

Practices Worthy of Attention
Collaboration of Special Education
and Mathematics Teachers
Denver Public Schools
Denver, Colorado

Summary of the Practice. Denver Public Schools began a two-year pilot program providing a collaboration model for mathematics and special education teachers that allows both to improve their mathematics instruction to accommodate the wide continuum of learners in their classrooms

Need. Special education teachers often do not have expertise in mathematics, and thus have difficulty supporting their students in mathematics at higher grade levels. Mathematics teachers do not always know how to accommodate special education students' individualized education plans without "dumbing down" the mathematics content. Denver saw a need to have mathematics and special education teachers work together to best support all of their students in secondary mathematics.

Goal. The goal of Denver's collaboration of special education and mathematics teachers is twofold: to support mathematics and special education teachers to improve their use of differentiated instruction in mathematics, and to provide students in special education an enriched mathematics curriculum and the opportunity to learn meaningful mathematics.

Demographics

Denver Public Schools, which serves grades K–12, has had a relatively stable enrollment rate of about 72,000 students over the past few years.

Table 1. Denver Public School District Enrollment Data

Academic Year	Enrollment
2002–2003	71,972
2003–2004	72,103
2003–2004	72,472
2005–2006	72,312

Table 2 shows the percentage of students enrolled by race/ethnicity and limited English proficiency; it also shows the percentage of students receiving special education services. In 2005–2006, the majority of students in Denver were Hispanic (57.5%) followed by white students and black students (each just below 20%) and then Asian American students (3.1%). The percentage of students classified as having limited proficiency in English has continued to increase over the last few years, most dramatically from 30% in 2004–2005 to 40.2% in 2005–2006.

Denver's 2004–2005 *Special Education Report* (Denver Public Schools, 2005) lists the number of students receiving special education services enrolled by disability as well as by race/ethnicity and sex. As seen in Table 2, the percentage of students in special education has continued to rise, from 10.8% in 2002–2003 to 11.9% in 2005–2006. Although the data are not disaggregated below, racial/ethnic representation in the special education category is similar to the makeup of the district, with about half of special education students being Hispanic and about 22% being white.

Table 2. Denver Public School District Enrollment Rates

Demographics	Academic Year	Percentage Enrolled
Asian American	2002–2003	3.3
	2003–2004	3.1
	2004–2005	3.1
	2005–2006	3.1
Black	2002–2003	19.1
	2003–2004	18.8
	2004–2005	19.0
	2005–2006	18.4
Hispanic	2002–2003	56.1
	2003–2004	57.1
	2004–2005	57.3
	2005–2006	57.5
White	2002–2003	20.2
	2003–2004	19.7
	2004–2005	19.4
	2005–2006	19.8
Special Education	2002–2003	10.8
	2003–2004	11.3
	2004–2005	11.7
	2005–2006	11.9
Limited English Proficient	2002–2003	29.1
	2003–2004	29.9
	2004–2005	30.0
	2005–2006	42.2

The 2004–2005 *Special Education Report* also lists the cross-classification of students as special education and English language learner (ELL), as seen in Table 3. There is a steady increase in the number of English language learners receiving special education services.

Table 3. Denver Public School District Enrollment Rates of English Language Learners in Special Education

Academic Year	Special Education/ELL Cross-Classification	
	Number Enrolled	Percentage of Students
2000–2001	921	12.7
2001–2002	1,054	13.7
2002–2003	1450	18.6
2003–2004	1,738	21.3
2004–2005	1,947	22.7

Description of the Practice

Denver Public Schools believes that students with special needs are part of a continuum of learners with differences, rather than a separate population. As such, adapting curriculum, instruction, and assessment is appropriate for any learner, not just for students with special needs. Denver has been working on supporting the collaboration of special education and mathematics educators, hoping to build capacity among both sets of teachers for improving instruction in mathematics. For mathematics teachers, the collaboration with special education teachers offers them opportunities to better understand the needs of students in special education. For special education teachers, the collaboration with mathematics teachers offers them opportunities to better understand the mathematics curriculum and encourage special education students with challenging mathematics work. In discussing the framework for what is involved in learning mathematics, teachers learn about the different types of difficulties students can have and are provided concrete lists of strategies to use as resources for making mathematics more accessible to all students.

The concept behind this collaboration is universal design for learning, which takes the approach that students differ in the ways that they best learn and express themselves (Burgstahler, 2005). CAST, the Center for Applied Special Technology, has developed several resources based on universal design for learning principles; CAST believes that good resources based on those principles provide

- Multiple means of representation, to give learners various ways of acquiring information and knowledge,
- Multiple means of expression, to provide learners alternatives for demonstrating what they know,
- Multiple means of engagement, to tap into learners' interests, offer appropriate challenges, and increase motivation. (CAST, 2007)

Denver used resources from the Education Development Center (EDC) in building this collaborative model. The EDC has conducted research and developed courses for teachers and administrators around the issue of universal design in mathematics curriculum (see, e.g.,

Brodesky, Gross, McTigue, & Palmer, 2007; Brodesky, Gross, McTigue, & Tierney, 2004; Education Development Center, 2007).

To participate in Denver's collaborative model, special education and secondary mathematics teachers meet regularly, about every six weeks after school, teaming up as pairs. The person who is both the district's mathematics and special education specialist facilitates these meetings. The first time the teachers are matched as a pair, teachers choose a sample student and think about what kinds of strengths and challenges this student has. Teachers then consider key questions about what accommodations should be used for individual students, how much accommodation is needed, and how the accommodations can be implemented. The fundamental goal of the task is not to alter the mathematics concepts but rather support students reaching the mathematical "big idea" of the lesson.

In subsequent meetings, the work revolves around collaboration of mathematics and special education teachers working together to support students' mathematical learning in pairs. For instance, each pair of teachers writes a single mathematics lesson plan, learning how to build in accessibility and accommodations to address the range of their students' individual challenges and needs. Based on the work of Barton and Heidema (2002) and Brodesky et al. (2004), the teachers learn strategies for preparing and implementing such a lesson plan. This approach is concrete, since teachers pick three students to represent a range of mathematical abilities (e.g., struggling or typical), and teachers actually write a lesson plan together with this new strategy as a guide. When teachers write a lesson plan with these focal students in mind, it helps them address the needs of the range of students in their class in a tangible way.

Learning to teach with this approach takes time, and, as Denver's teachers are becoming more comfortable with it, they have begun to decrease their use of different and less effective versions of lesson plans for specific students. With any of these strategies, the goal is for teachers to follow a process for planning accessibility strategies that address learning barriers while maintaining the integrity of the mathematics. Before leaving the meeting, the teachers plan to use specific strategies with their students and prepare to provide evidence (e.g., student work) of the use and effectiveness of the strategy at the next meeting. The next meeting begins with a follow-up of the collaboration with the teacher pairs reflecting on their collaboration in written form, answering the questions: *How did you collaborate? What were your successes? What were your learnings? What are your next steps?* Teachers then discuss their responses with their partners.

The meeting facilitator asks teachers to share their strategies and stories with the whole group. Afterward, each teacher documents the top three strategies they most frequently use with students, the two strategies they would like to add to their practice more often, and one question about using accessibility strategies for mathematics. They then share their goals and cautions regarding accessibility strategies so they can learn from one another to see what challenges other teachers have had. This type of sharing builds a support group that professionally shares ideas and actual practices in the field, which gives the teachers a common set of goals to aim for and cautions to keep in mind. Some of the teachers' goals and cautions are listed in Table 4.

Table 4. Goals and Cautions for Accessibility Strategies

Goals	Cautions
<ul style="list-style-type: none"> • Making the mathematics more accessible to diverse learners • Increasing the chances of learner success • Building on the students' strengths 	<ul style="list-style-type: none"> • Changing the task so much that you lose: <ul style="list-style-type: none"> * Important mathematics * Integrity of the content or pedagogical approach • Setting the expectations too low for students

Results

The Colorado Student Assessment Program (CSAP) is Colorado's large-scale assessment that is compliant with the regulations of the No Child Left Behind Act. Colorado began tracking disaggregated student performance in 2003–2004. Table 5 lists Denver's performance results for the grades 6, 8, and 10 mathematics sections on the CSAP.

Table 5. Denver Public Schools Results on the Colorado Student Assessment Program Mathematics Exam

Demographics	Academic Year	Percentage At and Above the Proficient Level		
		Grade 6	Grade 8	Grade 10
All Students	2003–2004	26	15	10
	2004–2005	31	17	13
	2005–2006	34	22	15
Asian American	2003–2004	46	35	21
	2004–2005	59	35	24
	2005–2006	59	49	35
Black	2003–2004	20	8	2
	2004–2005	21	9	4
	2005–2006	27	14	7
Hispanic	2003–2004	17	8	2
	2004–2005	23	9	4
	2005–2006	26	14	5
White	2003–2004	57	42	30
	2004–2005	65	44	37
	2005–2006	65	50	41
Limited English Proficient	2003–2004	13	6	1
	2004–2005	23	10	5
	2005–2006	11	5	2
Economically Disadvantaged	2003–2004	16	7	3
	2004–2005	22	8	4
	2005–2006	26	5	5

Students across all groups (except students with limited English proficiency) show steady improvement within each grade, but fewer students are meeting or surpassing the proficiency level on CSAP at higher grade levels. White and Asian American students are outperforming all other students at each grade level. At grade 8 and especially grade 10, the performance of black and Hispanic students is dramatically lower than that of their Asian American and white peers. The performance of students with limited English proficiency or with economic disadvantages is similar to that of black and Hispanic students in grades 8 and 10. At grade 6, it looks like economically disadvantaged students are improving their performance each year and closing the achievement gap.

Table 6 shows the percentage of students both in and not in special education courses who scored at or above the proficient level in the secondary grades on the mathematics portion of the CSAP. For students in special education courses, there appear to be steady gains in grade 6 in the percentage passing the mathematics CSAP, but in the other four grades, roughly the same percentage of students appears to pass the assessment each year. On the other hand, students who are not in special education courses tend to make steady improvement each year and for each grade, which exacerbates the achievement gap of students in special education.

Table 6. Percentage of Students Scoring At or Above the Proficient Level on the Mathematics Portion of the Colorado Student Assessment Program, by Special Education Classification

Academic Year	Classification	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
2003–2004	Special Education	4	3	3	2	3
	Non-Special Education	29	20	17	12	10
2004–2005	Special Education	7	4	4	2	2
	Non-Special Education	34	24	19	14	14
2005–2006	Special Education	10	5	4	3	3
	Non-Special Education	38	23	24	19	16

Conclusions

In the two years the pilot program of collaborative work between mathematics and special education teachers has been in place, reflective feedback collected from the participating teachers indicates that they are learning more about content and improving their teaching strategies. To date, the district has not collected a formal set of information to show evidence of the effect of the collaborative model on instructional practice or student performance. With a change in Denver's district administration in 2006–2007, a corresponding change in the focus of professional development occurred. Although teachers have suggested a continuation of collaborative opportunities and strategies to support struggling learners in mathematics, there was no formal structure for the model during 2006–2007.

New leadership at the district administration level is a challenge that can change the immediate priorities for a district. Until a possible revival of the collaborative program, teachers plan to continue using the resources that already exist. Representatives from the district math team have disseminated information through the annual fall meeting of the

Colorado Council of Teachers of Mathematics (CCTM) and the Colorado Metro Math Intervention Team (CoMMIT), which is an offshoot of the Colorado state leadership group of math educators, Colorado Math Leaders. Teachers can learn about the protocols and theory behind the work through these workshops, as well as learn which teachers may be able to talk about the materials informally within Denver Public Schools.

References

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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.

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