Practices Worthy of Attention

Connecting Mathematics Assessment to Instruction

Anchorage School District

Anchorage, Alaska

Summary of the Practice. Anchorage School District reviewed their schools' performance on the mathematics portion of the state standards-based exam and found that a number of their schools performed below average for the district. They targeted those schools for focused improvement work starting in 2006–2007. The district created an Assessment Reporting System that allows teachers to view individual student growth from year to year and to focus on performance on mathematics exams by content strand.

Need. Teachers in Anchorage School District needed evidence of students' understanding of mathematics to know what to change in their instruction. They also needed training on how to effectively modify and improve their teaching practices to accommodate students' mathematical learning needs.

Goal. The goal of Anchorage School District is to connect the data from mathematics assessments to instruction so teachers can understand where students need the most help and can modify their instruction accordingly.

Demographics

Anchorage School District serves grades K–12. Enrollment has increased from about 35,000 students in 2002–2003 to about 50,000 students in 2005–2006.

Table 1. Anchorage School District Enrollment Data

Academic Year	Enrollment
2002–2003	35,335
2003–2004	34,323
2004–2005	49,926
2005–2006	50,051

Table 2 shows student enrollment, graduation, and dropout rates since 2002–2003 by race/ethnicity, limited English proficiency, and economic disadvantage. The most recent data indicate that the majority of students in Anchorage are white (54.9%) followed by Alaska Native and American Indian (13.3%), Asian American and Pacific Islander (11%), black (7.7%), Multi-Ethnic (6.7%), and Hispanic (6.4%).[1] More than 15% of Anchorage students are classified as having limited proficiency in English, and about 33.5% are classified as economically disadvantaged.

[1] Multi-Ethnic is a race/ethnicity category used by Anchorage School District since 2004–2005. Before that year, the category was called Mixed Ethnicity.

Table 2. Anchorage School District Enrollment, Graduation, and Dropout Rates (Grades 7–12)

Demographics	Academic Year	Percentage of Enrollment	Percentage Graduating	Percentage Dropping Out
All Students	2002–2003	100	*	5.9
	2003–2004	100	*	4.5
	2004–2005	100	59.0	6.5
	2005–2006	100	63.9	6.3
Alaska Native† and American Indian‡	2002–2003	13.0	*	12.4† 8.3‡
	2003–2004	13.3	*	11.3† 7.0‡
	2004–2005	13.3	33.0	11.4
	2005–2006	13.3	37.5	9.5
Asian American and Pacific Islander	2002–2003	11.0	*	7.3
	2003–2004	10.7	*	4.6
	2004–2005	10.9	57.5	6.0
	2005–2006	11.0	63.1	4.8
Black	2002–2003	8.0	*	7.2
	2003–2004	8.3	*	5.3
	2004–2005	7.9	46.7	8.4
	2005–2006	7.7	56.5	6.0
Hispanic	2002–2003	6.0	*	6.9
	2003–2004	6.2	*	7.5
	2004–2005	6.3	46.3	8.1
	2005–2006	6.4	59.5	7.2
Multi-Ethnic	2002–2003	3.0	*	6.6
	2003–2004	4.3	*	4.7
	2004–2005	5.5	47.4	8.7
	2005–2006	6.7	45.9	7.0
White	2002–2003	59.0	*	4.2
	2003–2004	57.2	*	2.9
	2004–2005	56.0	69.6	5.0
	2005–2006	54.9	72.9	4.8
Limited English Proficient	2002–2003	*	*	*
	2003–2004	*	*	*
	2004–2005	13.8	*	6.5
	2005–2006	15.7	42.7	5.1
Economically Disadvantaged	2002–2003	*	*	*
	2003–2004	*	*	*
	2004–2005	26.2	*	5.8
	2005–2006	33.5	42.5	6.8

Note: The asterisk (*) notes that data were not available. Before 2004–2005, the district collected data separately for Alaskan Native students and American Indian students. The single cross (†) denotes the Alaska Native students only. The double cross (‡) denotes American Indian students only.

High school graduation data for all race/ethnicity subgroups were available only for 2004–2005 and 2005–2006; graduation data for subgroups with economic disadvantage or limited English proficiency were available only for 2005–2006. Graduation rates increased for all race/ethnicity subgroups except Multi-Ethnic between 2004–2005 and 2005–2006. The overall graduation rate for 2005–2006 was 63.9%; white students had the highest graduation rate (72.9%), while Alaska Native and American Indian students had the lowest graduation rate (37.5%).

The dropout rate is very high for Alaska Native and American Indian students, at 9.5% in 2005–2006; dropout rates for Hispanic and Multi-Ethnic students are also high, at 7.2% and 7%, respectively. The dropout rate for all students is 6.3%. Dropout rates between 2004–2005 and 2005–2006 decreased for all subgroups except students with economic disadvantage.

Description of the Practice

Anchorage School District has just begun reforming its mathematics program, using a variety of strategies recommended by researchers, including Cohen's (1995) four reform steps, Stiggins's (2001) advice about tailoring professional development to local schools, and Popham's (2003) recommendations for correctly using assessments to inform instructional practice.

Cohen (1995) describes four key strategies for reform: (1) new content standards or instructional frameworks, (2) assessments aligned with content standards, (3) more ambitious curricula, and (4) changes in teacher education for using the new tools. These four steps require a thorough understanding of the standards, curriculum, and instruction before development of new materials or alignment across resources. Anchorage is focusing especially on aligning assessment with content standards. Stiggins (2001) argues that teachers must have assessment literacy if they are to understand how the content standards align with assessment and also indicates that local learning teams focused on assessment can be an efficient and effective way to provide assessment training to all school staff.

Popham (2003) lists two important components for using assessments to inform instruction. First, clear standards, such as descriptions of the skills and knowledge that will be assessed, must be developed. Such descriptions make it possible for teachers to focus on specific knowledge and skills. Second, standard-by-standard reports of individual students' status should be provided. If each item on an assessment is linked to a specific grade-level expectation in mathematics, teachers can see which concepts individual students have mastered.

As its first step, Anchorage evaluated its K–12 mathematics program, completing the evaluation in 2005–2006. The purpose of the evaluation was to identify key factors associated with high mathematics performance in the district. The district's Assessment and Evaluation Department staff analyzed Anchorage's performance on Alaska's standards-based assessment in mathematics across all grades tested. Schools with students in grades 3–8 averaged 73% proficiency, so Anchorage decided to target their mathematics improvement efforts on the

schools with less than 73% proficiency. The district identified 28 schools—22 elementary schools and 6 middle schools—that fit these criteria.[2]

In summer 2006, Assessment and Evaluation staff analyzed the areas of weakness on the standards-based mathematics assessment for each school and provided their analyses to the district's Curriculum and Instructional Support Department. Mathematics curriculum specialists from the department, known as mathematics support teachers, spent the summer reviewing the data and planning for 90-minute inservice trainings they would provide at each school site.

Mathematics support teachers and Assessment and Evaluation staff members began their work in the 28 struggling schools at the beginning of 2006–2007. Each mathematics support teacher was assigned a set of schools for which they would offer training and follow-up support during year. The assessment and curriculum staff worked together to develop growth charts for each school, showing the mean scale score comparison for each mathematics strand in the state standards by grade and comparing the 2004–2005 and 2005–2006 data. During the initial training at the beginning of the year, they gave the teachers charts and graphs with data that identified mathematics strand weaknesses at their school and grade level so they could understand where they would need to focus instructional improvements.

Mathematics support teachers aligned K–6 mathematics curricula, even though students in K–2 are not tested, as they wanted to build an aligned curriculum that would support growth across strands and grades. In the initial training, the mathematics support teachers helped the classroom teachers build target grade-level expectations within each strand; in follow-up meetings, they are helping teachers measure their progress.

The follow-up meetings are similar across elementary and middle schools. The district has created an "instructional cycle" for teachers to use in teaching the aligned mathematics curriculum and assessing student progress. Mathematics support teachers train teachers on the instructional cycle for measuring improvement in student performance on the focus mathematics strands. In the instruction cycle, teachers (or the mathematics support teachers and Assessment and Evaluation staff) identify the learning goals by noting on which mathematics strands their students performed poorly and then plan instruction focused on the concepts in those strands. Next, teachers teach the material, assess student progress, and give feedback to students. Finally, teachers look at evidence of student learning to analyze areas students understand and areas where they still need help. This cycle continuously loops through the school year, as teachers reteach mathematics concepts, reassess student learning, and revise mathematics instruction.

With guidance from the mathematics support teachers, classroom teachers gather to discuss model lessons that support the mathematics strands identified as weak in their schools. The teachers practice using different sample lessons, tasks, and ideas in small groups, talking

[2] Anchorage School District has 59 elementary schools, 9 middle schools, 1 elementary/middle school combination, 1 middle/high school combination, 8 high schools, 1 K–12 school, and 6 charter schools, as well as a vocational school and several specialized programs and schools (www.asdk12.org/aboutasd).

through the mathematics content and discussing where they think students will need the most help.

As part of the training and follow-up meetings, Assessment and Evaluation staff show teachers how analyze their own student and classroom performance using the district's Assessment Reporting System. The Assessment Reporting System is a comprehensive database system that follows students longitudinally. Cumulative data is available for individual student performance on district and state assessments. Teachers can access their own classroom rosters and look up the information on each of their students. If a student transfers to another teacher or school within Anchorage, that student is immediately placed electronically into the new classroom, so teachers have up-to-date access to all the student information they need.

The Assessment Reporting System measures student growth using a sequential growth model, which matches an individual student's scores from one grade to the same student's scores from the next grade. The information the sequential growth model provides is more precise than information provided by the cohort model, which measures the growth of all students from one grade to the next; the cohort model does not account for students who have left or did not take assessments in both grades. Anchorage thus has a very accurate measure of individual student growth that provides student- and classroom-specific information teachers can attend to.

While teachers can view their own classroom data, school administrators can view an entire school or any classroom within their assigned school. The Assessment Reporting System allows users to sort students based on proficiency by demographic information like race/ethnicity or sex for an entire mathematics test or by strands. The four proficiency levels are color-coded, so teachers can get a visual snapshot of where students need the most help, allowing them to target specific students struggling in each strand. The format of all data output has been customized based on teachers' requests, and the reports continue to be revised with teacher feedback. Since the system is a homegrown database system, not an off-the-shelf product, Anchorage has the flexibility to further customize the system to make it most useful for teachers as a tool to inform their practice.

The Assessment Reporting System also features a grade-level expectation item bank. Teachers can pull items from this bank that are linked to the grade-level expectations they are focusing on and use them to develop mini-assessments. The data from these items can then be used as part of the instructional cycle for measuring and improving student learning on different mathematics expectations.

The district continues to work on improving the Assessment Reporting System and the way that teachers and administrators draw on its data. Trainings are available throughout the year and provide continued opportunities to discuss the system and how teachers are using test data to inform instruction. Teachers also review new features of the system. These trainings serve as a professional learning community, where teachers not only receive professional development on using data to inform instruction, but also think about ways they can shape their own practice and discuss results with colleagues.

Results

Ninety percent of principals from the 28 targeted schools attended training on reviewing the standards-based data and planning for improving student learning in the identified strands. Principals and teachers report that they appreciate the Assessment Reporting System because they had been asking for a way to analyze and understand how their instruction affected student performance. Now they are working on ways to use all the data. As one teacher said, "Beware what you wish for: We now have the data we want, but there's so much, I don't have time to analyze it all and use it to improve my teaching."

Table 3 lists results for the district on the Alaska Standards Based Assessment (grades 7–9) and the High School Graduation Qualification Exam (grade 12) in mathematics. Since there are only two years of data on the new standards-based assessment currently in the reporting system, and since the work on aligning assessments and instruction just began in fall 2006, the test data in Table 3 do not reflect the time period of this practice.

Table 3. Anchorage School District Mathematics Exam Results on SBA (Grades 7, 8, and 9) and HSGQE (Grade 12)

Demographics	Academic Year	Percentage At and Above the Proficient Level on SBA			Passed or Waived on HSGQE
		Grade 7	Grade 8	Grade 9	Grade 12
All Students	2004–2005	64.8	64.4	62.7	96.1
	2005–2006	67.1	69.3	61.4	94.1
Alaska Native† and American Indian‡	2004–2005	48.4	52.3	46.0	92.7† >90‡)
	2005–2006	50.4	52.9	51.6	87.0
Asian American and Pacific Islander	2004–2005	62.6	58.0	56.1	90.1
	2005–2006	64.8	67.0	59.5	90.1
Black	2004–2005	37.1	40.5	32.7	89.6
	2005–2006	51.1	48.5	38.3	87.8
Hispanic	2004–2005	54.8	51.3	49.4	91.6
	2005–2006	54.3	55.8	42.7	88.9
Multi-Ethnic	2004–2005	57.0	50.0	54.6	91.2
	2005–2006	58.4	57.9	46.9	78.4
White	2004–2005	74.6	74.1	73.5	98.6
	2005–2006	76.4	78.4	69.9	97.7
Limited English Proficient	2004–2005	45.9	38.8	38.1	74.2
	2005–2006	51.3	48.1	42.5	77.2
Economically Disadvantaged	2004–2005	45.8	45.6	38.5	85.3
	2005–2006	49.1	53.5	41.7	83.3

Note: Before 2004–2005, the school district collected data separately for Alaskan Native students and American Indian students. The single cross (†) denotes the Alaska Native students only. The double cross (‡) denotes American Indian students only; there were too few American Indian student scores to report reliably, but we include the data anyway to provide information for all subgroups

The data show that white students are the highest performers in Anchorage. In 2005–2006, about 75% of white students were at or above the proficient level in grades 7–9 and nearly all white students passed the graduation exam. About 64% of Asian American and Pacific Islander students were at or above proficient in grades 7–9, followed by the other subgroups. While students with limited English proficiency or an economic disadvantage showed improved performances in 2005–2006, their performance was still well below that of all students in grades 7–9 and on the graduation exam.

Conclusions

Anchorage School District has connected their mathematics curriculum staff and their assessment and evaluation staff to collaborate on a set of professional development opportunities for teachers and administrators in schools that scored below average on the mathematics portion of Alaska's standards-based assessment. The professional development opportunities are customized to the needs of individual teachers and schools. Anchorage has also developed a teacher-friendly database that offers teachers assessment data in ways they have not had access to before. The Assessment Reporting System allows teachers to measure change and growth for individual students over several academic years as well as for classrooms within an academic year. Although this is a new practice, it appears that Anchorage has built an infrastructure for connecting mathematics assessments to instruction, using key components from research that will encourage successful implementation. With the continuous training opportunities, district staff can gauge how well teachers are doing with this new practice and teachers can refine the ways they analyze and respond to the data.

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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