional development were decided collaboratively by GHHS faculty and CSUB. CSUB professors began their work with GHHS not by offering a workshop or specific training, but by observing classes, attending department meetings, and meeting with individual teachers. This relationship-based approach, grounded in mutual respect, led to a culture of professionalism and trust in the GHHS mathematics department that enabled teachers to take risks in their instruction and collaborate with their colleagues in powerful ways. It also gave CSUB excellent data for assessing teachers' needs and building staff buy-in. The partnership included a number of different programs and activities during these active funded years that are described in the next section. Many of these activities continue to live on at GHHS even without the formal participation of CSUB.

Buy-in: Building relationships and collective participation

GHHS faculty repeatedly cited the approach and unique personalities of the CSUB mathematics professors as being critical to the success of the partnership. Nearly all the teachers indicated that the personal relationships and mutual respect they had built with CSUB professors were key to the success of the partnership's work. The role of the CSUB professors was described by an administrator as that of "an advisor and guide." She said it worked "because they didn't come in with a know-it-all attitude. It was 'let's work together to do…what's best for GHHS.'" Another teacher described the interaction with a CSUB professor as "the way to do it. He had a gentle hand. He didn't say 'this is what you should be doing.' We respected his opinion but he wouldn't chime in unless he was asked. But he did sometimes offer his two cents. He offered really good insights." CSUB professors knew the GHHS teachers because they spent time with them in their classrooms, in their department meetings, and on numerous Saturday afternoons and summer days working to tailor the curriculum and instructional strategies to meet the needs of GHHS students.

Participants in the partnership between GHHS and CSUB acknowledged that timing contributed to the success in some ways. When the partnership started, the GHHS mathematics department had recently experienced high turnover, leaving an entire department of relatively young, new teachers. The new faculty members were actively seeking mentorship and a professional community and had time to devote to professional development activities because they were less tied down with other responsibilities. One teacher stated, "When we all started getting together 7 years ago, most of us didn't have kids so coming together on a Saturday wasn't that big of a deal." Later in the partnership, time became a scarcer commodity for many participating teachers.

Content of early professional development: handheld technology, textbooks, and curriculum

GHHS faculty and CSUB professors agreed that one key impediment to improved student outcomes in mathematics was the student learning culture. Lack of student motivation in mathematics drove the focus of the early professional development. As one teacher reported, students typically felt that their responsibility "ended when they sat down in class. In other words, they typically did not expect to have to actively engage." CSUB

professors suggested that teachers were being met with passive students in part because of the dominant teaching style of lecture or "talking at" lessons. CSUB introduced the teachers to graphing calculators as a means for "tackl[ing] the problem of student motivation." CSUB also realized that through working with the teachers to develop and refine lessons that used the data analysis functions and other advanced features of the calculators, they would deepen teachers' content knowledge and engagement with the substance of what they were teaching.

The CSUB professors showed GHHS teachers how to use calculators and other handheld technologies to build interest in mathematics among students who might not be engaged by traditional instructional strategies (e.g., lecture and drill), to gather data and demonstrate concepts, and not as a way to sidestep the development of necessary computational skills (Exhibit 5). The first official partnership activities included half-day workshops held at CSUB introducing the GHHS teachers to technology and giving them classroom equipment sets. The use of graphing calculators and other handheld technologies—to build excitement and the content knowledge of both the teachers and students—became a core feature of early partnership professional development.

CSUB professors also used the adopted curriculum at GHHS to increase content knowledge and empower teachers to make meaningful choices about how they pace and plan for instruction. Both Jerry Murdock and Allen Bellman, authors of algebra textbooks, worked with GHHS mathematics teachers. In 2003, Allen Bellman presented a 1-week institute on his *Algebra One* textbook that GHHS had adopted at that time. He worked with the faculty at GHHS to better utilize his book in terms of the sequence of topics and pacing and to incorporate hands-on activities that would support the development of students' knowledge of key topics covered in the textbook. This experience was described by one teacher as the "kick-start to how we would model our classrooms and what we wanted to do."

Exhibit 5
The Use of Calculators in Mathematic Instruction

Mathematicians and mathematics education researchers debate the appropriate role for calculators in instruction. The March 2008 report on research-based practices in K-8 mathematics instruction released by the National Mathematics Advisory Panel cited the critical need for students to develop fluency with mathematical facts and cautioned against instructional uses of calculators that may impede this development. The panel's findings, based on a review of the small number of studies that met their research criteria, did not find an impact (negative or positive) on the use of calculators on calculation skills, problem solving, or conceptual development over the period of 1 year, and it called for additional rigorous research.[1] Other studies have shown that graphing calculators can aid students in developing a better understanding of mathematical representations and concepts.[2,3] Additionally, eighth-grade NAEP results revealed a positive correlation between high scores and students' frequent use of calculators and graphing calculators. This finding holds for students with low socioeconomic status.[4]

[1] National Mathematics Advisory Panel (2008). *Foundations for success: The final report of the National Mathematics Advisory Panel*. Washington, DC: U.S. Department of Education.

[2] Doerr, H. M., & Zangor, R. (2000). Creating meaning for and with the graphing calculator. *Educational Studies in Mathematics*, *41*(2), 143–163.

[3] Ellington, A. J. (2003). A meta-analysis of the effects of calculators on students' achievement and attitude levels in precollege mathematics classes. *Journal for Research in Mathematics Education*, *34*(5), 433–463.

[4] National Center for Education Statistics (2001). *The nation's report card: Mathematics 2000*. Washington, DC: U.S. Department of Education. Office of Educational Research and Improvement.

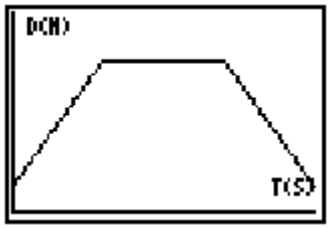
Building professional teaching corps: Lesson study and facilitated department meetings

CSUB introduced the mathematics department to "quasi-lesson studies"[3] that improved their content knowledge and pedagogy, and enabled the teachers to strengthen their collaboration as a department. According to one CSUB professor, the lesson studies created a space in which "you can talk about the pedagogy in a nonpersonal way," and teachers learned to talk about the lessons, not the teacher. As one teacher explained, "Things like the lesson study have broken down the barrier people build up of 'This is my classroom you can't tell me what to do.' With [the] format of lesson study, I think a lot more people are willing to interact, to share. There is that connection now, it easier for the open door to be there." Using the lesson study model, teachers were able to refine specific lessons (for example, the Walker Lesson described in Exhibit 6) and then apply new strategies, materials, and norms of collegiality more broadly in their work.

Exhibit 6
Example of an GHHS Lesson Study Using Handheld Technology
The "Walker Lesson"

In one of their lesson studies, teachers used a calculator-based ranger (CBR), a distance sensor, and a graphing calculator to collect and display data by creating graphical representations of the students' positions. The activity was designed to provide students with a hands-on, real-world experience in recognizing, describing, and manipulating the relationships between variables. GHHS teachers led students in group discussions about walking rates and distances. Then, using student volunteers, they demonstrated the use of the CBR and graphing calculator to produce graphs in which the distance they walked from the CBR was displayed on the x-axis and the time on the y-axis. They examined how both walking away from and toward the CBR and the speed at which they walked changed the graphs they were creating. The class discussed how distance and time were associated with the vertical and horizontal axes. Through this hands-on activity, students were guided through the process of discovering the relationship and then manipulating factors to create interesting graphs. Students were able to both create graphs based on a description and write descriptive stories to match graphs. Students can also access the data in list format and thus practice working with multiple representations of data. The lesson study format allowed GHHS faculty to observe one another and to modify the lesson to facilitate and extend their students' learning.

Example:



Description: Student started 0.5 meter from the CBR and walked away from it at a constant rate, stood still for 8 seconds, and then walked back toward the CBR at a constant rate. Students would also be challenged to determine what the constant rates were using the scale given on the axis.

[3] Formal lesson study is a professional development model that originated in Japan and provides teachers with a systematic process for examining their practice to become more effective. Working collaboratively, teachers develop a detailed plan for the lesson that one of the teachers then uses in a real classroom as the others observe. The teachers then meet to discuss their observations. Often, the group revises the lesson and then another teacher implements it in a second classroom with the group observing and then meeting to reflect and discuss observations.

Another way the CSUB professors worked with GHHS faculty was by attending department and professional learning community (PLC)/data team (e.g., Algebra I) meetings. The role of the CSUB professors in these meetings varied depending on the topic and needs of the teachers but tended to include facilitation, helping guide and refocus the discussion and draw on the research to help teachers reach consensus. As one teacher described, "Dr. [L] would usually observe for a good portion of the meeting and someone would ask him what he thought. He'd share his views on what he thinks and would help us in a way that involved our opinions." Through CSUB's expert facilitation, the teachers learned how to use departmental meetings as the setting for lively and productive debate. Since then, mathematics faculty members have engaged in discussion—described at times as "heated"—to push their own learning and approach to teaching to provide the best courses and instruction they can for their students. According to one teacher, over the years CSUB professors have helped to "take discussions to different places we might not have thought about" and "when we have conversations and it's tough and we don't come to consensus, he can praise us for asking the right tough questions even if we don't resolve [them]." Through these focused conversations, GHHS mathematics teachers have come to some deeply shared beliefs. For example, one teacher discussed how "mastery-based testing and retesting as opposed to simply moving through material" has become a tenet that the department built through work with CSUB.

The partnership work also involved focused, constructive discussion on vertical articulation. PLCs have worked together to align curricula to ensure that, for example, students entering geometry have mastered certain principles of algebra. One teacher described the vertical articulation as a means by which "I can focus more and have [students] prepared for the next teacher. With the vertical articulation, I'm preparing my students better knowing what the next level wants them to know." GHHS faculty also has worked with local feeder middle schools to help ensure that ninth-grade students are prepared for success.

Professionals outside the school walls: Attending and presenting at conferences

The CSUB professors stressed the importance of professionalism and the role that being a member of professional organizations plays in a teacher's growth. GHHS faculty have had the ongoing support from their administration and CSUB to attend, present at, and hold leadership positions at numerous conferences and trainings over the years. More than half of the 18 mathematics teachers at GHHS have presented at local, state, national, and international mathematics conferences. Attendance and participation in this type of professional activity is the norm for the department. In addition, teachers hold other leadership roles, including trainer for Texas Instruments, members of state mathematics advisory boards, trainer for AVID (Advancement Via Individual Determination), and professional development leaders for the school. Before the partnership began GHHS teachers were not presenting at conferences, and even today few can point to others from the district who take on these broader roles as teaching professionals. The mathematics teachers recognize themselves as "unusual" in this regard. For a number of teachers, the increased role as a conference attendee and presenter outside GHHS has been incredibly satisfying and an integral part of their professional growth. One teacher described the conference and other presentations as "trying our best to change the way things are

done." Building an outside professional network, in other words, helped to professionalize their teaching by providing the tools to systematically analyze practice and to share that knowledge with others in the field.

Institutionalization (2008–2009)

With a decline in funding for formal partnership work, CSUB has not been as active with GHHS in the last few years, but the foundation the partnership laid over the years has continued to guide the faculty. Many of the activities that were undertaken with support and direction from CSUB are now run wholly by GHHS's own mathematics faculty. This past year, for example, teachers did a lesson study on their own with a focus on better meeting the needs of all students. They applied the modified lesson study model they had learned with CSUB to a cross-departmental lesson study with non-mathematics teachers—including English language development (ELD) and special education teachers—to critique and improve lessons and instructional strategies. In addition to enabling the teachers to undertake formal projects like the lesson study, the principal and many teachers also credited their work with CSUB in providing the climate for running productive PLC and department meetings. Even though CSUB professors no longer attend departmental meetings, they continue to make themselves available to GHHS faculty to provide advice and guidance.

GHHS teachers also feel more prepared to take on new challenges, such as their change to block scheduling in 2006. Several teachers cited their work with CSUB professors in helping them use this additional time in a way that has really enhanced their instruction. They are able to use the block schedule for deeper investigations and discussion. According to one teacher, "There is time to go through an entire activity, come back to the classroom, and break it down with the students." This effective and efficient use of time is not automatic when transitioning to block schedules; in fact, one CSUB professor described it as a "potential for disaster" with teachers simply doing "two 2-page spreads in the textbook instead of the usual one."

The mathematics faculty members at GHHS value their time together and describe themselves as the only department that consistently wants more time for collaboration. Initially, they had hoped that the move to block scheduling would provide the time they needed for collaboration within the contract day, but they have found that they still hope for more. Teachers describe the department and PLC meetings as helping to reground them and giving them a space and time to stop and think about how they are doing things. During these meetings, ideas and strategies are shared that "make you sit back and re-evaluate, look at the big picture of how it might fit into your classroom, how it would affect me, the kids, and sometimes think, all right, I'll try it." But, unlike in the earlier days, the teachers—many of whom now have families and children of their own—are no longer typically free after school or on weekends to supplement time within the school day as they were in previous years.

The financial climate also means that despite strong administrative support and the provision of some release time for PLCs and other collaborative work, the resources to fund sufficient time for teachers to engage deeply and regularly with CSUB professors do not exist. Several GHHS teachers still e-mail regularly with CSUB professors and

continue to seek their input and guidance, and both GHHS and CSUB look forward to the possibility of establishing a more active partnership again if possible.

The sustained partnership work at GHHS created an institutionalization of professional community and participation in professional development activities that continued even when no funding provided for formal involvement from CSUB. One CSUB professor attributed much of the success to the teachers' ability early on to see the partnership as a long-term endeavor. He said, "Changes were small in the beginning, but teachers stuck with it. It was hard in the beginning; it was a new style for both the teachers and students to get used to. There was nothing that was going to happen radically over night; if you really wanted to implement change, you'd have to work patiently with the teachers and the administration." In the case of GHHS and CSUB, there were opportunities to build the trust necessary to try new things and to try again when necessary.

Progress Toward Goals

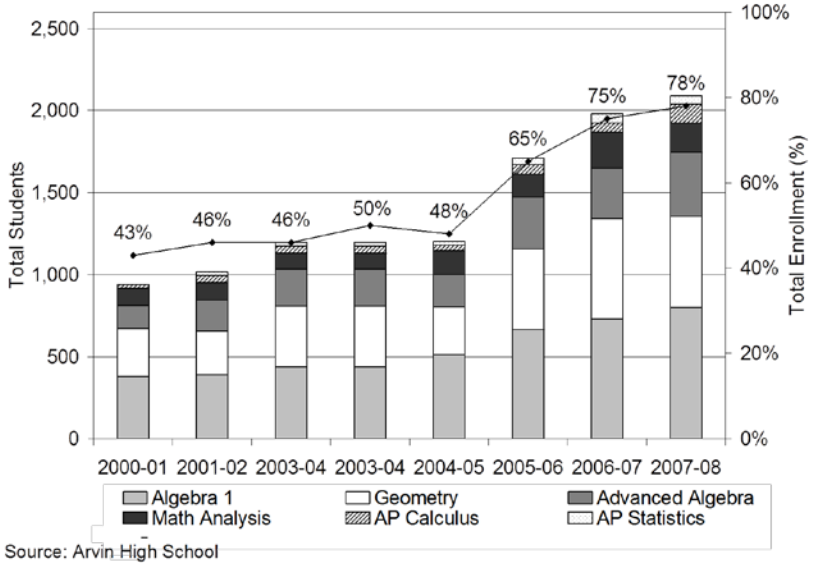
The work of the partnership between CSUB and GHHS for the past 10 years focused on increasing student achievement by increasing access and participation in college preparatory mathematics, increasing teacher retention and stability, and improving teacher quality, leadership, and professionalism. The outcomes that have been achieved through this partnership were the results of new school leadership, new teachers, and a shared vision.

High expectations and increased academic opportunities

As a result of the partnership, the attitude that students and the community have about mathematics education has changed in part because of the steps taken by the GHHS mathematics faculty and school leadership. The faculty's belief that all students can and will be successful at mathematics, access to additional courses (e.g., summer school, extended day), and enrollment of all students in Algebra I by their sophomore year have created a new mathematics culture. One teacher described a new school norm that taking college preparatory mathematics is "what you're supposed to do." Students no longer "top out" in algebra and many take Advanced Placement (AP) calculus or AP statistics.

Enrollment in college preparatory mathematics courses rose from 43% in the 2000–01 school year to 78% in 2007–08. During the same time period, enrollment in AP calculus quadrupled and AP statistics was added to the course offerings (Exhibit 7).

Exhibit 7
Green Hills High School College Prep Mathematics Enrollments



Increased teacher retention

Over this time, the mathematics department at GHHS has changed and grown. In the beginning, only about a quarter of the mathematics department teachers were fully credentialed and teacher turnover reached about 50% each year. Ten years later, the entire department is "highly qualified" under NCLB, and several teachers are enrolled in the CSUB Master of Arts in Teaching Mathematics program (two have already completed it). And, as mentioned, a number of GHHS faculty also have stepped into leadership roles in local and national professional organizations and the vast majority are active participants.

The partnership with CSUB and the connections the partnership helped mathematics teachers make with the professional teaching community were credited with helping create a collaborative culture. One teacher described the potential for "isolation and demoralization" when working alone and contrasted that to when "you are all working together; even if you're not making big strides the cumulative effect of the team is great." A CSUB professor described a culture in which

> "the senior people are spread out over the different courses and take responsibility for them. There is an idea that the courses—algebra, geometry, advanced algebra, and math analysis—are "corporate responsibilities." And that means when you are in the room you are not alone, you are responsible to the other teachers and they are responsible to you."

As new teachers join the department, they are incorporated into the community. And as in any community, some teachers are more or less involved in the activities and discussions. The structure created by the PLC was organized around specific classes (e.g., Algebra I

PLC, Geometry PLC) and the department meetings provided resources and avenues for discussion for all teachers in the department. One of the newer teachers at GHHS reflected, “It is a much bigger campus [than my previous school] but I’ve had good support. When I’ve needed something, if it is available they make it happen. I bounce ideas off the PLC all the time, it was a huge help.”

The supportive community and connections outside the school have enabled GHHS to reverse its previous labor market patterns. The department now has high teacher retention and is able to recruit experienced teachers when vacancies arise.

Improved teaching quality, leadership, and professionalism

Instruction at GHHS was described by a number of teachers as “really traditional” in the early days of the partnership and by one as being “right out of the book.” Some of the newer teachers began “trying to get away from that, and [they] started to develop activity-based lessons.” With practices such as lesson study and productive PLC time, supported by the CSUB partnership, teachers reflected on the changes they were making and became more intentional in their instruction. Over time, a teacher said they have “come to the realization that there’s a balance. Kids need basic skills but they also need to understand that math isn’t just a set of procedures. You need to be able to apply it.” Learning techniques for helping kids “apply it” and supporting curriculum articulation have been ongoing foci of the partnership work. The CSUB professors’ support and encouragement of teachers’ conference presentations and other outside roles have reinforced professional practices of trying new ideas, reflecting, and collaborating.

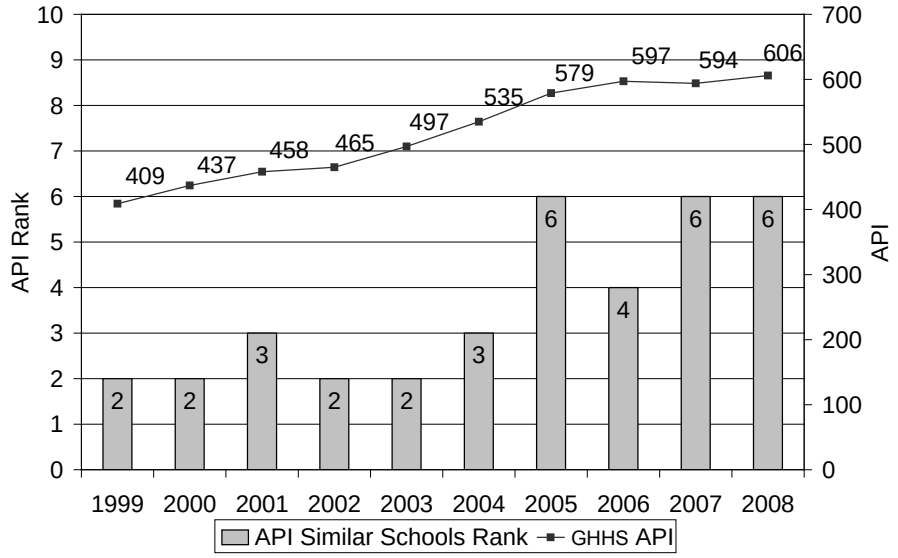
Teachers recognized that their students have benefited from the work they have done over the years with CSUB. One reflected, “I feel like the students have benefited a lot from it. My ideas are coming from a whole group of people not just me.” Another teacher described the role the use of technology (as instructed by CSUB professors) has played in her teaching. She said, “…I was using the calculators. I think it helped because I don’t know if I’d have been able to bring the kids up, but with the help of [CSUB] in terms of pedagogy and technology it allowed us to bring the kids further in shorter time.” She also credited the technology in helping her English language learners, saying “the graphing calculators take them out of language into some other realm where they are more capable of learning.”

The ultimate goal: Increased student achievement

Increasing student achievement drives all the partnership work because it is the underlying goal, but documenting and describing the student achievement are complicated. Nonetheless, student outcomes continue to drive GHHS’s teachers. Over the past 10 years, the Academic Performance Index (API) has risen steadily, moving from an

API of 409 in 1999 to 606 in 2008 (Exhibit 8). When compared with similar schools, GHHS has moved from an API Similar Schools rank of 2 to a 6 during this time.[4] CAHSEE mathematics scores also have increased significantly over the past 10 years, from 22% of students passing in 2001–02 to 69% in 2008–09 (Exhibit 9).

Exhibit 8
Green Hills High School Academic Performance Index (API) and Rankings



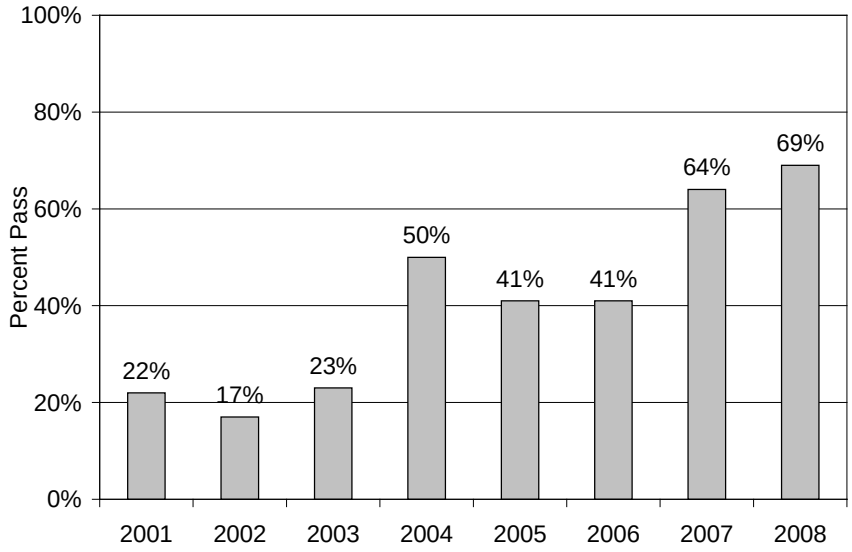
Source: California Department of Education

Significant gains in the subject-specific California State Test (CST) have not yet been realized, although far more students are reaching the level of college preparatory mathematics. Data specific to these course levels are available only for 2003 through 2008 and are more challenging to interpret. The number of students scoring basic or above has, on average, risen over this time period although there also were fluctuations (Exhibit 10). During this time, the percentage of students scoring at basic or above has remained between 15 and 30% across all three subject areas.

Many teachers see the increase in students taking higher-level mathematics as progress, but this data-driven department continues to look for more evidence of success and room for improvement. One teacher discussed his own frustration in not seeing the impact on CST mathematics scores that he would like to: "I think it says something that we're pushing more students into the higher math classes and our scores haven't dropped. [But] they haven't necessarily risen like we wanted them to." The professional culture of the mathematics department gives teachers a place to recognize their accomplishments without losing sight of a key goal that has not yet been fully attained.

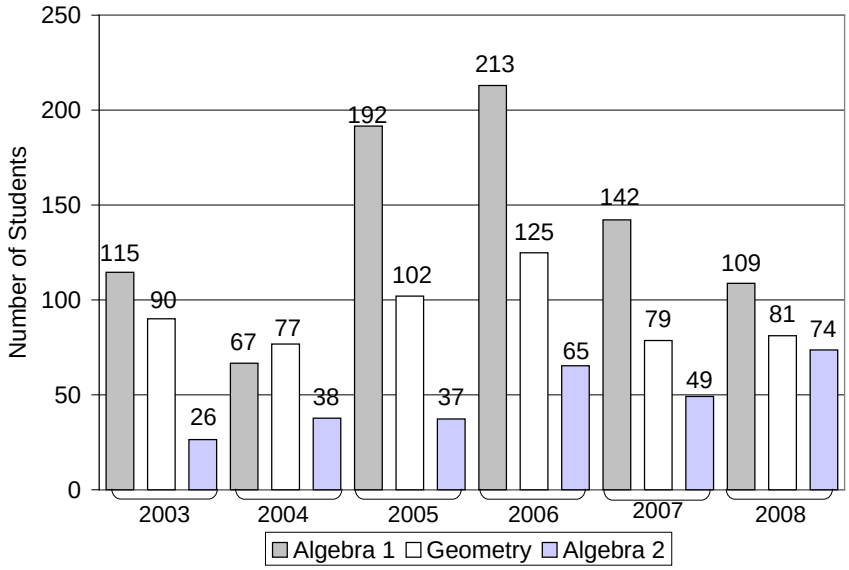
[4] The API is based on a score from 200 to 1,000. Rankings are deciles, with 10 the highest and 1 the lowest. For statewide rankings, each decile contains 10% of all schools. The Similar School ranking is based on 100 of the most similar schools (based on demographic and socioeconomic characteristics), with 10 schools in each decile ranking.

Exhibit 9
Percentage of 10th Grade Students Passing the California High School Exit Examination (CAHSEE)



Source: California Department of Education

Exhibit 10
Number of Students Scoring Basic or Above on California State Standards Tests (CST)



Source: California Department of Education

Conclusion

GHHS school leaders and teachers have worked to increase the opportunities for their students, and the partnership with the Cal Poly SLO/CSUB Mathematics Project facilitated those efforts. Over the past 10 years, the GHHS mathematics department and the school's leadership have focused on expanding student's access to college preparatory mathematics courses and on improving teaching and learning for all students. The teachers and leaders at GHHS credited their work with CSUB in helping create a culture of high expectations for students, collegiality and collaboration for teachers, and ongoing participation and pursuit of professional development in the mathematics department. The partnership with CSUB initially provided outside mentorship and guidance when high turnover at GHHS left few internal resources for teachers. Over time, the partnership built the internal capacity to continue the type of work that once required more support. Additionally, the partnership connected individual teachers to other opportunities to continue their professional growth outside the formal partnership but in ways that benefit the school. For example, several teachers have enrolled in the CSUB Master of Arts in Teaching Mathematics program, which has a primary focus on mathematics with a secondary emphasis on pedagogy for mathematics instruction.

The legacy of the partnership and the relationships developed with CSUB leave a department that will continue to work toward the goals of increased student achievement and access to college preparatory mathematics. The mathematics faculty members welcome new opportunities for collaboration with CSUB to support their goals of improved teaching quality and professionalism. Finally, the principal is striving to support the types of changes she has seen in the mathematics department in other departments in the school. While the partnership is currently in hiatus, it may return in the future and if not its legacy is strong enough to spur continuous work at GHHS.