

Practices Worthy of Attention

Raising Student Achievement Through Academic Intensification

As all readers will acknowledge, there is continual innovation in education. Our goal with *Practices Worthy of Attention* was to document what is really happening in the field to strengthen secondary mathematics around the country. The practices we highlight may be common, but the specific structures and strategies used to implement them are worthy of attention. As we examined the schools, districts, and programs in this study, we found innovation in two categories:

- their approaches to raising student achievement and improving student learning in mathematics, and
- their approaches to increasing teacher capacity.

This document describes a set of district and school practices for raising student achievement and improving student learning in mathematics. Strategies and practices for increasing teachers' knowledge and skills are discussed in a companion to this piece, *Building Teacher Capacity*.

Recent changes in federal and state education policies call for a substantial increase in the breadth and depth of mathematical knowledge that students must acquire in order to graduate from high school. In response, schools and districts are raising their expectations for what students should master in mathematics before graduating high school (Center on Education Policy, 2006).

All of the schools, districts, and programs profiled in this study have increased their expectations for student achievement, but some of them focused particularly on academic intensification strategies to help students meet the higher expectations. These strategies fall into two broad categories: (1) raising standards and expecting higher levels of achievement for all students, which means an intensification of what students were required to do, and (2) providing targeted and intense support to help students achieve at a higher level.

The practices we identified challenge both students and teachers to rise above notions of remedial and deficit-focused education, particularly in mathematics. These practices focus instead on students' strengths and assets. This document describes three types of practices that emerged in support of academic intensification: building summer bridge programs, requiring and supporting more rigorous mathematics courses, and providing intense and ongoing to students support throughout the school day.

Summer Bridge Programs

Two practices in this study involve summer bridge programs that help students transition from middle school to high school mathematics: the Academic Youth Development (AYD) Initiative and Step Up to High School (a Chicago Public Schools program). These programs are not remedial programs; they focus on developing problem-solving skills that form a

foundation for success in Algebra I. Both programs also include community-building components that introduce and reinforce ideas about how students learn and ensure that students entering ninth grade already know some teachers and peers and have developed a supportive academic network.

Both programs are based on research about the effect of social interventions on student engagement and academic success (Aronson, Fried, & Good, 2002; Good, Aronson, & Inzlicht, 2003; Treisman, 1988). Step Up to High School, for example, models its format on the Emerging Scholars Program used at the college level for improving minority and female participation in mathematics. Both programs also include education for teachers, with training and professional development sessions that focus on understanding student learning and modeling successful teacher practices.

- **AYD**¹ is an Algebra I readiness program that focuses on helping students better understand content through multiple perspectives and real-life applications. At the heart of AYD is a three-week transitional summer school and yearlong follow-up program. Rather than focus on the behavior of all students, the initiative focuses on the beliefs, attitudes, and behavior of a cadre of student allies upon whom the algebra teachers can rely to model respectful engagement and academic success and thus help shape the classroom culture during the regular school year.

Teachers nominate students for the program who are at risk for failure in a future Algebra I course but who have good attendance and show potential leadership skills. In addition to mathematics problem solving, AYD concentrates on teaching students persistence and giving them the power to be in charge of their own learning. For instance, students who view intelligence as a factor that can be improved with learning and habits of mind are more likely to persist through initial failure (Dweck, 2002); AYD gives students information about the changing nature of intelligence and encourages them to see failure not as a sign that they cannot learn, but as a signal to change strategy.

- **Step Up to High School** in Chicago Public Schools is a four-week literacy and mathematics program for students in the summer before their ninth-grade year. Step Up targets students who are likely to be overlooked by other programs—their low test scores indicate that they are at risk for academic failure as they transition into high school, but their scores are not quite low enough for the students to be placed automatically in other academic support programs.

In addition to building the academic skills in reading and mathematics that are key to high school success, Step Up focuses on helping students build teacher–student relationships and student–student relationships around shared academic interests. Step Up includes orientation seminars and activities, information about high school resources, and discussions of study skills, such as organization and time management. Students attend Step Up at the high school they will attend and are taught by teachers

¹ AYD was created through a partnership between the Minority Student Achievement Network, Agile Mind, Inc., and the Charles A. Dana Center. The Dana Center developed the *Practices Worthy of Attention* profiles.

who teach at that school in the regular academic year, ideally by the teacher who will be their freshman Algebra teacher. This means that students meet teachers and classmates before high school begins and learn to navigate through their new physical surroundings.

Both AYD and Step Up to High School show promise for improving teachers' understanding of student learning processes and for supporting students' mathematical learning and academic engagement. Pre/post surveys in both programs show gains in student confidence about their ability to do well in challenging academic courses.

More Rigorous Course Requirements

Research shows that students who take rigorous high school mathematics courses are much more likely to go to college than those who do not. For example, a U.S. Department of Education (1997) study found that 83% of high school students who took Algebra I and Geometry went to college within two years of graduating from high school, whereas only 36% of those who did not take these courses enrolled in college. In response to such research, many schools and districts now impose more rigorous mathematics course completion requirements for high school graduation, hoping to provide a larger pool of students the opportunity to prepare for college. However, simply increasing requirements is not enough to propel students to success; schools and districts must also ensure that students are prepared for and supported in the higher-level courses.

Three sites profiled in this study set specific course-completion goals for their students and then backward-mapped the curriculum to better prepare students on the strands and topics they would later be required to know. Each site also found ways to support students and help them do well in the more advanced courses. Bellevue School District's goal is for all students to pass Precalculus before high school graduation; El Paso Collaborative for Academic Excellence requires all students to complete Algebra II; Grant High School's goal is for all students to pass Geometry by their sophomore year; and Norfolk Public Schools' goal is for all students to pass Algebra I in eighth grade.

Bellevue School District (Bellevue, Washington) requires all students to complete four years of high school math, including Precalculus, before graduating. To prepare students for this level of mathematics, the district has focused on curriculum alignment and support for students in the more rigorous courses.

- **Curriculum alignment:** Bellevue partnered with higher education institutions to help them backward-map a coherent progression of mathematics knowledge and skills from Precalculus all the way down to kindergarten. The partnerships with higher education faculty helped the district discover the gaps in their curriculum frameworks and refine their curriculum. The district's move to improve and standardize curriculum removed the burden of the curriculum and assessment development from teachers, giving them more time to focus on their instruction and on providing students the supports they need to be successful with these higher expectations; the standardization also provided a common set of curriculum, assessments, and other resources for teachers to use in class.

- **Student support:** Bellevue began moving all students into honors-level mathematics courses starting in middle school. With the majority of middle school students (75%) now in honors mathematics courses, Bellevue's mathematics curriculum coordinator has begun to remove most non-honors mathematics courses from the middle school curriculum and to find ways to get all students better prepared for the higher-level mathematics they will encounter in high school. Now, students needing extra help are offered a second period of mathematics in which the mathematics is intensified: Teachers pre-teach material, work with students on the most challenging material, help students with their homework, and help strengthen students' study skills and mathematics foundations.

El Paso Collaborative for Academic Excellence (El Paso, Texas) has built and implemented a cohesive K–16 mathematics program for all 12 school districts EPCAE serves in the greater El Paso area. EPCAE realized that if students could successfully complete Algebra II in high school, they could usually avoid remedial mathematics courses in college and enter College Algebra fully prepared.

- **Large-scale collaborative effort:** EPCAE is a collaborative effort of 12 school districts in the El Paso area, the local community college, the local four-year university, and the entire El Paso community in an effort to achieve coherence in their curriculum and promote success for students past high school graduation to establish a common vision for a K–16 effort.
- **Curriculum alignment:** EPCAE formed a K–16 mathematics alignment initiative made up of mathematics educators—elementary, middle, and high school teachers and college and university faculty—who spent two-and-a-half years producing a curricular framework that aligned high school and first-year college mathematics. This group backward-mapped the curriculum to prepare students for successfully completing Algebra II before high school graduation. After the curriculum frameworks were developed, EPCAE provided teachers with professional development to use the frameworks as the foundation for Algebra II in high schools.

Grant High School (Portland, Oregon) set the goal of having all students pass Geometry by their sophomore year of high school. Mathematics teachers at the school set this goal themselves when they became frustrated that the school seemed like two schools within one building—in the Pre-Algebra courses, the students were predominantly racial or ethnic minorities, while in the Precalculus courses, the students were predominantly white. The teachers felt that this division illustrated unequal access to higher-level mathematics courses, which would limit some students' postsecondary opportunities. Four teachers developed an intensive mathematics program, and the school started a freshman academies program to help students transition successfully into high school.

- **Intensive mathematics program:** Grant's intensive math program is for students who enter high school behind in mathematics. Teachers decided to intensify instruction by providing double periods of math for two years, in effect giving the students three years of mathematics—Pre-Algebra, Algebra I, and Geometry—in just two years, beginning in their freshman year. One goal of the two-year program is to allow

students to have the same mathematics teacher both years. This has helped teachers create a culture of learning and support that students can benefit from in their two periods of math and in their first two years of high school.

- **Academies for entering freshmen:** Grant created academies for all entering freshmen. Students shared three class periods and only three teachers, so teachers got to know all of their students quickly. If students were enrolled in the intensive double-period math class, then they would likely have five classes together and four teachers in total. The students spent the majority of their time together, so they got to know each other well, and this encouraged the formation of small learning communities in which students could begin to trust one another and work together on their academics.

Norfolk Public Schools (Norfolk, Virginia) wants to ensure that their students have every opportunity to access not only Geometry in high school, but also Algebra II and other higher-level mathematics; they feel that getting students through Algebra I earlier—in eighth grade—creates greater chances for students to take and excel in the higher-level courses in high school. The district developed the Algebra for All project, which requires students to take and pass an Algebra I course and the state’s end-of-course algebra exam in eighth grade. Norfolk knew that the project could not consist only of changing enrollment patterns, but rather must involve a true improvement in the quality of mathematics instruction. To that end, the district is focusing on curriculum and extending the time students spend working on mathematics each day.

- **Curriculum:** Norfolk focused on vertical articulation and coherence of mathematics across grades. The district realized that there needed to be a foundation of algebra content in all grades preceding Algebra I. Mathematics content staff integrated algebraic reasoning across all topics in the grades K–7 curriculum in a coherent content strand involving patterns, functions, and algebra. The new articulation ensures a progression of concepts, so that when students reach Algebra I, they are prepared with basic algebraic ideas and concepts.
- **Extended instructional time:** Mathematics is taught for a minimum of 90 minutes per day at all grade levels. The district provides teachers with an instructional manual that shows how they can use those 90 minutes to fully engage students in learning mathematics. Teachers also help students learn mathematics in “academic success sessions” during the school day or after school.

Bellevue, EPCAE, Grant, and Norfolk all show promise for helping students meet rigorous mathematics course requirements. In Bellevue, more students are completing higher levels of mathematics each year: 85% of the 2006 graduating class had taken Precalculus or higher. EPCAE has seen an increased number of students enrolling and passing Algebra II as well as increased graduation rates. At Grant, the enrollment of black students in Algebra II has increased from 8.9% to 17.9% since the first cohort completed the intensive two-year course; 100% of students in the two-year course plan to enter college. In Norfolk, the percentage of middle school students enrolled in Algebra I has increased, as has the percentage of students passing the course and exam: from 41% to 69%.

Embedded Student Support Within the School Day

Schools and districts that engage in academic intensification must find ways to support students who come to the mathematics classroom with a diverse set of experiences. Some small schools, like Eastside College Preparatory School, High Tech High, and YES College Preparatory School, have found ways to embed such student support in the daily schedule as a regular part of students' schooling. In these schools, a low student-to-teacher ratio helps teachers provide students more individualized attention, and the school culture has students thinking about college as a regular part of their schooling. Larger schools, like Evanston Township High School, are challenged by large classrooms and high student-to-teacher ratios, so the schools must rely on strategies like tutorial programs and extra time for mathematics instruction.

Eastside College Preparatory School (East Palo Alto, California) is an independent school serving students in grades 6–12 from populations that are historically underrepresented in higher education. Enrollment is just over 200 students. Eastside's goal is to provide a strong student-centered academic environment by providing a college-preparatory curriculum (for example, four years of mathematics, with a minimum requirement of Precalculus upon graduation) and all the kinds of assistance and support students need to meet the high expectations of the curriculum, which is especially important, given that most students do not arrive at Eastside adequately prepared for high school. Student support systems are embedded pieces of the Eastside school day, and they include an open campus, daily tutorials, individual advising, and additional academic supports.

- **Open campus:** Eastside has extended school days (8 a.m. to 5 p.m.), which run three hours longer than days in most public high schools. The computer lab is open until 10 p.m. each weeknight and for most of Saturday. School opens for breakfast at 7 a.m. each weekday. The point of these hours and resources is to make the campus as accessible and useful as possible to students so that they want to be at school and feel connected and supported there.
- **Tutorials:** Two 90-minute tutorials are built into the school day to ensure that students are getting support to understand the core course content (English and mathematics) and are completing their homework. For English and math, teachers tutor around 20 students in a 90-minute tutorial right after class, so students receive immediate help on concepts and ideas from the same teacher. This framework offers consistency of instruction and allows the teacher extra time to work with students who are struggling with certain ideas and to provide more intensive opportunities for students to engage with the academic content.
- **Advisory system:** Students meet daily with an advisor, who helps them specifically with their personal and academic challenges and issues. Advisors are teachers assigned to a group of 6–8 students with whom they work closely over the four years of high school. Advisors also provide students resources for extracurricular activities that can help support their academic interests and portfolios for applying to college.

- **Academic supports:** The curriculum includes additional academic courses that focus on reasoning and analytical skills as well as topics in college admission and transitioning to college. These courses provide students with a strong foundation in skills and habits that are necessary for academic success in high school and beyond. For example, the Senior Research Institute helps prepare students for the demands of independent research and writing at the college level.

High Tech High (San Diego, California) is a charter school focusing on solutions for dealing with student disengagement and low academic achievement; the school builds personalized, project-based learning environments where all students are expected to graduate well prepared for college. The school's enrollment is just over 500 students. HTH encourages the interaction of vision and practice for students through project-based learning and close work with advisors and mentors.

- **Project-based learning:** HTH offers hands-on experiences in mathematics through project-based learning. For example, after mathematics teachers provide a lesson and tasks for students to engage in, students break into small learning groups to work on projects that apply the mathematics concept to a hands-on activity. Since the classrooms are grouped by grade level and students come in with differing levels of mathematical proficiency, classes are taught in ways that cover the span of several mathematics courses; for example, Algebra I, Geometry, and Calculus are taught in the same class, where the teacher focuses on a mathematics strand and differentiates the difficulty in the project activity for students. Students work within and across groups to gain advice and input for their projects, and the teachers check in with each group to monitor the projects and provide support and guidance as needed.
- **Advising:** The advisory program was designed to support students in their academic preparation for college. Each HTH student is assigned a staff advisor who also acts as a liaison to the student's family, so parents are aware of their child's growth and challenges at HTH. Advisors work closely with students to help them plan for their future, navigate the college admissions process, and apply for financial aid and scholarships.
- **Internships:** Beginning in their junior year, students work as interns two afternoons a week for at least one semester at local businesses, schools, nonprofit organizations, or professional associations. They work on a specific project that is overseen by a mentor. This mentor understands and supports HTH's design principles, and works individually with the student to cultivate a productive learning experience that exemplifies their project-learning schooling in an actual work-related setting.

YES College Preparatory School (Houston, Texas) is a charter school serving students in grades 6–12. Enrollment is almost 700 students. Some of the school's measurable practices are their requirements that all students follow the college-preparatory track and that all students gain acceptance to a four-year college or university. YES has also required all students to take a minimum of one Advanced Placement (AP) course and test or one International Baccalaureate (IB) course and test prior to graduation. Strong support is a key

component of students' success at YES; his begins with the teachers' commitment to their students' success.

- **Teacher belief and influence:** Critical to YES's student support system is that the teachers believe in and actively contribute to students' positive daily school experiences. When a student is accepted to the school, teachers go to students' homes to meet the student and his or her family. These meetings usually last about 45 minutes; teachers welcome the student and family to YES and review the contract that parents, students, and teachers agree to and sign. The contract is a commitment to excellence and hard work. Teachers make themselves available to help students at any time—they even have cell phones so that students can call them for help with homework instead of getting frustrated and feeling like giving up.
- **Extended day:** The school day at YES is longer than that of most public schools, 7:40 a.m. to 5:00 p.m. The long day provides teachers and students with additional time and opportunities to work together to meet the high expectations of the school. The longer hours include tutorials and study halls that provide extra academic support for students. Co-curricular activities such as clubs and sports are also included in the school day, usually at the end of the day.
- **Study skills, tutorials, and individualized support plans:** Classes on study skills and life skills are built into the school day to help reinforce the culture of high expectations of students on a college-preparatory track. Tutorials and study hall periods are built into the school day and offer time for students to receive help with different ideas and concepts and to work on homework. In the earlier grades (6–8), focused pullouts in mathematics are provided for students needing extra time and intensification of the content. These self-paced pullout classes depend on the needs of the students. Teachers work with students needing additional help, devising individualized support plans and providing a concrete process to help struggling students get back on track.

Evanston Township High School (Evanston, Illinois) has an enrollment of over 3,100 students. The school is working on building student success in Algebra I, and it has taken steps to ensure that students receive daily, individual support in mathematics, especially because research suggests that specific math courses, such as Algebra I, serve as gatekeepers to high-level mathematics knowledge and can affect mathematics achievement in high school and beyond (Adelman, 2006; Ma, 2001).

- **Intensive daily support:** Algebra I classes are structured so that there is more instructional time for all students. Students work in small groups to discuss an idea and then share their findings with the whole class; students feel comfortable asking questions of each other and of the teachers when they do not understand a concept. Students in upper-level mathematics courses have been recruited to assist in Algebra I classes, helping students understand concepts and serving as teachers' aides. In addition, to make sure struggling students receive support, the chair of the mathematics department meets individually with students who have failing grades to

discuss their performance and talk about what kind of help they need. Algebra I teachers also have 30 minutes each morning to work with struggling students.

All four schools show promise for supporting students on a daily basis to ensure their long-term success. In the three small schools that mainly serve economically disadvantaged, first-generation college-bound students, 100% of students graduate high school and enroll in four-year universities. In Evanston, students are passing Algebra I at higher rates.

Conclusions

Raising student achievement through academic intensification requires changes in the attitudes and practices of administrators, teachers, and students.

In summer bridge programs, students learn about the value of academic effort and build peer and teacher relationships that will support them throughout high school. Success in these programs necessitates firm belief on the part of teachers that their students really can succeed in high school mathematics and that collegial student peer groups can be a strong support for that success; when the teachers in these programs believe and demonstrate these ideas, they have a greater chance of convincing students to engage wholeheartedly in their own education.

Similarly, requiring all students to take rigorous courses students demands a change in how districts and schools think about student ability. In the practices profiled here, districts and schools are getting students into rigorous mathematics courses earlier and providing much more support for both students and teachers. Intense, embedded, daily supports, for example, constantly reiterate the idea that mathematics is important and that, with hard work and a strong network of teacher and peer support, all students can take and pass rigorous mathematics courses.

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About *Practices Worthy of Attention: Local Innovations in Strengthening Secondary Mathematics*

Practices Worthy of Attention is a joint initiative of Achieve, Inc. (www.achieve.org), and the Charles A. Dana Center at The University of Texas at Austin (www.utdanacenter.org). The initiative is led by Pamela L. Paek, a research associate at the Dana Center, who, in 2006, examined 22 program, school, and district practices that showed promise—based on early evidence and observation—of strengthening secondary mathematics teaching and learning.

Our goal was to document practitioners' descriptions of *what is really happening* in the field to strengthen secondary mathematics education around the country. Thus, while the practice highlighted may be common, the specific structures and strategies used to implement the practice are worthy of attention. These initial investigations set out to mark these practices for future rigorous scientific inquiry by Dana Center and other researchers.

Ultimately, we hope to create a community of inquiry made up of university researchers working with administrators and teachers from featured schools and districts to more rigorously research how effectively these practices improve secondary mathematics learning for all students.

Reports and practice profiles. An executive summary details the methods for this initiative and analyzes themes. Two cross-case analyses discuss specific strategies for raising student achievement and building teacher capacity. Brief profiles describe each practice. All of these publications are available on our website at www.utdanacenter.org.

Data. In all cases, data about the practice were provided by the program, school, or district studied as part of a description of their practice. We did not independently analyze data gathered through a consistent assessment tool, and we did not evaluate their uses of data for measuring effectiveness. Thus, the data in the practice profiles are intended not to prove the practice's effectiveness from a research perspective, but to paint a detailed picture of the practice and what data were used by the program, school, or district to gauge how well it was working.

Theoretical frameworks. In some cases, district staff mentioned specific literature on theory or practice that they used when they developed the practice we highlight. In those cases, we cite that literature in our discussion of the practice.

How to cite this cross-case analysis

Paek, P. L. (2008, January). Raising student achievement through academic intensification. Cross-case analysis from *Practices worthy of attention: Local innovations in strengthening secondary mathematics*. Austin, TX: Charles A. Dana Center at The University of Texas at Austin.

Where to find the profiles

For profiles of the practices discussed in this cross-case analysis, see our website at www.utdanacenter.org. The practices discussed here were:

Academic Youth Development; Algebra for All: Norfolk Public Schools; Building an Algebra Program: Evanston Township High School; Eastside College Preparatory School; High Tech High; Intensive Mathematics Program: Grant High School; K–12 Aligned Mathematics Curriculum: Bellevue School District; K–16 Mathematics Alignment: El Paso Collaborative for Academic Excellence; Step Up to High School: Chicago Public Schools; YES College Preparatory School