The Impact of the Use of the Mathematics Diagnostic Testing Project in San Diego Unified School District: Teacher Survey Component

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Karen Volz Bachofer, Andrew C. Zau, Julian R. Betts

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EXECUTIVE SUMMARY

Since 1977, the Mathematics Diagnostic Testing Project (MDTP) has provided California teachers with free diagnostic tests designed to measure student readiness for secondary school mathematics courses. MDTP tests have been used widely across the state for more than 40 years, and voluntary use of MDTP tests in San Diego Unified School District (SDUSD) has been quite similar to statewide use. The full range of MDTP tests has been administered by district mathematics teachers since the early 1980s and, by the 1998-99 school year, approximately 184,974 tests had been voluntarily administered by hundreds of mathematics teachers in the district. The number of MDTP tests administered increased dramatically after 1998-99 as a result of a districtwide literacy and mathematics reform program.

Beginning with the 1999-2000 school year, in order to inform mathematics course placement decisions for the following year, SDUSD officials mandated a spring administration of the MDTP Geometry Readiness Test to all students enrolled in Algebra. Mandated use of the MDTP Geometry Readiness Test was discontinued at the end of the 2002-03 school year. However, the district then mandated administration of the MDTP Algebra Readiness Test (at grade 7) and MDTP Pre-Algebra Readiness Test (at grade 6) – beginning in spring 2004 and spring 2005 respectively – through the end of the 2007-08 school year. Even through mandated administration of designated MDTP tests has been discontinued in SDUSD, some district mathematics teachers continue to use MDTP tests on a voluntary basis.

Betts, Hahn, and Zau (2011) examined the effect of voluntary and mandatory MDTP testing in SDUSD on students' mathematics achievement from 1999-2000 through 2006-07. They found that mandatory MDTP testing was associated with gains on the California Standards Tests (CSTs) in mathematics the following year and that, if a student was given an MDTP test two years in a row, those gains persisted and strengthened slightly. The voluntary use of MDTP tests, on the other hand, had no detectable relationship to student gains in mathematics.

This study, commissioned by the California Academic Partnership program (CAPP), aims to extend the Betts, Hahn, and Zau (2011) work by exploring the ways that mathematics teachers in SDUSD use, or have used, MDTP tests and to determine the extent to which the voluntary and mandated use of MDTP tests, varying mathematics program characteristics, instructional practice, and professional development opportunities for teachers are associated with student learning in mathematics.

The primary data collection method used in this study was an online teacher survey deployed to all teachers assigned to a mathematics classroom at a SDUSD middle or high school in October 2011. Survey questions were designed to gather information about teachers' experiences with district-mandated and voluntary use of MDTP tests, their mathematics programs, and professional development opportunities. District administrative records were used to explore relationships among MDTP use, mathematics program characteristics, instructional practice, and student gains in mathematics. Survey

results were analyzed for overall trends, for teachers whose students achieved greater than/less than expected gains in mathematics, and for teachers with varying teaching experience.

District-Mandated MDTP Testing
Teachers who had administered a district-mandated MDTP test reported using test results before the end of the school year in which it was administered more often than in the school year following administration. The most frequently reported use – both before the end of the school year and in the school year following administration – was reviewing results "on my own" to determine students' overall strengths and weaknesses. An equivalent number of teachers indicated that they modified their teaching to help students understand and correct misunderstandings and errors revealed by the test in the year following administration.

Teachers whose students made greater than expected gains in mathematics were more likely than teachers whose students made less than expected gains to review test results on their own to determine students strengths, weaknesses, and misunderstandings before the end of the school year of MDTP administration. Teachers whose students made less than expected gains were more likely to report discussing MDTP results with their students, distributing MDTP letters to students, and discussing results at a mathematics department meeting. In the year following administration, teachers whose students made greater than expected gains were much more likely to discuss results at a mathematics department meeting and to discuss their prior year's students' results with the teacher who was teaching them in the current school year. On the other hand, teachers whose students made less than expected gains were much more likely to review results with other teachers and to discuss their current year's students' results with the teacher who had taught those students last year.

Nearly half of the teachers who administered a district-mandated MDTP test thought that the overall impact on the goal of teaching mathematics was positive; only 6 percent thought it was negative. Teachers whose students made greater than expected gains had a more positive view of MDTP than their colleagues whose students made less than expected gains.

Voluntary MDTP Testing
Two-thirds of survey respondents reported that they had voluntarily administered an MDTP test. More experienced teachers indicated that they had voluntarily administered an MDTP test more often than less experienced teachers; teachers whose students made less than expected gains were more likely to report voluntary MDTP use. Most often, the decision to voluntarily administer tests was made by a school's mathematics department; tests were administered in every class for which a given MDTP test was selected (e.g., all Algebra classes). Teachers whose students made less than expected gains and more experienced teachers were more likely to report voluntary administration.

A comparison of voluntary and district-mandated spring administration showed that teachers were more likely to review results on their own to determine students' strengths

and weaknesses, distribute MDTP letters to students, and discuss results with students following district-mandated administration. Teachers who voluntarily administered an MDTP test in spring were more likely to review results with other teachers or with a school administrator, counselor, or mathematics coach. Teachers who voluntarily administered an MDTP test were much more likely to indicate that the MDTP had a positive effect on the goal of teaching mathematics to their students.

No Voluntary MDTP Testing
Nearly one-third of survey respondents indicated that they had never voluntarily administered an MDTP test. Most often, this was because they had no knowledge of the MDTP program or how it works.

Use of Instructional Time
Survey results indicate that students spent the greatest proportion of their instructional time in mathematics classrooms watching the teacher demonstrate or explain how to do a procedure or solve a problem or listening to the teacher present mathematical concepts, ideas, applications, or results. They spent the least amount of instructional time writing about mathematics and using manipulatives, measurement instruments, and data collection devices.

Teachers whose students made greater than expected gains reported that their students spent more instructional time completing routine exercises or computational procedures than teachers whose students made less than expected gains. On the other hand, teachers whose students made less than expected gains reported that their students spent more instructional time watching the teacher demonstrate or explain how to do a procedure or solve a problem and participating in peer discussions about non-routine problems, investigations, or tasks.

The survey also asked teachers to estimate the amount of time their students spent engaged in various types of activities when working on mathematics exercises, problems, investigations, or tasks in class. Results indicate that students spent most time working on routine exercises designed to help them master mathematical operations or using multiple representations to demonstrate understanding and communicate connections between and among ideas and concepts. Teachers reported that their students spent the least amount of time explaining their reasoning or thinking when solving problems and solving non-routine problems.

Survey responses of teachers whose students made greater than expected gains indicate that their students spent more time using multiple representations to demonstrate understanding, and solving real-world problems or working on real-world scenarios, than teachers whose students made less than expected gains. On the other hand, teachers whose students made less than expected gains spent more time making estimates, predictions, or hypotheses, and using several sentences orally or in writing to explain their reasoning than teachers whose students made greater than expected gains.

Professional Development

Teachers indicated that the topics most frequently addressed in mathematics professional development they attended were alignment of instruction to curriculum, standards, and mandated tests, technology to support student learning, instructional approaches or strategies, and analyzing high-stakes tests. Topics addressed least frequently were in-depth study of mathematics and Response to Intervention and Instruction (RTI^2).

Survey responses of teachers whose students made greater than expected gains indicate that their professional development was more often focused on analyzing high-stakes tests, studying how students learn mathematics, deconstructing or unpacking standards, and discussing strategies for teaching English Learners.

Teachers were also asked to indicate the frequency with which they engaged in various types of professional development. The most widely attended type of professional development was mathematics department meetings focused on mathematics or mathematics education. Teachers also reported discussing student work or scoring assessments with another teacher, or engaging in self-directed learning about mathematics or mathematics education. Teachers were least likely to indicate that they served on committees or task forces focused on mathematics, attended Response to Instruction and Intervention (RTI^2) training, participated in modified lesson study groups, or attended mathematics "Course-Alike" meetings.

Survey responses of teachers whose students made greater than expected gains indicated that they were more likely to have participated in a teacher study group, to have observed another teacher, to have engaged in modified lesson study, or to have attended RTI^2 training than teachers whose students made less than expected gains. They were less likely to have engaged in self-directed learning or attended a conference outside school.

Summary of Key Findings and Conclusions

A majority of teachers responding to the survey used results from MDTP testing, whether district-mandated or voluntary, for a range of purposes – most notably, to determine students' strengths and weaknesses, to modify their teaching to help students understand and correct misunderstandings, and to inform appropriate placement in mathematics coursework. Teachers, especially those who administered the MDTP voluntarily, have positive opinions about MDTP testing – but are unaware of all of the services and supports available to them from MDTP. Given that prior research (Betts, Hahn, and Zau (2011)) has shown that district-mandated MDTP testing results in improved student outcomes in mathematics, and that this study's findings indicate that most teachers used MDTP results for instructional purposes and believe in the efficacy of the MDTP, conversations with district officials about integrating the use of MDTP testing into the district's secondary mathematics program should be considered.

District-Mandated MDTP Testing. In their 2011 study, Betts, Hahn, and Zau found that district-mandated MDTP testing in SDUSD was associated with gains in mathematics achievement the following year and that, if a student was given an MDTP test two years in a

row, those gains persisted and strengthened slightly. They suggest that possible reasons for student gains might include the fact that MDTP results allow teachers to identify and address specific learning needs in mathematics, that mandated use of the MDTP across a particular grade level might lead to discussion among mathematics teachers about strategies to address students' learning needs, or that coordination among teachers and mathematics departments might result in systematic review and refinement of the school's instructional program in mathematics.

Even though the stated purpose for district-mandated administration of MDTP readiness tests was to inform placement decisions for the following school year, study findings indicate that the number one use of MDTP test results was reviewing results to determine students' overall strengths and weaknesses. Mandated MDTP testing, then, did provide benefits that went well beyond those that district officials envisioned, in spite of the narrow scope of the district mandate.

Survey responses indicate that teachers were much more likely to review results from district-mandated MDTP administration on their own. In fact, teachers were more likely to discuss test results with their students than their colleagues. Conversations with students may have been prompted by teachers' efforts to help students understand the impact of MDTP test results on course placement. It is also possible that the district mandate did not provide teachers with sufficient guidance about the ways in which MDTP results could be used to address students' learning needs, or training to support such uses.

A majority of teachers responding to the survey indicated that their school did not change its approach to teaching mathematics based on an analysis of the results of district-mandated MDTP testing. This may be due to the fact that district-mandated MDTP use was intended primarily for placement purposes and identification of students who might benefit from summer school participation.

During the year following administration, teachers whose students made greater than expected gains were more likely to review MDTP results to determine common misunderstandings and to modify their teaching; teachers whose students made less than expected gains results were more likely to review results to determine their students' overall strengths and weaknesses. These findings suggest that teachers of students who made greater than expected gains tended to use MDTP test results to *identify and address* specific learning needs of their students. While teachers whose students made less than expected gains reviewed MDTP results – they were much more likely to discuss results with other teachers, for example – it may be that they did not go on to use the information to inform their teaching practice. This finding illustrates the importance of providing guidance about effective strategies for using MDTP results to diagnose specific student learning needs and to use that information to address them.

Given the "top down" nature of the district-mandated MDTP administration, it is somewhat surprising that nearly half of the teachers responding to the survey indicated that the impact of district-mandated testing was somewhat positive or extremely positive. Teachers whose students made greater than expected gains were much more likely to give

positive marks to district-mandated testing than teachers whose students made less than expected gains. Most teachers reported reviewing and using MDTP results from district-mandated testing – more often than they reported using MDTP results for student placement – and many teachers indicated that the MDTP had a positive impact on the goal of teaching mathematics to their students. This indicates that teachers would benefit from more information about MDTP's products, supports, and services, and that teachers would likely increase and enhance their MDTP use as a result.

Sadly, less than 4 percent of survey respondents reported using MDTP Written Response items. This finding, coupled with the fact that several teachers' suggestions for improving MDTP were related to providing an item bank of problems aligned with students' learning needs, suggests that teachers are not aware that this valuable resource is already available to them.

Voluntary MDTP Testing. Survey respondents indicated that voluntary administration of the MDTP was most often the decision of their school's mathematics department and that, typically, MDTP tests were administered in every class for which a given MDTP test was selected (e.g., all Algebra classes). Teachers whose students made less than expected gains were more likely to report that they had voluntarily administered an MDTP test than teachers whose students made greater than expected gains. More experienced teachers were much more likely to have voluntarily administered an MDTP test than their less experienced colleagues.

Surprisingly, teachers who administered the MDTP under the *district mandate* were more likely to report that they reviewed results on their own to determine students' strengths and weaknesses than teachers who voluntarily administered an MDTP test in the spring. As might be expected, given the consequences associated with MDTP scores, they were also more likely to have discussed MDTP results with their students and distributed MDTP student letters. These findings – reviewing results to determine student strengths and weaknesses and discussing results with students by district-mandated users – may partially explain the Betts, Hahn, and Zau (2011) finding that voluntary use of MDTP testing had no detectable relationship to student gains in mathematics.

Non-Use of MDTP Testing. About three-quarters of teachers who had never voluntarily administered an MDTP test indicated that it was because they did not have sufficient knowledge about the MDTP program or how it works. This finding suggests that the mechanisms used to publicize MDTP products, programs, and services may not be comprehensive enough to ensure teacher awareness.

Use of Instructional Time in Mathematics Classrooms. Survey results indicate that, overall, students spent the greatest proportion of their instructional time watching the teacher demonstrate or explain how to do a procedure or solve a problem, or listening to the teacher present mathematical concepts, ideas, applications, or results. Students spent the least instructional time writing about mathematics and using manipulatives, measurement instruments, and data collection devices.

Time Spent by Students When Working on Mathematics Exercises, Problems, Investigations, or Tasks in Class. Findings suggest that students spent most time working on routine exercises designed to help them master mathematical operations, and using multiple representations to demonstrate understanding and communicate connections between and among ideas and concepts. Students spent the least amount of time using several sentences orally or in writing to explain their reasoning or thinking, and solving non-routine problems. This finding suggests that teachers might find MDTP's written response items useful as they seek to provide students with opportunities to tackle non-routine problems and to explain their thinking when solving those problems.

Professional Development Topics. The two topics most frequently addressed in mathematics professional development attended by survey respondents were alignment of instruction to curriculum, standards, and mandated tests, and technology to support student learning. Both of these topics are consistent with districtwide professional development priorities during the years covered by the study. The topics that were addressed least frequently were in-depth study of mathematics, Response to Instruction and Intervention (RTI^2), and study of how students learn mathematics.

Professional Development Types. The types of professional development activities in which teachers engaged most often were mathematics department meetings, discussions or scoring of student work with another teacher, and i21 (Promethean) training. The fact that department meetings was ranked number one is not surprising and, because of comprehensive districtwide training requirement associated with the award of an i21 grant, neither is the Promethean training. However, 86 percent of survey respondents reported that they had discussed or scored student work with other teachers during the last year. This finding was unexpected and follow-up questions will be asked in the upcoming teacher interview component of the study. The type of professional development activities in which teachers engaged least were committees or task forces focused on mathematics curriculum and instruction and modified lesson study.

1.0 BACKGROUND

Established in 1977 by the California State University (CSU) and the University of California (UC), the Mathematics Diagnostic Testing Project (MDTP) develops, distributes, scores, and reports the results of diagnostic tests designed to measure student readiness for secondary school mathematics courses ranging from Pre-Algebra to Calculus.[1] Each MDTP readiness test, which takes about 45 minutes to administer, assesses students' understanding of the specific prerequisite skills and knowledge needed to be successful in a particular mathematics course. For example the Algebra Readiness test addresses content – and reports on student strengths and weaknesses – in the following foundational areas:

- Data Analysis, Probability, and Statistics
- Decimals, Their Operations and Applications, Percent
- Simple Equations and Operations with Literal Symbols
- Exponents and Square Roots, Scientific Notation
- Fractions and Their Applications
- Measurement of Geometric Objects
- Graphical Representation
- Integers, Their Operations and Applications

MDTP tests, scoring, and reporting services are available at no cost to mathematics teachers across California, and detailed student- and classroom-level diagnostic reports are returned to teachers within a week or two of test administration. Individual results letters for students and parents are also provided. In 2009-10, MDTP introduced Daskala, a web-based system featuring online student testing and immediate teacher access to detailed student- and classroom-level results. Daskala online reporting, which includes "drill-down" capability, allows teachers to sort and view results with far greater flexibility than previously available via hard copy MDTP reports.

In addition to providing diagnostic mathematics testing and reporting, MDTP staff members assist teachers, schools, and districts in interpreting test results and using information gained to inform mathematics instruction. They also conduct regional conferences and teacher leadership institutes to help teachers use MDTP tests and other materials most effectively, publish a newsletter, and make available a range of written response materials (i.e., sample open-ended mathematics problems, commentary, solutions, and scoring rubrics) for classroom use.[2]

MDTP tests have been used widely across California since the early 1980s. During the 2010-11 school year, MDTP processed about 514,000 tests for just over 7,500 teachers, statewide. In a recently published study about the relationship between MDTP testing and student outcomes in mathematics, Betts, Hahn, and Zau (2011) estimated that as many as

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[1] While this study focuses on the use of MDTP tests at the middle and high school levels, half of the UC campuses, approximately two-fifths of the campuses of the CSU, and more than one-third of the campuses of the California Community Colleges also use at least one of the MDTP tests as part of the course placement process for entering students. (http://mdtp.ucsd.edu/history.shtml)

[2] Additional information can be found on the MDTP website at http://mdtp.ucsd.edu.

20 percent of middle and high school students in the state took an MDTP test during the 2006-07 school year, and that MDTP tests were administered in approximately 44 percent of California public schools with the relevant grade ranges. Since 2004-05 the most frequently administered MDTP tests have been the Algebra Readiness and Pre-Algebra Readiness Tests; in 2010-11, they accounted for about 43 percent and 20 percent of the MDTP tests given in California, respectively.[3]

Voluntary use of MDTP tests in San Diego Unified School District (SDUSD) is remarkably similar to statewide use. The full range of MDTP tests has been administered by district mathematics teachers since the early 1980s and, over time, the most frequently administered tests have been the Pre-Algebra Readiness and Algebra Readiness Tests. The number of MDTP tests administered increased dramatically after 1998-99 as a result of the testing mandate associated with a districtwide literacy and mathematics reform program.

Beginning with the 1999-2000 school year, in order to inform mathematics course placement decisions for the following year, SDUSD officials decided to mandate a spring administration of the MDTP Geometry Readiness Test to all students enrolled in Algebra. The MDTP testing window followed the California Standards Test (CST) window; for the most part, MDTP testing took place in May. Students who scored above an established cut-point on the test and earned a passing grade in Algebra (the district's criteria for having mastered key Algebra concepts) were moved on to Geometry; students who scored below the cut-point or who failed Algebra were re-enrolled in Algebra for the following year.

Mandated use of the MDTP Geometry Readiness Test was discontinued at the end of the 2002-03 school year.[4] However, the district then mandated administration of the MDTP Algebra Readiness Test (at grade 7) and MDTP Pre-Algebra Readiness Test (at grade 6) – beginning in spring 2004 and spring 2005 respectively – through the end of the 2007-08 school year.[5] (See Table 1.) Even through mandated administration of designated MDTP tests has been discontinued in SDUSD, district mathematics teachers continue to use MDTP tests on a voluntary basis as diagnostic tools. As stated above, most recent data indicate that 223 SDUSD teachers administered MDTP tests during the 2010-11 school year.[6]

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[3] We thank state MDTP director Bruce Arnold for providing information about historical MDTP use.

[4] Beginning with the 2003-04 school year, a district-developed end-of-course Algebra exam was used for placement purposes.

[5] Voluntary use of the full range of MDTP tests by individual teachers or schools continued in SDUSD during the time period when Geometry Readiness, Algebra Readiness, and Pre-Algebra Readiness testing was mandated.

[6] In 2010-11, MDTP scored 22,535 answer sheets from 785 classes taught by 223 teachers at 49 SDUSD schools.

Table 1
SDUSD Mandated Use of MDTP Readiness Tests, by School Year

	Spring 2000	Spring 2001	Spring 2002	Spring 2003	Spring 2004	Spring 2005	Spring 2006	Spring 2007	Spring 2008	Spring 2009
Geometry	■	■	■	■						
Algebra					■	■	■	■	■	
Pre-Algebra						■	■	■	■	

1.1 Betts, Hahn, and Zau MDTP Study

Betts, Hahn, and Zau (2011) examined the effect of voluntary and mandatory MDTP testing in SDUSD on students' mathematics achievement from 1999-2000 through 2006-07. They found that mandatory MDTP testing was associated with gains on the California Standards Tests (CSTs) in mathematics the following year and that, if a student was given an MDTP test two years in a row, those gains persisted and strengthened slightly. The voluntary use of MDTP tests, on the other hand, had no detectable relationship to student gains in mathematics.

In an effort to determine why mandated MDTP testing might have had a positive effect on gains in mathematics achievement, Betts, Hahn, and Zau (2011) studied the two primary ways that SDUSD used MDTP results – assignment to summer school and mathematics course placement for the following year – to see if these mechanisms could explain student gains. They found that, on average, students who took the mandated MDTP test and had low math achievement were slightly more likely to attend summer school than similar students who had not taken a mandated test. They also found that the variation in students' prior year's mathematics test scores within a classroom fell if students had taken an end-of-year MDTP test the previous spring. In both cases, then, it appears that MDTP results really were used to inform mathematics placement decisions for SDUSD students.

Betts, Hahn, and Zau (2011) next examined whether these consequences of MDTP testing (that is, placement decisions) explained any of the positive effect of MDTP testing on students' subsequent gains in mathematics. They found that students who attended summer school in a given year had higher gains the following year and that students who were assigned to classes with less variation among students made greater gains than they did in years when they were in classes with more heterogeneity. Summer school attendance and ability grouping – both informed by MDTP assessments of students' learning needs – appeared to promote student learning.

Although Betts, Hahn, and Zau (2011) were able to account for approximately 6 to 12 percent of the impact of mandatory MDTP testing on students' gains in mathematics, they determined that most of the effect of MDTP occurs for reasons other than summer school and appropriate classroom placement. They go on to suggest that other possible reasons might include the fact that MDTP results provide teachers with the information needed to identify and address specific student learning needs in mathematics, that mandated use of

MDTP across a particular grade level might engender active discussion among mathematics teachers about strategies to address students' learning needs, and that coordination among teachers within a school's mathematics department might result in systematic review and refinement of the school's instructional program in mathematics.

The Betts, Hahn, and Zau (2011) findings contribute significantly to the literature on the impact of diagnostic testing, and suggest that further study is needed to fully understand the mechanisms through which such testing impacts student learning gains.

The current study, commissioned by the California Academic Partnership program (CAPP), aims to extend the Betts, Hahn, and Zau (2011) work by exploring the ways that mathematics teachers in SDUSD use, or have used, MDTP tests and to determine the extent to which the voluntary and mandated use of MDTP tests, varying mathematics program characteristics, instructional practice, and professional development opportunities for teachers are associated with student learning in mathematics.

This paper is presented in seven sections, including this background section (Section 1.0). Section 2.0 (MDTP Study) describes the overall three-part study of the MDTP commissioned by the CAPP, as well as the methodology for the current teacher survey component of the study. Section 3.0 (Data) describes the teacher survey data and the student longitudinal database used to conduct this study. Section 4.0 presents findings from the teacher survey related to MDTP use, Section 5.0 presents findings related to instructional practice, and Section 6.0 presents findings related to professional development. Finally, Section 7.0 provides conclusions.

2.0 MATHEMATICS DIAGNOSTIC TESTING PROJECT (MDTP) STUDY

2.1 A Three-Part Study of the MDTP

This study is the second part of a three-part research project aimed at examining the ways in which mathematics teachers use or have used Mathematics Diagnostic Testing Project (MDTP) tests, materials, and resources in San Diego Unified School District (SDUSD) and determining the extent to which MDTP use, mathematics program characteristics, and instructional practice in the district are associated with student learning outcomes in mathematics.

Part One of the study, which focused on the relationship between mandatory and voluntary use of MDTP testing in SDUSD and student learning outcomes in mathematics, is described in the preceding section (*Findings from Betts, Hahn, and Zau MDTP Study*).

Part Two, the current study, builds on the Betts, Hahn, and Zau (2011) research by examining MDTP use in SDUSD – from voluntary and mandated administrations during the 1999-2000 through 2010-11 school years. An online survey was used to capture teachers' descriptions of the ways they have used MDTP, their mathematics programs, their instructional practice, and their professional development experiences. Individual

teachers' survey responses, together with a measure of their students' learning gains in mathematics, were used to explore the relationships among MDTP use, mathematics program characteristics, instructional practice, professional development, and student outcomes in mathematics.

In Part Three of the study, which will be completed by September 2012, researchers will interview 24 teachers who voluntarily used MDTP tests during the 2010-11 school year in order to determine the conditions under which voluntary MDTP use impacts student learning in mathematics.

2.2 Questions Guiding the Study

Core study questions for the overall study are:

Characteristics of MDTP and the District-Mandated/Voluntary Use of MDTP Tests in SDUSD (Addressed in Parts Two and Three)

1. What is MDTP and how have MDTP tests and related resources been used in SDUSD?
2. How do teachers characterize their use of MDTP tests and related resources?
3. How do teachers characterize the quality and usefulness of MDTP tests and related resources?
4. Do teachers report changing course content or emphasis, instructional practice, or student grouping as a result of MDTP use?
5. What suggestions do teachers have for improving the usefulness of MDTP assessments and related resources?
6. To what extent do findings vary by course, mandatory v. voluntary MDTP use, or student, teacher, or school characteristics?

Characteristics of Mathematics Programs and Instructional Practice in SDUSD (Addressed in Parts Two and Three)

7. How do teachers characterize their mathematics program, instructional practice, and professional development in mathematics?
8. How is instructional time used in mathematics classrooms? What types of activities do students engage in during mathematics instruction?
9. What topics have been emphasized in professional development activities for SDUSD teachers in recent years? How frequently have teachers engaged in different types of professional development?
10. To what extent do findings vary by course, mandatory v. voluntary MDTP use, or student, teacher, or school characteristics?

Student Outcomes, MDTP Use, and Mathematics Program Characteristics (Addressed in Parts One, Two, and Three)

11. To what extent are student learning outcomes affected by mandatory and voluntary MDTP use and mathematics program characteristics?

2.3 The Current Study: Teacher Survey

The primary data collection method used in this study was an online teacher survey deployed to all teachers assigned to a mathematics classroom at a SDUSD middle or high school in October 2011. The survey consisted of approximately 20 multiple-choice questions (fewer for some teachers, based on their use of MDTP tests and other resources) and eight optional open-ended questions. Survey questions were designed to gather information about teachers' experiences with district-mandated and voluntary use of MDTP tests, their mathematics programs (i.e., use of instructional time, learning activities provided to students), and professional development opportunities (i.e., topics, types) in which they had participated. (See the Appendix for a copy of the teacher survey.[7]) District administrative records were used to explore relationships among MDTP use, mathematics program characteristics, instructional practice, and student gains in mathematics.

3.0 DATA

3.1 Teacher Survey Data

SDUSD records indicate that 519 middle and high school teachers were assigned to a secondary mathematics classroom in early October 2011. The district Mathematics Department sent an email to each of these teachers explaining the study and inviting them to participate by completing the survey; a link to the online survey was embedded in the email. Teachers were offered a $10 gift card to thank them for their participation. Of the 519 SDUSD mathematics teachers of record in early October, 126 (24 percent) responded to the survey.

3.2 Student Longitudinal Database

SanDERA researchers have compiled a longitudinal dataset that includes administrative records for both students and teachers. The student data contains demographics characteristics, academic records, state test results, English learner status, special education status, school characteristics, and teacher characteristics. Academic records are linked to individual teachers in order to determine anticipated gains in scores by classroom. For this report, student records from 2002 to 2010 were used.

[7] The teacher survey included in the Appendix is the print version; the content of the online version of the survey was identical, but the formatting was adapted for a web-based environment. For example, survey respondents who indicated that that they had never taught a course in which a district-mandated MDTP test was administered were automatically "skipped" to the next section of the survey, bypassing all questions about district-mandated administration.

3.3 Calculation of Greater than Expected/Less than Expected Gains[8] in Student Mathematics Achievement

To estimate mathematics teacher value-added, we estimated models of changes in student achievement, using student test scores from grade 6 through 11, as tested in spring 2002 through spring 2010. Within each mathematics CST test we converted test scores to Z-scores (by subtracting the districtwide mean for the grade and year and test and dividing by the corresponding standard deviation).

We then regressed individual students' changes from one year to the next, calculated from the Z-scores just described, on a set of mathematics teacher dummy variables, student race/ethnicity dummy variables, dummies for student gender, English Learner and special education status, dummies for parental education, the type of mathematics CST test taken, grade, school year, school identity code, and the percentage of students at the school eligible for meal assistance in each year.

We subsequently ranked the mathematics teachers by their coefficients, and divided the sample into three parts. Teachers whom we identify as those with above expected gains in mathematics achievement are those in the top third of the distribution; teachers whom we identify as having below expected gains in mathematics achievement are those in the bottom third of the distribution.

4.0 RESULTS

4.1 Survey Respondents

About one-quarter of the 519 middle and high school teachers assigned to a secondary mathematics classroom in October 2011 completed the online survey. Of those, 113 provided names and school locations, allowing researchers to determine respondent demographics. Table 2 provides the demographic characteristics of survey respondents and of all SDUSD secondary mathematics teachers, as of October 2011.

[8] Please note that the labels "greater than expected gain" and "less than expected gain" indicate that teachers were in the top third or bottom third of the distribution when ranked by their students' change in mathematics achievement using a regression. These designations should not be interpreted in a statistical sense as meaning that these teachers were significantly better or worse at producing achievement gains than a given comparison teacher. Rather, we estimated statistical models aimed at producing estimated teaching effectiveness for each teacher, ranked teachers by these estimates, and then identified the top and bottom thirds.

Table 2
Demographic Characteristics of Survey Respondents and
All SDUSD Secondary Mathematics Teachers in October 2011

Characteristic	Percent of Survey Respondents with Identifying Information n=113	Percent of All Secondary Mathematics Teachers n=519
Ethnicity		
White	77	69
African American	4	4
Hispanic	11	14
Asian	7	10
Other	0	0
Gender		
Female	69	54
Male	31	46
Degree		
Bachelors Degree in Mathematics	39	32
Graduate Degree in Mathematics	2	3
Masters Degree	66	61
Doctorate	1	1
Credential		
Full Mathematics Credential	97	96
Multiple Subject Credential	23	31
Student Gain[9]		
Greater Than Expected	32	33
Less than Expected	27	33

While teachers who completed the survey were demographically similar to the larger group of secondary mathematics teachers invited to participate, teachers completing the survey were more likely to be white, to be female, to have a bachelors degree in mathematics, or to have a masters degree than secondary mathematics teachers in the district. Survey respondents were less likely than teachers, overall, to be in the less than expected gain category.

4.2 Teachers' Experiences with District-Mandated MDTP Testing

4.2.1 Before the End of the School Year of Mandated Administration

Only 55 of the 126 teachers responding to the survey (44 percent) said that they had taught a mathematics course in which a district-mandated MDTP test had been administered. Of those, just over 49 percent reported that testing occurred in their Pre-Algebra classes (that

[9] Of the 126 teachers responding to the survey, sufficient data (multiple years of CST mathematics test results) were available to calculate greater than/less than expected student gain measures for 95 respondents. See Section 3.3 for a description of how student gain was calculated for the purposes of this study.

is, they administered the Algebra Readiness Test); about 42 percent said they had tested students in their Algebra classes (they administered the Geometry Readiness Test).

Of the 55 teachers who reported administering a district-mandated MDTP test in at least one of their classes, 93 percent indicated that they used the results *before the end of the school year in which it was administered*. (See Table 3, column 2.) When asked to describe the ways in which MDTP results were used, 75 percent of teachers indicated that they reviewed test results for their classes on their own to determine students' overall strengths and weaknesses. Not surprisingly, given the intent of the district mandate, 61 percent of teachers said that MDTP test results were used to inform placement decisions for their students' mathematics coursework for the following school year. Indeed, 69 percent of teachers indicated that that district-mandated MDTP testing had a moderate or high degree of influence on their schools' decisions about student placement into mathematics courses.

According to the MDTP website, MDTP readiness tests are designed to provide diagnostic information to help teachers and students identify specific areas where additional study or review is needed, and to help teachers identify topics and skills that need more attention in specific mathematics coursework. Survey results indicated that many teachers used MDTP results for these purposes. Almost half of the teachers reported that they discussed MDTP test results with their students, reviewed the results to determine misunderstandings and errors shared by many of their students, or distributed MDTP student letters[10] before the end of the school year in which the test was administered.

About a third of the teachers said that they modified their teaching to help students understand and correct misunderstandings and errors that were identified when reviewing test results, discussed test results at a formal meeting of the school's mathematics department, reviewed test results with other teachers, or spent additional class time working on areas in which student did poorly. Far fewer teachers reported reviewing test results with a school administrator, sharing test results with parents, or using MDTP Written Response items in class.

[10] MDTP individual student letters, which are provided in both English and Spanish, give students their test scores, and identify topics that were mastered, topics that need review, and topics that need substantial review.

Table 3
Reported Use of MDTP Test Results from District-Mandated Administration,
Before the End of the School Year of Administration and During the Following School Year

Use of MDTP Test Results from Spring Administration	**Percent Reporting Use *Before End of School Year***	**Percent Reporting Use During *Following School Year***
Administered District-Mandated MDTP	51 of 55 (92.7%)	41 of 55 (74.5%)
Reviewed results on my own to determine overall strengths and weaknesses	74.5	58.5
Used to inform placement decisions for next school year	60.1	n/a
Reviewed on my own to determine misunderstandings and errors shared by students	47.1	43.9
Discussed results with students in my classes	47.1	n/a
Distributed MDTP student letters to students	45.1	n/a
Modified teaching to help students understand and correct misunderstandings and errors revealed by test	39.2	58.5
Discussed results at a formal meeting of school's mathematics department	33.3	29.3
Reviewed with other teachers	31.4	24.4
Spent additional time working on areas in which my students performed poorly	31.4	36.6
Reviewed with a school administrator, counselor, or mathematics coach	13.7	14.6
Reported students' test results to parents	11.8	n/a
Used one or more of MDTP Written Response items	3.9	2.4

MDTP Use by Greater than Expected/Less than Expected Student Gain. Students of 15 of the 55 teachers who administered a district-mandated MDTP test in one or more of their classes made greater than expected gains in mathematics; 11 of 55 teachers' students made less than expected gains. While the small number of teachers in these categories suggests the use of caution when interpreting results related to MDTP use, the following could provide valuable information for those making decisions about program and policy based, in part, on survey results.

All of the teachers whose students made greater than expected gains indicated that they used MDTP results *before the end of the school year in which it was administered*. These

teachers were more likely to report reviewing MDTP results on their own to determine students' strengths, weaknesses, misunderstandings, and errors, than teachers whose students made less than expected gains. They were also more likely to indicate that district-mandated MDTP results had a moderate or high degree of influence on placement decisions than teachers whose students made less than expected gains. (See Table A1 in the Appendix for complete findings.)

Ten of the 11 teachers whose students made less than expected gains in mathematics indicated that they used MDTP test results *before the end of the school year in which it was administered*. Survey results indicate that teachers whose students made less than expected gains were more likely to distribute MDTP letters and discuss test results with their students, review results with other teachers, discuss results in a mathematics department meeting, and modify their teaching to help students understand and correct misunderstandings than teachers whose students made greater than expected gains. (See Table A1 in the Appendix for complete findings.)

4.2.2 During the School Year Following Mandated Administration

Of the 55 teachers who reported administering a district-mandated MDTP test in at least one of their classes, 75 percent said that they used the results *during the school year following the year in which it was administered*. (See Table 3, column 3.) When asked to describe the ways in which they used the results, 59 percent of teachers said that they reviewed test results for their classes on their own to determine students' overall strengths and weaknesses or modified their teaching to help students understand and correct misunderstandings identified when reviewing test results. Nearly 44 percent of teachers reported that they reviewed test results to determine misunderstandings shared by many students and 37 percent spent additional time in class working on areas in which students performed poorly on the test.

About a quarter of the teachers said that they discussed test results at a formal meeting of the school's mathematics department *during the school year following administration*, reviewed results with other teachers, or discussed the results for their prior year's students with those students' current teacher. Far fewer teachers indicated that they discussed the results of their current students with the teacher who had taught those students in the prior year or with a school administrator, counselor, or mathematics coach. Finally, only 2 percent of teachers reported using one or more MDTP Written Response Items in class.

<u>MDTP Use by Greater than Expected/Less than Expected Student Gain</u>. Nine of the 15 teachers (60 percent) whose students made greater than expected gains indicated that they used MDTP results *during the school year following administration*; 8 of the 11 teachers (73 percent) whose students made less than expected gains reported doing so. Teachers whose students achieved greater than expected gains were more likely to report discussing MDTP results at a mathematics department meeting, reviewing results to determine students' misunderstandings, and modifying their teaching to help students understand those misunderstandings than teachers whose students made less than expected gains.

Additionally, they were much more likely to discuss their last year's students' individual results with the teacher who was teaching them in the current school year. (See Table A2 in the Appendix for complete findings.)

Teachers whose students made less than expected gains were much more likely than teachers whose students made greater than expected gains to review MDTP results with other teachers and to discuss their current year's students' results with the teachers who had taught those students the prior year. (See Table A2 in the Appendix for complete findings.)

4.2.3 Comparison of the Use of Results of District-Mandated MDTP Testing Before the End of the School Year of Administration and During the Following School Year

Ninety-three percent of teachers who administered a district-mandated MDTP test indicated that they used the results from that test before the end of the school year in which it was administered; 75 percent of teachers reported using results during the following school year. As shown in Table 3, teachers reported reviewing test results on their own to determine overall strengths and weaknesses *before the end of the school year* in which the test was administered more often than during the following school year. Similarly, they said that they reviewed the misunderstandings and errors shared by their students, discussed student results at mathematics department meetings and with other teachers, and used MDTP Written Response items more frequently before the end of the school year in which the test was administered.

On the other hand, teachers reported modifying their teaching to help students understand and correct misunderstandings, spending additional time working on areas in which students did poorly, and discussing results with a school administrator, counselor, or mathematics coach *more often in the school year following* the year in which the district-mandated MDTP test was administered.

MDTP Use by Greater than Expected/Less than Expected Student Gain. Like teachers, overall, teachers whose students made greater than expected gains and teachers whose students made less than expected gains reported using MDTP results more often during the year in which it was administered. However, greater than expected gain teachers reported using MDTP results more often during the year the test was administered; less than expected gain teachers reported using MDTP results more often during the year following administration (See Tables A1 and A2 in the Appendix for complete findings.)

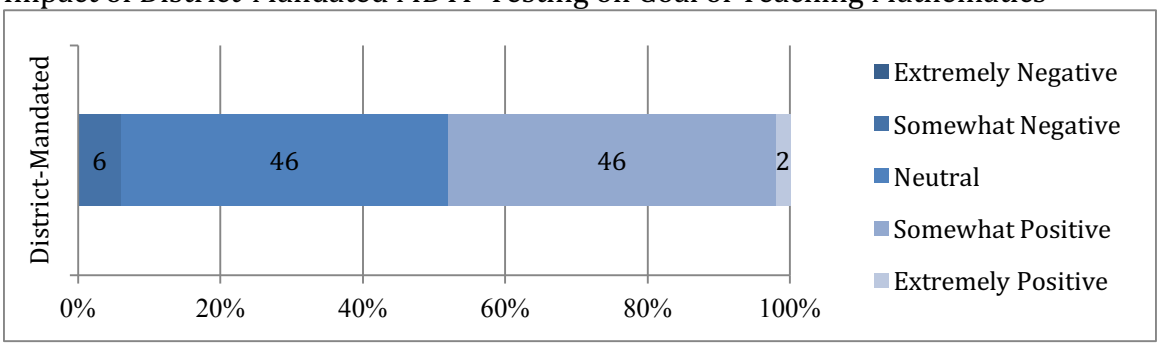
4.2.4 Impact of District-Mandated MDTP Testing

About 90 percent of the teachers who reported administering a district-mandated MDTP test responded to follow-up questions related to its impact. A decided majority (88 percent) of teachers indicated that their school did not change its approach to teaching mathematics based on an analysis of the results of district-mandated MDTP testing. Of those few who said that their school did change its approach, however, the most commonly

reported change was emphasis or de-emphasis of specific mathematics topics based on MDTP test results.

Nearly half of the teachers who administered an MDTP test thought that the overall impact of district-mandated MDTP testing on the goal of teaching mathematics to their students was somewhat positive or extremely positive; only 6 percent of teachers characterized district-mandated MDTP testing as somewhat negative, and no teachers characterized it as extremely negative. (See Figure 1.) Specific follow-up questions about the ways in which district-mandated MDTP testing supported the district's goal of teaching mathematics will be included in the teacher interview component of this three-part study.

Figure 1
Impact of District-Mandated MDTP Testing on Goal of Teaching Mathematics



When asked to characterize the impact of district-mandated MDTP testing on the goal of teaching mathematics to their students, 53 percent of teachers whose students made greater than expected gains in mathematics indicated a positive impact compared with 36 percent of teachers whose students made less than expected gains. Overall, 48 percent of teachers responding to the survey indicated a positive impact.

4.2.4 Teachers' Suggestions for Improving Usefulness of District-Mandated MDTP Testing

Teachers who had administered a district-mandated MDTP test during the 1999-2000 through 2007-08 school years confirmed that test results were used to inform decisions about students' mathematics course placement during the following school year. However, some teachers voiced the opinion that MDTP tests were "more useful in analyzing strengths and weaknesses than for placement in a subsequent course" – both because of the valuable diagnostic information the tests provide and because parents were often able to override mathematics course placement decisions if their students did not do well on the tests. Other teachers lamented that, because the district mandated a spring administration, the results were received too late in the school year to help them address their current students' learning needs. As one teacher wrote, "The MDTP is better suited for the beginning of the year to diagnose problems and inform the teaching of the students to whom the test was given."

Still others teachers wished for assistance and direction in using MDTP test results to address their students' learning needs. For example, one teacher remarked that, "The math department chair of the school needs to direct the teachers. I was given 'a pile of results' with no direction. I looked at them and passed them out to the students." Another teacher went a bit further, saying, "I believe teachers at each site should learn how to use MDTP results to analyze student performance in each course then plan specific actions to… address the weakness of each course. We need to nurture a culture of analyzing student data."

Finally, several teachers offered suggestions for improving the usefulness of MDTP testing, including:

- "It would be nice if there were a master bank of items that supported the weakness of the students and then created problems for the students. At the very least, [I would like] a guide for teachers that shows what kind of problems could help meet the needs of the students."
- "Have online data available to me instead of solely hard copy."

It is interesting to note that many of the suggestions that teachers had for improving MDTP's tests and services are already in place. For example, Daskala (MDTP's web-based testing and reporting tool) provides online testing, instant access to student- and classroom-level results, and drill-down capability allowing data detailed analysis. Similarly, Written Response items aligned with specific mathematics topics are currently available on the MDTP website.

4.3 Teachers' Experiences with Voluntary MDTP Testing[11]

Of the 126 teachers who responded to the survey, 121 answered questions about their experiences with *voluntary* administration of MDTP tests; of those, 67 percent reported that they or their school had voluntarily administered an MDTP readiness test. In 78 percent of cases, the decision to voluntarily administer MDTP tests was made by schools' mathematics departments. Whether the decision to voluntarily administer an MDTP was made by an individual teacher or the school's mathematics department, the most frequent scenario – 61 percent of the time – was that MDTP tests were administered in every class for which a given MDTP test was selected (e.g., all Algebra classes). However, 39 percent of teachers reported that MDTP tests that they or their school decided to administer voluntarily were given in some, but not all, of the mathematics classes for which an MDTP test was available.

Survey respondents who indicated that they or their school typically used voluntary MDTP testing with some, but not all, of the classes for which a test was available were asked to indicate the reasons for selecting only some classes. In 59 percent of cases, the MDTP test was administered in selected courses at the school, such as all in Algebra I classes. Thirty-four percent of teachers reported that MDTP tests were used when students in a particular

[11] "Voluntary administration" means that the decision to administer one or more MDTP readiness tests was made by an individual teacher or by a mathematics department at a particular school.

class appeared to have a range of mathematics achievement, and 13 percent said that they were used when the class appeared to have lower-than-average achievement. Only 3 percent of teachers reported that MDTP tests were used when a particular class appeared to have higher-than-average achievement. One-quarter of teachers said that their schools' mathematics departments changed their policy on voluntary MDTP use over time; 16 percent said that they, personally, changed their MDTP use, over time.

Seventy-three percent of the teachers whose students made less than expected gains indicated that they or their school had voluntarily administered an MDTP readiness test, compared to 67 percent of the teachers whose students made greater than expected gains and 67 percent of teachers responding to the survey, overall. Teachers whose students made less than expected gains were also more likely to report that tests were typically administered in every class for which an MDTP test was available. Teachers whose students made greater than expected gains were more likely to indicate that the MDTP was used in some, but not all, of their mathematics classes.

Eighty-five percent of highly experienced teachers (20 or more years teaching experience) indicated that they had voluntarily administered an MDTP readiness test, compared to 80 percent of teachers with 11 to 20 years of experience and 52 percent of teachers with 10 or fewer years of experience.

Eighty-one percent of the time, teachers who indicated voluntary use of MDTP testing indicated that tests were administered at the beginning of the school year. Forty-seven percent of teachers reported using MDTP tests at the end of the school year (spring administration); only 8 percent used tests in the middle of the year.[12] Survey responses of teachers whose students made greater than expected and less than expected gains in mathematics reported similar trends.

4.3.1 Voluntary Administration of MDTP in Spring

Teachers who indicated that they or their school voluntarily administered MDTP tests in spring were asked to describe the ways in which they used test results. (See Table 4, column 2.) Although nearly half of the teachers indicated that they voluntarily administered an MDTP test in spring, only 10 teachers answered survey questions about the ways that they and the mathematics departments at their schools used the results. While the small number of responses to this question dictates the use of caution when interpreting results, the most frequently reported use of *spring testing results before the end of the school year* included reviewing results "on my own" or with other teachers to determine students' strengths and weaknesses. Five of ten teachers indicated that they reviewed MDTP test results to determine students' misunderstandings and 4 of 10 teachers said that they discussed results at a mathematics department meeting or modified their

[12] MDTP administrative data indicate that teachers often administer a given MDTP test more than one time per year. Of the 126 survey respondents, 8 indicated that their only MDTP use had been via the district mandate, 41 indicated only voluntary use, and 42 indicated that they had used the MDTP both as part of the district mandate and voluntarily.

teaching to address students' misunderstandings. Three of 10 teachers said that they spent additional time working on areas in which their students did poorly, reviewed results with a school administrator, counselor, or mathematics coach, or distributed MDTP student letters to their students; only 2 of 10 teachers reported discussing test results in class, and only one teacher reported test results to parents. No teachers reported using Written Response items.

Table 4
Percentage of Teachers Reporting Use of Spring MDTP Test Results from Voluntary and District-Mandated Administration, Before the End of the School Year of Administration

Use of MDTP Test Results from Spring Administration	**Voluntary in Spring**	**District-Mandated**
Administered MDTP in Spring and Responded to Questions about Use	10 of 39 who Indicated Voluntarily Use in Spring	51 of 55 who Indicated Mandated Use
Reviewed results on my own to determine overall strengths and weaknesses	60.0	74.5
Reviewed with other teachers	60.0	31.4
Reviewed on my own to determine misunderstandings and errors shared by students	50.0	47.1
Modified teaching to help students understand and correct misunderstandings and errors revealed by test	40.0	39.2
Discussed results at a formal meeting of school's mathematics department	40.0	33.3
Spent additional time working on areas in which my students performed poorly	30.0	31.4
Reviewed with a school administrator, counselor, or mathematics coach	30.0	13.7
Distributed MDTP student letters to students	30.0	45.1
Discussed MDTP test results with students in class	20.0	47.1
Reported MDTP results to parents	10.0	11.8
Used one or more of MDTP Written Response items	0.0	3.9

4.3.2 Comparison of Voluntary and District-Mandated MDTP Testing

Given that district-mandated MDTP testing occurred in spring, it is informative to compare teachers' use of MDTP results from voluntary and district-mandated spring testing. (Again,

we remind the reader to use caution when interpreting these results, due to the small number of responses from teachers who voluntarily administered the MDTP in spring.) As Table 4 indicates, reviewing test results "on my own" was mentioned most frequently with both voluntary and district-mandated testing – though a greater percentage of teachers reported doing so following *district-mandated* testing. Interestingly, teachers who *voluntarily* administered an MDTP test in spring were more likely to report that they discussed MDTP results with other teachers, at a mathematics department meeting, or with a school administrator, counselor, or mathematics coach. Voluntary users were also slightly more likely to review MDTP test results to determine their students' shared misunderstandings and errors and to modify their teaching to help students understand and correct those misunderstandings and errors.

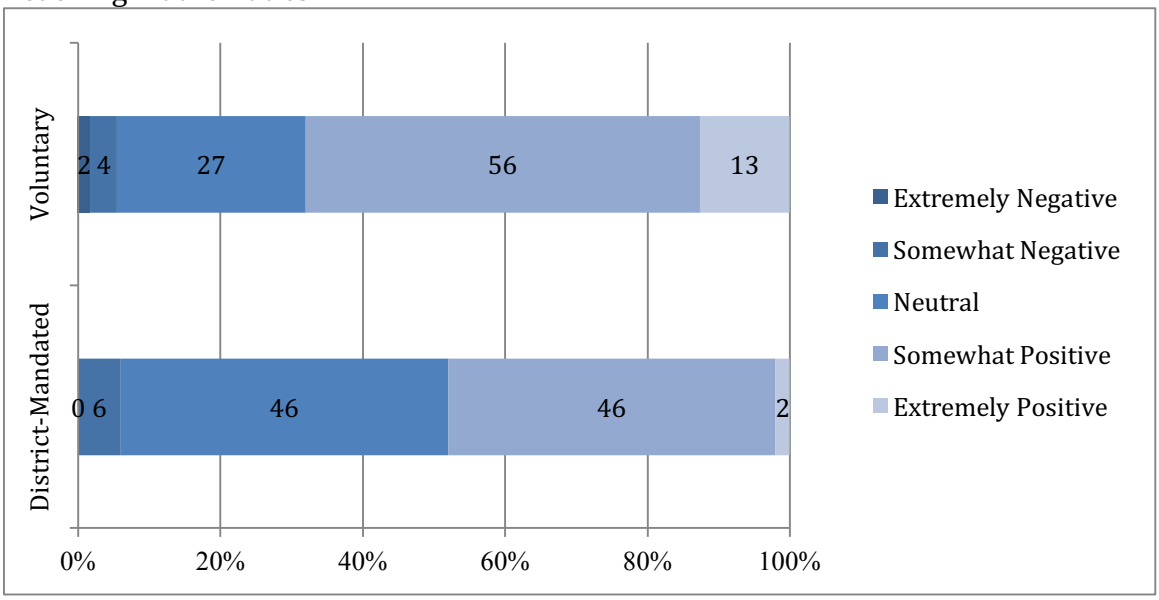
On the other hand, teachers who administered an MDTP test as a result of the *district mandate* were more likely to report that they discussed MDTP test results with students in their classes and distributed MDTP letters to students; they were only slightly more likely to report MDTP results to parents. Teachers reported using MDTP Written Response items least frequently in both voluntary and district-mandated scenarios.

These findings suggest that MDTP test results from voluntary administration were more likely to be discussed by a range of school staff in order to meet students' shared learning needs and to improve mathematics instruction. Use of test results from district-mandated administration was more likely to be associated with carrying out the district's placement policy, that is, informing students about their results and subsequent placement in appropriate mathematics coursework. These survey results may also partially explain the Betts, Hahn, and Zau (2011) finding that mandatory MDTP testing was associated with gains on the California Standards Tests (CSTs) in mathematics and that voluntary use of MDTP tests had no detectable relationship to student gains in mathematics.

4.3.3 Impact of Voluntary MDTP Testing

As mentioned above, 48 percent of teachers who administered a *district-mandated* MDTP test thought that the impact of testing on the goal of teaching mathematics to students was somewhat positive or extremely positive; of teachers who *voluntarily* administered an MDTP test, 68 percent indicated a somewhat positive or extremely positive impact. (See Figure 2.) The percentage of teachers indicating somewhat negative or extremely negative impact was identical for voluntary and district-mandated scenarios, 6 percent. It appears, then, that voluntary administration – whether the decision of a school's mathematics department or of an individual teacher – yielded more positive views about the impact of MDTP testing on student learning in mathematics. This is hardly surprising, given that teachers who choose to voluntarily administer an MDTP test are highly likely to believe that the information gained from testing will provide valuable information about their students' strengths and weaknesses, inform their instruction, and improve student learning outcomes.

Figure 2
Comparison of Impact of Voluntary and District-Mandated MDTP Testing on Goal of Teaching Mathematics



The benefit of voluntary use of the MDTP most often mentioned by teachers was that it provided valuable information about incoming students' strengths and weaknesses and facilitated appropriate mathematics course placement. One teacher remarked that the MDTP test results made it possible to "see the concepts that I need to focus on and review" and identify "areas where I may need to provide extra support." Another teacher indicated that students "like to see their growth [on the MDTP], so I use it as a pre- and post test. They are amazed by how much they have learned." Still another teacher wrote that the MDTP "reports are helpful. I cut up the exam and pasted the items together by strand so that I can look at the items together when considering implications for instruction." Finally, MDTP results were used to identify misplaced students early in the school year so that they could be moved to a more appropriate mathematics class. Teachers mentioned very few drawbacks to the MDTP; some felt that using instructional time for testing was problematic.

4.3.4 Teacher Suggestions for Improving Usefulness of Voluntary MDTP Testing

Teachers offered a range of suggestions for improving the usefulness of voluntary MDTP testing, the most common of which was access to online results reporting. One teacher remarked, "I have used the paper version of the test in the past. I would love to receive a report that had the students' original scores and their second scores together so that I could more easily compare the data." Another teacher said, "The document delivery is unwieldy. I wonder if it's possible to go more digital with this test, especially as schools increasingly move to netbooks or DataDirector scanners." Comments such as these indicate that teachers are not aware Daskala or the range of services and supports available from MDTP.

Easier access to results – coupled with more effective use of data to improve mathematics instruction – was mentioned by several teachers. One teacher wrote, "I would love to see data that shows historically how my school does on the various subject tests. It might allow me to assess how the different teaching models that are used in my school and the district over the years have affected students' readiness for mathematics." Similarly, other teachers wished that the mathematics department, as a whole, reviewed student progress from the beginning to end of the school year using the MDTP.

A few teachers thought that the questions on various tests were too difficult for a diagnostic assessment and that "students typically score so low that we don't get any useful information other than they need everything." Given the length and difficulty of the test, some teaches felt that their students burned out and didn't do their best.

Other suggestions were related to student reports (e.g., two copies of student results so that the teacher could keep one, a more detailed report for parents that included a detailed description of what is meant by the topics covered and a couple of sample problems), common core standards ("I would recommend that they be cross-referenced to the new math standards as soon as possible."), the MDTP newsletter (e.g., incorporating ideas from the MDTP summer institute into the newsletter), and the inclusion of open-ended or written-response items to MDTP tests.

4.4 Teachers Who Have Never Voluntarily Administered an MDTP Test

Just over 30 percent of survey respondents (38 of 126 teachers) indicated that they had never voluntarily administered an MDTP test; of these, 36 responded to questions about the reasons that they had never done so. Most often, teachers said that they had not *voluntarily* used MDTP tests because they did not have sufficient knowledge about the MDTP program or how it works (75 percent). One quarter of teachers said that they had never voluntarily used MDTP tests because they could use their own tests and quizzes to get adequate insight into their students' strengths and weaknesses; 11 percent said that they could use students' CST scores for that purpose. Far fewer teachers (8 percent) said that they do not have time to administer the test or that they can use information from students' prior teachers to identify strengths and weaknesses.

Ten of the 30 of the survey respondents whose students made greater than expected gains in mathematics indicated that they had never administered an MDTP test; 7 of the 26 survey respondents whose students made less than expected gains indicated no MDTP use. Most often, these teachers said that they had not *voluntarily* used MDTP tests because they did not have sufficient knowledge about the MDTP program or how it works (6 of 10 greater than expected gain teachers and all of the less than expected gain teachers).

5.0 INSTRUCTIONAL PRACTICE

The primary purpose of this study was to gather information about the ways in which teachers use MDTP tests, services, and supports. However, MDTP representatives were also very keen to use the teacher survey to learn more about instructional practice in mathematics classrooms in SDUSD secondary schools. To that end, teachers were asked to estimate the amount of time a typical student in their classroom spent engaged in specific types of learning activities during the course of a school year. Of the 126 teachers who responded to the survey, 115 (91 percent) answered the questions in this section. Tables 5 and 6 provide their responses.

5.1 Use of Instructional Time in Mathematics Classrooms

As Table 5 shows, survey results indicate that students spent the greatest proportion of their instructional time in mathematics classrooms watching the teacher demonstrate or explain how to do a procedure or solve a problem (83 percent of teachers indicated a moderate or considerable amount of time) or listening to the teacher present mathematical concepts, ideas, applications, or results (82 percent of teachers indicated a moderate or considerable amount of time).

Students spent the least amount of instructional time writing about mathematics (77 percent of teachers indicated no time or small amounts of time) and using manipulatives, measurement instruments, and data collection devices (70 percent of teachers reported no time or a small amount of time).

Table 5
Estimated Amount of Instructional Time Spent by Students in Mathematics Class, by Activity Type

Activity	None	Small Amount	Moderate Amount	Considerable Amount
Watch teacher demonstrate or explain how to do a procedure or solve problem	0.0	17.4	55.6	27.0
Listen to teacher present mathematical concepts, ideas, applications, or results	0.0	18.3	55.6	26.1
Complete routine exercises or computational procedures	0.9	28.7	56.5	13.9
Use computers, calculators, or other technology	2.6	30.1	41.6	25.7
Work individually on non-routine problems, investigations, or tasks	0.0	46.1	44.3	9.6
Present or demonstrate solutions to a mathematics problem to the whole class	2.6	50.4	33.1	13.9
Participate in peer discussions about non-routine problems, investigations, or tasks	2.6	54.8	37.4	5.2
Use manipulatives, measurement instruments, and data collection devices	8.7	61.7	27.0	2.6
Write about mathematics	22.8	54.4	16.7	6.1

Use of Instructional Time, by Greater than Expected/Less than Expected Student Gain. Teachers whose students made greater than expected gains reported that their students spent more instructional time completing routine exercises or computational procedures than teachers whose students made less than expected gains. On the other hand, teachers whose students made less than expected gains reported that their students spent more instructional time watching the teacher demonstrate or explain how to do a procedure or solve a problem and participating in peer discussions about non-routine problems, investigations, or tasks than teachers whose students made greater than expected gains. (See Table A3 in the Appendix for complete results.)

Use of Instructional Time, by Type of MDTP Use (District-Mandated, Voluntary, None). Teachers who had never administered an MDTP readiness test indicated that their students spent less instructional time working individually on non-routine problems, investigations, or tasks or using computers, calculators, or other technology than teachers who had administered an MDTP test. For all other uses of instructional time, teachers who had never administered an MDTP test indicated that their students spent more instructional time – sometimes a great deal more – than their colleagues who had administered the MDTP. Differences between voluntary and district-mandated users of the MDTP were considerably smaller, though voluntary users reported that their students spent more time participating in peer discussions about non-routine problems, investigations, or tasks, and less time presenting or demonstrating solutions to a mathematics problem to the whole class than their colleagues who had administered the district-mandated MDTP. (See Table A4 in the Appendix for complete results.)

Use of Instructional Time, by Length of Teaching Experience. Finally, responses to questions about the use of instructional time in mathematics classrooms were analyzed by years of teaching experience (10 or fewer years, 11-20, years, more than 20 years). The least experienced teachers were more likely to report that their students spent a moderate or considerable amount of time completing routine exercises or computational procedures, working individually on non-routine problems, investigations, or tasks, and participating in peer discussions about non-routine problems, investigations, or tasks. On the other hand, highly experienced teachers were more likely to indicate that their students spent a moderate or considerable amount of instructional time watching the teacher demonstrate or explain how to do a procedure or solve a problem, listen to the teacher present mathematical concepts, ideas, applications, or results, use computers, calculators, or technology, and use manipulatives, measurement instruments, and data collection devices. (See Table A5 in the Appendix for complete results.)

Table 6 (below) summarizes teachers' responses to questions about the ways that instructional time was used in their classrooms, by rank ordering activity types using the percentage of teachers in each group indicating that their students spent a moderate or considerable amount of time engaged in that activity. Ranked results are provided for survey respondents, overall, and by type of MDTP use, student gains in mathematics, and years of teaching experience.

There are few differences in instructional time rankings across groups, with one exception. Teachers who have never administered an MDTP readiness test rank "students spend instructional time working individually on non-routine problems, investigations, or tasks" lower than survey respondents, overall, or other groups. On the other hand, they rank "students present or demonstrate solutions to a mathematics problem to the whole class" higher than other groups.

Table 6
Moderate or Considerable Use of Instructional Time in Rank Order, by Overall, MDTP Use, Greater than/Less than Expected Gain, and Years of Teaching Experience

Activity	Overall	MDTP Use			Expected Student Gain		Years of Teaching Experience		
		None	Voluntary	District Mandate	Less than	Greater than	≤ 10	11-20	> 20
	n=115	n=29	n=78	n=51	n=26	n=30	n=42	n=30	n=33
Watch teacher demonstrate or explain how to do a procedure or solve problem	1	2	1	1	1	1.5	2	1	1.5
Listen to teacher present mathematical concepts, ideas, applications, or results	2	1	2	2	2	1.5	2	2	1.5
Complete routine exercises or computational procedures	3	3	4	4	3	3	2	3	4
Use computers, calculators, or other technology	4	4.5	3	3	5	5	4	4	3
Work individually on non-routine problems, investigations, or tasks	5	7	5	5	4	4	5	5	5
Present or demonstrate solutions to a mathematics problem to the whole class	6	4.5	6	6	7	6	7	6	6
Participate in peer discussions about non-routine problems, investigations, or tasks	7	6	7	7	6	7	6	7.5	7
Use manipulatives, measurement instruments, and data collection devices	8	8	8	8	8	8	9	7.5	8
Write about mathematics	9	9	9	9	9	9	8	9	9

5.2 Time Spent by Students When Working on Mathematics Exercises, Problems, Investigations, or Tasks in Class

The survey also asked teachers to estimate the amount of time their students spent engaged in various types of activities when working on mathematics exercises, problems, investigations, or tasks in class. As Table 7 shows, students spent most time working on routine exercises designed to help them master mathematical operations (83 percent of teachers said that students spent a moderate or considerable amount of time engaged in

this type of activity) or using multiple representations to demonstrate understanding and communicate connections between and among ideas and concepts (71 percent of teachers indicated moderate or considerable time). Teachers reported that their students spent the least amount of time explaining their reasoning or thinking when solving problems (65 percent of teachers reported no or a small amount of time) and solving non-routine problems (with 63 percent of teachers indicating no or small amounts of time).

Table 7
Estimated Amount of Time Students Spent Engaged in Activity While Working on Mathematics Exercises, Problems, Investigations, or Tasks, by Activity Type

Activity	**None**	**Small Amount**	**Moderate Amount**	**Considerable Amount**
Work on routine exercises designed to help students master mathematical operations	0.9	15.7	61.7	21.7
Use multiple representations to demonstrate understanding and communicate connections between and among ideas/concepts	1.7	27.8	52.2	18.3
Reflect upon and analyze their solution(s) to develop or understand procedures or strategies	4.4	34.5	53.1	8.0
Solve real-world problems or work on real-world scenarios	3.5	40.9	48.7	7.0
Make estimates, predictions, or hypotheses	6.1	49.6	38.3	6.1
Analyze mathematical situations, including those involving data, to make inferences or draw conclusions	7.0	53.9	35.7	3.5
Solve non-routine problems	4.3	59.1	31.3	5.2
Use several sentences orally or in writing to explain the reasoning or thinking used in solving a problem	7.8	57.4	31.3	3.5

Use of Class Time When Working on Mathematics Exercises, Problems, Investigations, or Tasks, by Greater than Expected/Less than Expected Student Gain. Survey responses of teachers whose students made greater than expected gains indicate that their students spent more time using multiple representations to demonstrate understanding, and solving real-world problems or working on real-world scenarios, than teachers whose students made less than expected gains. On the other hand, teachers whose students made less than expected gains reported that their students spent more time making estimates, predictions, or hypotheses and using several sentences orally or in writing to explain their reasoning than teachers whose students made greater than expected gains. (See Table A6 in the Appendix for complete results.)

Use of Class Time When Working on Mathematics Exercises, Problems, Investigations, or Tasks, by Type of MDTP Use (District-Mandated, Voluntary, None). Teachers who had never administered an MDTP test were much more likely than their colleagues who had administered the MDTP to report that students spent a moderate or considerable amount of instructional time working on routine exercises designed to help them master mathematical operations, reflecting upon and analyzing their solution(s) to develop or understand procedures or strategies, and using several sentences orally or in writing to explain their reasoning. Differences between voluntary and district-mandated MDTP users were less striking. (See Table A7 in the Appendix for complete results.)

Use of Class Time When Working on Mathematics Exercises, Problems, Investigations, or Tasks, by Length of Teaching Experience. The least experienced teachers were more likely to report that their students spent a moderate or considerable amount of time working on routine exercises designed to help them master mathematical operations. The students of the most experienced teachers were more likely to spend time reflecting upon and analyzing their solutions(s) to develop or understand procedures or strategies, making estimates, predictions, or hypotheses, analyzing mathematical situations, and using several sentences orally or in writing to explain their reasoning. These differences may be explained by the fact that more experienced teachers have had time to hone their instructional practice, that they are more likely to teach advanced versions of mathematics coursework, or that they are more likely to be assigned to higher-achieving schools than less experienced teachers. (See Table A8 in the Appendix for complete results.)

Table 8 (below) summarizes teachers' responses to questions about the ways that instructional time was used by students while working on mathematics exercises, problems, investigations, or tasks, by rank ordering activity types by the percentage of teachers in each group indicating that their students spent a moderate or considerable amount of time engaged in that activity. Ranked results are provided for survey respondents, overall, and by type of MDTP use, student gains in mathematics, and years of teaching experience.

There are few differences in instructional time rankings across groups, with a few exceptions. Teachers who had never administered an MDTP readiness test rank "students analyze mathematical situations to make inferences or draw conclusions" lower than teachers who had administered an MDTP test, and they rank "students use several

sentence orally or in writing to explain the reasoning or thinking used in solving a problem" higher than MDTP users. Teachers whose students made greater than expected gains in mathematics rank "making estimates, predictions, or hypotheses" lower than all other groups, including survey respondents, overall. The least experienced teachers rank "make estimates, predictions, or hypotheses" lower than the most experienced teachers; they ranked "solve non-routine problems" higher.

Table 8
Use of Instructional Time in Rank Order, by Group

Activity	**Overall**	**MDTP Use**			**Expected Student Gain**		**Years of Teaching Experience**		
		None	**Voluntary**	**District Mandate**	**Less than**	**Greater than**	**≤ 10**	**11-20**	**> 20**
	n=115	n=29	n=78	n=51	n=26	n=30	n=42	n=30	n=33
Work on routine exercises designed to help students master mathematical operations	1	1	1	1	1	1.5	1	2	1
Use multiple representations to demonstrate understanding and communicate connections between and among ideas/concepts	2	3	2	2	2	1.5	2	1	2
Reflect upon and analyze their solution(s) to develop or understand procedures or strategies	3	2	4	3.5	3	3.5	3.5	3.5	3
Solve real-world problems or work on real-world scenarios	4	4	3	3.5	4	3.5	3.5	3.5	5.5
Make estimates, predictions, or hypotheses	5	6.5	5	5	5.5	7	6	5	4
Analyze mathematical situations, including those involving data, to make inferences or draw conclusions	6	8	6	6	7.5	6	7	7	5.5
Solve non-routine problems	7	6.5	7.5	7	5.5	5	5	6	8
Use several sentences orally or in writing to explain the reasoning or thinking used in solving a problem	8	5	7.5	8	7.5	8	8	8	7

6.0 PROFESSIONAL DEVELOPMENT

MDTP representatives were also interested in learning about the professional development in which SDUSD mathematics teachers had participated. The survey asked teachers to provide information about the range of professional development topics they had experienced over the prior five years and about the types of professional development that they had experienced over the past year. Of the 126 teachers who responded to the survey, 115 (91 percent) answered the questions in this section.

6.1 Professional Development Topics

Teachers indicated that the topics most frequently addressed in mathematics professional development they attended were alignment of instruction to curriculum, standards, and mandated tests (77 percent of teachers estimated that they had spent a moderate or considerable amount of time on this topic), technology to support student learning (with 72 percent indicating moderate or considerable time), instructional approaches or strategies (with 70 percent), and analyzing high-stakes tests (with 69 percent). Topics addressed least frequently were in-depth study of mathematics (78 percent of teachers indicated no or a small amount of time on this topic) and Response to Instruction and Intervention (RTI^2)[13](with 73 percent reporting no or a small amount of time). (See Table A9 in the Appendix for complete results.)

Professional Development Topics, by Greater than Expected/Less than Expected Student Gain. Survey responses of teachers whose students made less than expected gains compared teachers whose students made greater than expected gains indicate that their professional development was more often focused on analyzing high-stakes tests, studying how students learn mathematics, deconstructing or unpacking standards, and discussing strategies for teaching English Learners. For the other professional development topics listed in the survey, responses were fairly similar for teachers whose students made greater than expected gains or less than expected gains. (See Table A10 in the Appendix for complete results.)

Professional Development Topics, by Type of MDTP Use (District-Mandated, Voluntary, None). Teachers who had never administered an MDTP test were more likely to report a moderate or considerable emphasis on individual differences in student learning, teacher- or school-developed mathematics assessment, and Response to Instruction and Intervention (RTI^2) than teachers who had administered an MDTP test. They were less likely to report attending professional development activities emphasizing the use of technology to support student learning. Teachers who had administered a district-

[13] The SDUSD website (http://www.sandi.net/cms/lib/CA01001235/Centricity/Domain/101/RTI/RTI%20Brochure.pdf) defines RTI^2 as a systematic, data-driven approach to instruction that benefits every student. It is meant to communicate the full spectrum of instruction, from general core, to supplemental or intensive, to meet the academic and behavioral needs of students. RTI^2 integrates resources from general education, categorical programs and special education.

mandated MDTP test were less likely to report participating in professional development emphasizing instructional approaches or strategies, interpretation of assessment data for use in instruction, or strategies for teaching English Learners. (See Table A11 in the Appendix for complete results.)

Professional Development Topics, by Length of Teaching Experience. The least experienced teachers indicated moderate or considerable emphasis for every topic listed on the survey more often than their experienced colleagues. Given that teachers typically participate in more professional development activities during their first years of teaching, this is not surprising. Interestingly, professional development attended by teachers with 11-20 years of experience was less likely to emphasize alignment of instruction to curriculum, standards, and mandated tests, analyzing high-stakes tests, interpretation of assessment data, strategies for teaching English Learners, individual differences in student learning, or teacher- or school-developed assessments than the professional development attended by less and more experienced teachers. Teachers with more than 20 years of experience were least likely to attend professional development emphasizing the ways students learn mathematics, Response to Instruction and Intervention, and In-depth study of mathematics. (See Table A12 in the Appendix for complete results.)

Table 9 (below) summarizes teachers' responses to questions about the focus of their professional development opportunities. Ranked results are provided for survey respondents, overall, and by type of MDTP use, student gains in mathematics, and years of teaching experience.

Teachers who had never administered an MDTP readiness test ranked Response to Instruction and Intervention (RTI^2) and strategies for teaching English Learners higher than teachers who had administered an MDTP test; they ranked technology to support student learning much lower. Although rankings for voluntary and district-mandated users are very similar, overall, voluntary users ranked instructional approaches or strategies higher than teachers who administered the MDTP under the district mandate.

Teachers whose students made greater than expected gains in mathematics ranked alignment of instruction to curriculum, standards, and mandated tests and technology to support student learning higher than teachers whose students made less than expected gains; they ranked deconstructing/unpacking standards lower. Teachers whose students made less than expected gains ranked analyzing high-stakes tests higher than their colleagues whose students made greater than expected gains. Less experienced teachers ranked analyzing high-stakes tests higher than their more experienced colleagues; their ranking for technology to support student learning was lower.

Table 9
Rank Order of Emphasis in Mathematics Professional Development in Last Five Years, by Group

Activity	Overall	MDTP Use			Expected Student Gain		Years of Teaching Experience		
		None	Voluntary	District Mandate	Less than	Greater than	≤ 10	11-20	> 20
	n=115	n=29	n=78	n=51	n=26	n=30	n=42	n=30	n=33
Alignment of instruction to curriculum, standards, and mandated tests	1	1	2	1	4.5	1	2	3	1
Technology to support student learning	2	8	3	2	4.5	2	6	2	3
Instructional approaches or strategies	3.5	2	1	4	2.5	3	3.5	1	5.5
Analyzing high-stakes tests (district benchmarks, CST released items)	3.5	5	4	3	1	5	1	4.5	2
Interpretation of assessment data for use in instruction	5	3.5	5	5	2.5	4	3.5	4.5	4
Strategies for teaching English Learners	6	3.5	6	6	6	6	5	6	5.5
Individual differences in student learning	7	6	7.5	7	8	7.5	7	8	7.5
Teacher- or school-developed classroom mathematics assessment	8	8	7.5	8	8	7.5	8	8	7.5
Deconstructing/unpacking standards	9	10.5	9	9	8	11	10	8	9
Study of how students learn mathematics	10	10.5	10	10	10	12	11	10	10
Response to Instruction and Intervention (RTI²)	11	8	12	12	11.5	9.5	9	12	12
In-depth study of mathematics	12	12	11	11	11.5	9.5	12	11	11

6.2 Types of Professional Development

In a related question, teachers were asked to indicate the frequency with which they engaged in various types of professional development in the past year. (See Table A13 in the Appendix for complete results.) Nearly 71 percent of teachers reported attending mathematics department meetings focused on mathematics or mathematics education at least monthly, by far the most widely attended type of professional development. Just over half of teachers surveyed indicated that they discussed student work or scored assessments with another teacher or engaged in self-directed learning about mathematics or mathematics education at least monthly. Survey responses indicate that teachers were least likely to serve on committees or task forces focused on mathematics (61 percent reported never doing so), attend Response to Instruction and Intervention (RTI^2) training (56 percent said never), participate in modified lesson study groups (56 percent said never), or attend mathematics "Course-Alike"[14] meetings (55 percent said never).

Professional Development Types, by Greater than Expected/Less than Expected Student Gain. Survey responses of teachers whose students made greater than expected gains indicate that they were more likely to have participated in a teacher study group, to have observed another teacher, to have engaged in modified lesson study, or to have attended RTI^2 training than teachers whose students made less than expected gains. They were less likely to have engaged in self-directed learning or attend a conference outside school. (See Table A14 in the Appendix for complete results.)

Professional Development Types, by Type of MDTP Use (District-Mandated, Voluntary, None). Teachers who had administered an MDTP test, either voluntarily or as part of the district mandate, were more likely to have attended mathematics conferences outside school, but less likely to have received coaching or mentoring, to have attended Course Alikes or RTI^2 training, to have participated in modified lesson study, or to have served on a committee or task force focused on mathematics than teachers who had never administered and MDTP test. (See Table A15 in the Appendix for complete results.)

Professional Development Types, by Length of Teaching Experience. More experienced teachers were less likely to have discussed student work or scored student assessments with another teacher, to have received coaching or mentoring, to have participated in QTEL[15] or RTI^2 training, or to have participated in Course Alikes or modified lesson study than less experienced teachers. As might be expected, the least experienced teachers were more likely to have received coaching or mentoring about mathematics, attend QTEL

[14] Course Alike meetings bring teachers who teach the same course (e.g., Geometry) together to discuss course curriculum, instructional strategies, assessment, technology use, and/or student learning needs.

[15] Developed by WestEd (http://www.wested.org/cs/tqip/print/docs/qt/home.htm), Quality Teaching for English Learners (QTEL) is a professional development initiative aimed at improving the capacity of teachers to support the linguistic, conceptual, and academic development of adolescent English Learners.

training, and participate in Course Alikes than more experienced teachers. (See Table A16 in the Appendix for complete results.)

Table 10 (below) summarizes teachers' responses to questions about the types of professional development that they attended in the last school year. Ranked results are provided for survey respondents, overall, and by type of MDTP use, student gains in mathematics, and years of teaching experience.

Teachers who had never administered an MDTP readiness test ranked self-directed learning, receiving coaching or mentoring, RTI^2, and modified lesson study higher than teachers who had administered an MDTP test, either voluntarily or as a part of the district-mandate; their rankings for attending conferences outside school, participating in a teacher study group, and acting as a coach or mentor to another teacher were lower.

Teachers whose students made greater than expected gains in mathematics ranked participation in a teacher study group much higher and RTI^2 higher than teachers whose students made less than expected gains. Ranking for self-directed learning, receiving coaching or mentoring, QTEL were higher for teachers whose students made less than expected gains.

Less experienced teachers ranked analyzing high-stakes tests higher than their more experienced colleagues; their ranking for technology to support student learning was lower.

Table 10
Types of Mathematics Professional Development in Last Year, by Group

Activity	Overall	MDTP Use			Expected Student Gain		Years of Teaching Experience		
		None	Voluntary	District Mandate	Less than	Greater than	≤ 10	11-20	> 20
	n=115	n=29	n=78	n=51	n=26	n=30	n=42	n=30	n=33
Attended mathematics department meetings focused on mathematics or mathematics education	1	2	1	1.5	1.5	1.5	2	1	1.5
Discussed student work or scored assessments with another teacher	2.5	2	3	3	3.5	3.5	1	2	3.5
i21 Training (Promethean)[16]	2.5	5	2	1.5	3.5	3.5	3.5	3	1.5
Engaged in self-directed learning about mathematics or mathematics education	4	2	6	5	1.5	6	3.5	5	3.5
Observed another teacher teaching a lesson in person or through media	5	5	5	6	6	5	5	4	5
Attended conferences outside school related to mathematics or mathematics education	6	11	4	4	5	7	6	6	6
Participated in a teacher study group about mathematics or mathematics education	7	11	7.5	7.5	10	1.5	10	7.5	7.5
Acted as a coach or mentor to another mathematics teacher	8	13.5	7.5	9	7	9	11.5	7.5	7.5
Received coaching or mentoring about mathematics or mathematics education	9	5	10	12	8	11.5	7	11.5	12.5
Quality Teaching for English Learners (QTEL)	10	8.5	9	7.5	10	13	8.5	10	9.5
Course Alikes	11.5	11	11	13	10	9	8.5	13	14
Response to Instruction and Intervention (RTI²)	11.5	7	13.5	10	12.5	9	13.5	9	11
Modified Lesson Study	13	8.5	12	11	14	11.5	11.5	11.5	12.5

[16] Integrated 21st Century Interactive Classroom (i21)(http://www.sandi.net/page/1148) provides a learning environment designed to optimize teaching and learning by the interconnected use of mobile computing, audio, visual, and formative assessment technology across the curriculum.

Participated in a committee or task force focused on mathematics curriculum and instruction	14	13.5	13.5	14	12.5	14	13.5	14	9.5

7.0 SUMMARY OF FINDINGS AND CONCLUSIONS

A majority of teachers responding to the survey used results from MDTP testing, whether district-mandated or voluntary, for a range of purposes – most notably, to determine students' strengths and weaknesses, to modify their teaching to help students understand and correct misunderstandings, and to inform appropriate placement in mathematics coursework. Teachers, especially those who administered the MDTP voluntarily, have positive opinions about MDTP testing – but are unaware of all of the services and supports available to them from MDTP. Given that prior research (Betts, Hahn, and Zau (2011)) has shown that district-mandated MDTP testing results in improved student outcomes in mathematics, and that the current study's findings indicate that most teachers used MDTP results for instructional purposes and believe in the efficacy of the MDTP, evidence-based conversations with district officials about integrating the use of MDTP testing into the district's secondary mathematics program should be considered.

7.1 District-Mandated MDTP Testing

7.1.1 Addressing Findings in Betts, Hahn, and Zau (2011)

In their 2011 study, Betts, Hahn, and Zau found that district-mandated MDTP testing in SDUSD was associated with gains in mathematics achievement the following year and that, if a student was given an MDTP test two years in a row, those gains persisted and strengthened slightly. While they were able to explain about 6 to 12 percent of the impact of mandatory MDTP testing, they determined that most of the effect of MDTP occurs for reasons other than summer school and appropriate classroom placement. They suggest that possible reasons for student gains might include the fact that MDTP results allow teachers to identify and address specific learning needs in mathematics, that mandated use of the MDTP across a particular grade level might lead to discussion among mathematics teachers about strategies to address students' learning needs, or that coordination among teachers and mathematics departments might result in systematic review and refinement of the school's instructional program in mathematics.

<u>Identification of Students' Learning Needs</u>. Even though the stated purpose for district-mandated administration of MDTP readiness tests was to inform placement decisions for the following school year, it is interesting to note that study findings indicate that the number one use of MDTP results *before the end of the school year* in which the test was given was reviewing results to determine students' overall strengths and weaknesses, rather than to inform placement decisions. When asked how they used MDTP results *in the*

year following administration, teachers most often reported that they reviewed results to determine students' overall strengths and weaknesses and modified their teaching to help students understand and correct misunderstandings and errors revealed by the test. Mandated MDTP testing, then, did provide benefits that went well beyond identifying students for summer school attendance and appropriate mathematics course placement. Teachers – nearly 93 percent of them – reported using MDTP results in the ways that test developers envisioned, even though the intent of the district mandate was much narrower.

Collaboration to Address Student Learning Needs. Somewhat surprisingly, survey responses indicate that teachers were much more likely to review results from district-mandated MDTP administration on their own than to discuss them at a mathematics department meeting, with other teachers, or with a school administrator, counselor, or mathematics coach. In fact, teachers were more likely to discuss test results with their students than their colleagues. Conversations with students may have been prompted by teachers' efforts to help students understand the impact of MDTP test results on course placement. It is also possible that the district mandate did not provide teachers with sufficient guidance about the ways in which MDTP results could be used to address students' learning needs, or training to support such uses. As one survey respondent remarked, "I was given a pile of results with no direction. I looked at them and passed them out to students."

Systematic Review and Refinement of the School's Mathematics Program. A majority of teachers responding to the survey indicated that their school did not change its approach to teaching mathematics based on an analysis of the results of district-mandated MDTP testing. Although one teacher remarked that "teachers at each site should learn how to use MDTP results to analyze student performance in each course and then plan specific actions to… address the weaknesses of each course," there was little evidence that MDTP results were used for that purpose. Again, this may be due to the fact that district-mandated MDTP use was intended primarily to be used for placement purposes and identification of students who might benefit from summer school participation.

7.1.2 Additional Findings Related to District-Mandated MDTP Testing

Greater than Expected/Less than Expected Student Gain. Teachers whose students made greater than expected gains were more likely to report using MDTP results to determine students' overall strengths, weaknesses, and misunderstandings than teachers whose students made less than expected gains – *before the end of the year in which the test was administered*. However, teachers whose student made less than expected gains were more likely to report modifying their teaching to help students understand and correct misunderstandings revealed by the test (even though the school year was drawing to a close).

During the year following administration, teachers whose students made greater than expected gains were more likely to review MDTP results to determine common misunderstandings and to modify their teaching than teachers whose students made less than expected gains; teachers whose students made less than expected gains results were

more likely to review results to determine their students' overall strengths and weaknesses. These findings suggest that teachers of students who made greater than expected gains tended to use MDTP test results to *identify and address* specific learning needs of their students. While teachers whose students made less than expected gains reviewed MDTP results – they were much more likely to discuss results with other teachers, for example, it may be that they did not go on to use the information to inform their teaching practice. This finding illustrates the importance of providing guidance about effective strategies for using MDTP results to diagnose specific student learning needs and to use that information to address them.

Impact of District-Mandated MDTP Testing. Given the "top down" nature of the district-mandated MDTP administration, it is somewhat surprising that nearly half of the teachers responding to the survey indicated that the impact of district-mandated testing was somewhat positive or extremely positive, and an additional 46 percent were neutral. Indeed, only 6 percent of teachers indicated that the impact of the district-mandated MDTP testing was negative. Teachers whose students made greater than expected gains were much more likely to give positive marks to district-mandated testing than teachers whose students made less than expected gains.

Use of Written Response Items. Sadly, fewer than 4 percent of survey respondents reported using MDTP Written Response items. This finding, coupled with the fact that several teachers' suggestions for improving MDTP were related to providing an item bank of problems aligned with students' learning needs, suggests that teachers are not aware that this valuable resource is already available to them.

7.2 Voluntary MDTP Testing

Survey respondents indicated that voluntary administration of the MDTP was most often the decision of their school's mathematics department and that, typically, MDTP tests were administered in every class for which a given MDTP test was selected (e.g., all Algebra classes). Teachers whose students made less than expected gains were more likely to report that they had voluntarily administered an MDTP test than teachers whose students made greater than expected gains. More experienced teachers were much more likely to have voluntarily administered an MDTP test than their less experienced colleagues.

7.2.1 Comparison of Voluntary and District-Mandated MDTP Administration

Surprisingly, teachers who administered the MDTP under the *district mandate* were more likely to report that they reviewed results on their own to determine students' strengths and weaknesses than teachers who *voluntarily* administered an MDTP test in the spring. As might be expected, given the consequences associated with students' MDTP test scores, teachers who administered a district-mandated MDTP test were also more likely to have discussed MDTP results with their students and distributed MDTP student letters.

Teachers who *voluntarily* administered the MDTP were more likely to have reviewed results at a mathematics department meeting and with other teachers, school

administrators, counselors, or mathematics coaches than teachers who had administered the MDTP under the district mandate. Given that voluntary users indicated that the decision to voluntarily administer the MDTP was typically made by the mathematics department, it makes sense that the MDTP results would be discussed widely.

However, the fact that teachers who administered *district-mandated* MDTP tests were more likely than *voluntary* users to review results to determine overall strengths and weaknesses is curious, and follow-up questions related to this finding will be included in the teacher interview component of the study. These findings – that teachers who administered an MDTP test under the district mandate reviewed results to determine student strengths and weaknesses and discussed results with students – may partially explain the Betts, Hahn, and Zau (2011) finding that voluntary use of MDTP testing had no detectable relationship to student gains in mathematics.

7.3 Non-Use of MDTP Testing

About three-quarters of teachers who had never voluntarily administered an MDTP test indicated that it was because they did not have sufficient knowledge about the MDTP program or how it works. This finding suggests that the mechanisms used to publicize MDTP products, programs, and services may not be comprehensive enough to ensure teacher awareness.

7.4 Instructional Practice

7.4.1 Use of Instructional Time in Mathematics Classrooms

Survey results indicate that, overall, students spent the greatest proportion of their instructional time watching the teacher demonstrate or explain how to do a procedure or solve a problem, or listening to the teacher present mathematical concepts, ideas, applications, or results. This finding was consistent across groups – by greater than expected/less than expected gain, varying use of MDTP, and teacher experience. Students spent the least instructional time writing about mathematics and using manipulatives, measurement instruments, and data collection devices. When examining the use of instructional time across the range of activities, few differences were found across groups. One exception was that teachers who had never administered an MDTP test ranked "work individually on non-routine problems, investigations, or tasks" lower than all other groups. Students spent the least amount of instructional time writing about mathematics and using manipulatives, measurement instruments, and data collection devices.

7.4.2 Time Spent by Students When Working on Mathematics Exercises, Problems, Investigations, or Tasks in Class

Findings suggest that students spent most time working on routine exercises designed to help them master mathematical operations, and using multiple representations to demonstrate understanding and communicate connections between and among ideas and concepts. This finding was fairly consistent across groups (i.e., Greater then Expected/Less

than Expected Student Gain, Type of MDTP Use, Teaching Experience). Overall, students spent the least amount of time using several sentences orally or in writing to explain their reasoning or thinking, and solving non-routine problems. This finding suggests that teachers might find MDTP's written response items useful as they seek to provide students with opportunities to tackle non-routine problems and to explain their thinking when solving those problems. When looking at the full range of possible activity types, results were similar – but a few exceptions should be noted. Teachers who had never administered an MDTP test ranked "analyze mathematical situations to make inferences or draw conclusions" lower than other groups; they ranked "use several sentences orally or in writing to explain the reasoning or thinking used in solving a problem" higher than other groups. Two groups – teachers whose students made greater than expected gains and teachers with the least experience – ranked "solve non-routine problems" higher than other groups.

7.5 Professional Development

7.5.1 Professional Development Topics

The two topics most frequently addressed in mathematics professional development attended by survey respondents were alignment of instruction to curriculum, standards, and mandated tests, and technology to support student learning. Both of these topics are consistent with districtwide professional development priorities during the years covered by the study. Differences were noted with respect to Greater than Expected/Less than Expected Student Gain and teaching experience – with Less than Expected Gain teachers and the least experienced teachers indicating that their number one professional development topic was analyzing high-stakes tests. Instructional approaches or strategies was the number one topic for teachers who had voluntarily administered an MDTP test. The topics that were addressed least frequently were in-depth study of mathematics, Response to Instruction and Intervention (RTI^2), and study of how students learn mathematics.

There were quite a few differences in the rank order of professional development topics, by group. Most notably,

- Teachers whose students made less than expected gains ranked "alignment of instruction to curriculum, standards, and mandated tests" much lower than other groups.
- Teachers who had never administered an MDTP test and the least experienced teachers ranked "technology to support student learning" much lower than other groups.
- Teachers whose students made less than expected gains and least experienced teachers ranked "analyzing high-stakes tests" much higher than other groups.
- Teachers who had never administered an MDTP test ranked "RTI^2" much higher than other groups.

7.5.2 Professional Development Types

The types of professional development activities in which teachers engaged most often were mathematics department meetings, discussions or scoring of student work with another teacher, and i21 (Promethean) training[17]. The fact that department meetings was ranked number one is not surprising and, because of comprehensive districtwide training requirement associated with the award of an i21 grant, neither is the prevalence of Promethean training. However, 86 percent of survey respondents reported that they had discussed or scored student work with other teachers during the last year. This finding was unexpected and follow-up questions will be asked in the upcoming teacher interview component of the study.

Interestingly, teachers whose students made greater than expected gains listed "participating in a teacher study group about mathematics" and mathematics department meetings as their top professional development types (in a tie for first place). And, teachers whose students made less than expected gains listed "self-directed learning" and mathematics department meetings as their top professional development types (also tied for first place). The type of professional development activities in which teachers engaged least were committees or task forces focused on mathematics curriculum and instruction and modified lesson study.

[17] Funding from Proposition S and an i21 (Integrated 21st Century) interactive classroom grant allowed SDUSD to install advanced technology tools in each of the district's 7,000 classrooms. The Promethean ActivBoard Mobile System is an interactive whiteboard integrated with a video projector connected to the teacher's laptop computer, allowing the teacher to project content from the laptop or document camera onto the whiteboard. Mandatory training took place during the period of this study.

References

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About the Authors

Karen Volz Bachofer is the Director of the San Diego Education Research Alliance in the Department of Economics at the University of California, San Diego. Previously she was the Executive Director of the San Diego Unified School District's Research and Evaluation Division, where her responsibilities included oversight of national, state, and district assessment and accountability processes and reporting, including the CAHSEE; internal, external, and commissioned research and evaluation activities; and the development and roll-out of the district's data management tool. She served as a member of California's Academic Performance Index (API) Technical Design Group and the Advisory Committee for the national evaluation of Title I Accountability Systems and School Improvement Efforts (TASSIE). She holds a Ph.D. in Education from the Claremont Graduate School and San Diego State University.

Andrew C. Zau is a senior statistician for the San Diego Education Research Alliance in the Department of Economics at the University of California, San Diego. Previously, he was a research associate at PPIC. Before joining PPIC, he was a SAS programmer and research assistant at the Naval Health Research Center in San Diego, where he investigated the health consequences of military service in Operations Desert Shield and Desert Storm. He holds a B.S. in bioengineering from the University of California, San Diego, and an M.P.H. in epidemiology from San Diego State University.

Julian R. Betts is an adjunct policy fellow and a Bren fellow at the Public Policy Institute of California. He is professor and former chair of economics at the University of California, San Diego, where he is Executive Director of the San Diego Education Research Alliance (sandera.ucsd.edu). He is also a research associate at the National Bureau of Economic Research and UC San Diego Campus Director of the University of California Educational Evaluation Center. He has written extensively on the link between student outcomes and measures of school spending, and he has studied the role that educational standards, accountability, teacher qualifications, and school choice play in student achievement. He has served on three National Academy of Sciences panels, the Consensus Panel of the National Charter School Research Project, and various advisory groups for the U.S. Department of Education. He is also principal investigator for the federally mandated National Evaluation of Magnet Schools. He holds a Ph.D. in economics from Queen's University, Kingston, Ontario, Canada.

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APPENDIX

UNIVERSITY OF CALIFORNIA, SAN DIEGO UCSD

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Department of Economics
9500 Gilman Drive
La Jolla, California
92093-0508

October 3, 2011

Teacher Consent to Participate in a Research Study

An Evaluation of the Use of Mathematics Diagnostic Testing Project (MDTP) Tests and Educational Practice in San Diego Unified School District

Dear Mathematics Teacher,

San Diego Unified School District (SDUSD) is working with Dr. Julian Betts, Professor and Chair of the Department of Economics at the University of California, San Diego (UCSD), on a research project to study the Mathematics Diagnostic Testing Project (MDTP), which provides mathematics teachers throughout California with free diagnostic testing of the mathematics preparation of their students. This project, which is sponsored by the California Academic Partnership Program (CAPP), will study the ways in which mathematics teachers use – or have used – MDTP tests, gather descriptions of instructional practice in mathematics, and determine whether the use of the MDTP tests has impacted student achievement.

One part of the research project is a survey directed to all mathematics teachers and mathematics department chairs at every middle and high school in SDUSD – about 550 teachers, in all. The survey asks teachers about their experiences with MDTP tests, both when voluntarily adopted for use by individual teachers and when mandated districtwide at certain grade levels, as was the practice in SDUSD from roughly spring 2000 through spring 2008. Because you are currently a mathematics teacher at a SDUSD middle or high school, this consent letter invites you to participate in this study by completing the teacher survey that follows.

Description of Teacher Survey
This survey is designed to help researchers gather information about how mathematics teachers use the MDTP tests, reasons why they may not use the MDTP tests, and suggestions to make the MDTP tests more helpful. The survey also asks some questions about teachers' and schools' instructional practice and professional development activities. The survey is web-based and, should you click on the "Consent to Participate" button at the end of this letter, you will be automatically directed to the survey. The survey should take approximately 15-20 minutes to complete.

You will receive a $10 gift card to thank you for completing the survey if you let us know where to send it by providing your contact information where requested. Your identity will be kept strictly confidential.

Records of Participation in this Research
Only UCSD researchers directly involved with the project will have access to your individual responses. We will not divulge the answers by specific schools or respondents to any other party, including other researchers or to any employee of the school district. Only summary data will be reported in any public report emanating from the survey. All of the information that participants provide via the survey will be protected and kept confidential to the extent allowed by law. Research records may be reviewed by the UCSD Institutional Review Board (IRB) as part of its oversight function.

Possible Risks
Some teachers may feel uneasy sharing ideas about the MDTP program in their school/in the district. Participation is completely voluntary, and you may decide not to participate, to skip questions you do not wish to answer, or to discontinue the survey at any time.

Possible Benefits
Teachers who complete the survey may contribute important ideas to help the MDTP program in SDUSD – and at schools across the state – become even more successful. In addition, teachers may enjoy the opportunity to reflect on the use of MDTP in SDUSD.

Publications Associated with this Research Study
A written report of research findings will be submitted to the California Academic Partnership Program (CAPP) and the Mathematics Diagnostic Testing Project (MDTP) by Summer 2012, but individual participants and schools will not be identified in any way. In addition, Dr. Betts will post results of the research on his website (http://www.econ.ucsd.edu/~jbetts/), including any findings on the ways that individual teachers, or mathematics departments within schools, use the MDTP tests and which practices are most strongly associated with improved student gains in mathematics achievement.

Teachers who would like more information about this research project may contact Dr. Julian Betts at jbetts@ucsd.edu or (858) 534-3369. You may call the Human Research Protections Program Office at (858) 455-5050 to ask about your rights as a research subject or to report research-related problems.

Sincerely,

Julian R. Betts, Ph.D.
Professor
Department of Economics

O	Please click here to indicate that you have read this Consent to Participate form and that you agree to participate in this study. This will automatically launch the MDTP teacher survey. Thank you so much for you support of this important project.

Thank you for agreeing to complete this
Mathematics Diagnostic Testing Project (MDTP) survey!

The survey has four sections.

Section A asks you about experiences you may have had with the MDTP testing that was mandated by San Diego Unified School District (SDUSD). *District-mandated* MDTP testing was used each spring in the 1999-2000 through 2007-2008 school years to help make course placement decisions for students for the following school year.

Section B asks you about experiences you might have had with MDTP testing that you *voluntarily* administered to students in one or more of your own mathematics classes. By "voluntary," we mean that you or the mathematics department at your school contacted the MDTP office at UCSD and ordered specific tests for one or more of your classes.

Section C is only for teachers who have *never* participated in MDTP *voluntary* testing.

Section D asks some questions about your instructional practice in mathematics and about mathematics professional development opportunities you may have had over the past several years.

SECTION A: DISTRICT-MANDATED ADMINISTRATION OF MDTP TESTS

All questions in this section are about the district-mandated administration of MDTP tests during spring 2000 through spring 2008 – the years when the district used spring MDTP results to make decisions about which mathematics courses students would take during the next school year.

If you have never taught a course in which a district-mandated MDTP test was administered, click here to skip this section of the survey. O

Please tell us which mathematics courses you remember teaching during the 1999-2000 through 2007-08 school years. (Check all that apply.)

6th Grade Math	Pre-Algebra	Algebra Readiness	Algebra I	Algebra Exploration	Geometry	Algebra II	Other

Now, we ask that you think about the mathematics courses you checked above and indicate the courses in which *district-mandated* MDTP tests were used. (Check all that apply.)

6th Grade Math	Pre-Algebra	Algebra Readiness	Algebra I	Algebra Exploration	Geometry	Algebra II	Other

Keeping those courses in mind, please answer the following questions:

1. Which of the following describe the ways you used the results from *district-mandated* MDTP testing *before the end of the school year that it was administered*? (Check all that apply.)

O	I reviewed MDTP test results for my class(es) on my own to determine overall strengths and weaknesses.
O	I reviewed MDTP test results for my class(es) on my own to determine particular misunderstandings and errors shared by many students.
O	I reviewed MDTP test results with other teachers.
O	We discussed spring MDTP test results at a formal meeting of the school's mathematics department.
O	I reviewed MDTP test results with a school administrator, counselor, or mathematics coach.
O	I distributed MDTP student letters to my students.
O	I reported my students' MDTP test results to parents.
O	I discussed MDTP test results with students in my class(es).
O	I selected and used one or more of the MDTP Written Response items in class.

O	I spent additional time in class working on areas in which my students performed poorly on the MDTP test.
O	I modified my teaching to help students understand and correct particular misunderstandings and errors that I identified when reviewing the MDTP test results.
O	MDTP results were used to inform placement decisions for my students' mathematics coursework for the next school year.

If you would like to provide additional detail about the ways you and your school used results from *district-mandated* MDTP testing *before the end of the school year in which it was administered*, please do so in this box.

2. Which of the following describe the ways you used the results from *district-mandated* MDTP testing *during the school year following the year that it was administered*? (Check all that apply.)

   Note: Please consider actions you might have taken during the summer following spring administration of MDTP testing as part of the "following school year" when responding to this question.

O	I reviewed MDTP test results for my class(es) on my own to determine overall strengths and weaknesses.
O	I reviewed MDTP test results for my class(es) on my own to determine particular misunderstandings and errors shared by many students.
O	I reviewed spring MDTP test results with other teachers.
O	We discussed spring MDTP test results at a formal meeting of the school's mathematics department.
O	I reviewed spring MDTP test results with a school administrator, counselor, or mathematics coach.
O	I discussed last year's students' individual MDTP results from the prior spring with the teacher who would be/was teaching those students in the next/current school year
O	I discussed my current year's students' individual MDTP results from the prior spring with the teacher who had taught those students in the prior school year.
O	I selected and used one or more of the MDTP Written Response items in class.
O	I spent additional time in class working on areas in which my students performed poorly on the MDTP test administered the previous spring.
O	I modified my teaching to help students understand and correct particular misunderstandings and errors that I identified when reviewing the MDTP test results.

If you would like to provide additional detail about the ways you and your school used results from district-mandated MDTP testing *during the school year following the year that it was administered*, please do so in this box.

3. The amount of influence that district-mandated MDTP testing had on my school's decisions about student placement into mathematics courses is best described as:

   O a high degree of influence
   O a moderate degree of influence
   O not much influence
   O no influence at all

4. Did your school change its overall approach to teaching mathematics based on analysis of results from district-mandated MDTP testing?

O	Yes
O	No

If you answered "yes" to question 4, please tell us how your school's approach changed. (Check all that apply.)

O	Teaching methods for specific mathematics topics were changed *because of the MDTP test results*.
O	Specific mathematics topics were emphasized/de-emphasized *because of the MDTP test results*.
O	Formal or informal professional development was provided to help teachers improve student understanding of certain mathematics topics, at least in part, *because of the MDTP test results*.
O	I changed the way I organized or taught my own course, at least in part, *based upon analysis of MDTP test results*.

If you would like to provide more detail about changes you and/or your school made as a result of district-mandated MDTP testing, please do so in this box. Please indicate whether the change was made in your own classroom or schoolwide.

5. Overall, how would you characterize the impact of district-mandated MDTP testing on the goal of teaching mathematics to your students? MDTP was:

O	Extremely positive
O	Somewhat positive
O	Neutral
O	Somewhat negative
O	Extremely negative

If you would like to provide information about the benefits/drawbacks of district-mandated MDTP testing, please do so in this box.

6. What suggestions do you have for improving the usefulness of district-mandated MDTP testing, MDTP tests, and/or other MDTP resources (e.g., parent reports, written response items)?

If you would like to provide suggestions, please do so in this box.

SECTION B: VOLUNTARY ADMINISTRATION OF MDTP TESTS

All questions in this section are about *voluntary* use of MDTP tests by you or your school. This testing is separate from the *district-mandated* testing used for course placement that was covered in Section A.

If you or your school have never *voluntarily* administered MDTP tests, click here to skip this section of the survey. O

1. Which of the following best characterizes your *voluntary* use of MDTP testing? (Check one.)

O	I decided on my own to use MDTP tests voluntarily. I typically use MDTP tests in every class for which a given MDTP test addresses relevant material.
O	I decided on my own to use MDTP tests voluntarily. I typically use MDTP tests for some, but not all, of the classes for which a given MDTP test addresses relevant materials.
O	My school's mathematics department decided that we would use MDTP tests voluntarily. We typically use MDTP tests, schoolwide, in every class for which a given MDTP test addresses relevant material.
O	My school's mathematics department decided that we would use MDTP tests voluntarily. We typically use MDTP tests, for some, but not all, of the classes for which a given MDTP test addresses relevant material.

[Respondents who answer "every class" (either individual or schoolwide) will be automatically routed to Question 3.]

2. You indicated that you and/or your school typically use *voluntary* MDTP testing with some, but not all, of the classes for which a relevant MDTP test is available. Which of the following characterize your reasons for selecting only some classes? (Check all that apply.)

O	I/We tend to use MDTP tests when the class appears to have lower-than-average mathematics achievement.
O	I/We tend to use MDTP tests when the class appears to have higher-than-average mathematics achievement.
O	I/We tend to use MDTP tests when students in the class appear to have a range of mathematics achievement.
O	I have changed my use of MDTP over time.
O	The mathematics department at my school has changed its policy on our school's voluntary MDTP use over time.
O	I/We tend to use MDTP tests in only selected courses (e.g., Pre-Algebra, Algebra).

O	Other reasons. (Please describe.)

3. When have you *voluntarily* administered MDTP tests? (Check all that apply.)

O	At the beginning of the school year (September through November)
O	In the middle of the school year (December through February)
O	At the end of the school year (March through June)

[Respondents who answer "at the end of the school year" will be automatically routed to Question 4. Respondents who do not indicate spring administration will be automatically routed to Question 5.]

4. **If you voluntarily administered MDTP tests in the spring**: Which of the following describe the ways you and the mathematics department at your school used the results from *voluntary* MDTP testing *before the end of the school year that it was administered*? (Check all that apply.)

O	I reviewed MDTP test results for my class(es) on my own to determine overall strengths and weaknesses.
O	I reviewed MDTP test results for my class(es) on my own to determine particular misunderstandings and errors shared by many students.
O	I reviewed MDTP test results with other teachers.
O	We discussed MDTP test results at a formal meeting of the school's mathematics department.
O	I reviewed MDTP test results with a school administrator, counselor, or mathematics coach.
O	I distributed MDTP student letters to my students.
O	I reported my students' MDTP test results to parents.
O	I discussed MDTP test results with students in my class(es).
O	I selected and used one or more of the MDTP Written Response items in class.
O	I spent additional time in class working on areas in which my students performed poorly on the MDTP test.
O	I modified my teaching to help students understand and correct particular misunderstandings and errors that I identified when reviewing the MDTP test results.

If you would like to provide additional detail about the ways you and your school used results from *voluntary* MDTP testing *before the end of the school year that it was administered*, please do so in this box.

5. Overall, how would you characterize the impact of *voluntary* MDTP testing on the goal of teaching mathematics to your students/students at your school? MDTP was:

O	Extremely positive
O	Somewhat positive
O	Neutral
O	Somewhat negative
O	Extremely negative

If you would like to provide information about the benefits/drawbacks of *voluntary* MDTP testing, please do so in this box.

6. What suggestions do you have for improving the usefulness of voluntary MDTP testing, MDTP tests, and/or other MDTP resources (e.g., parent reports, written response items)?

If you would like to provide suggestions, please do so in this box.

SECTION C: FOR TEACHERS/SCHOOLS THAT HAVE NEVER VOLUNTARILY USED MDTP TESTS

1. Which of the following factors best explain why you have never voluntarily used MDTP tests in your mathematics classes? (Check all that apply.)

O	I do not have sufficient knowledge of the MDTP program or how it works.
O	I feel that I can get adequate insights into my students' strengths and weaknesses through my own tests and quizzes.
O	I feel that I can get adequate insights into my students' strengths and weaknesses through their previous year's CST scores.
O	I feel that I can get adequate insights into my students' strengths and weaknesses by talking to the teacher(s) who taught them in previous years.
O	I do not have enough time to administer an additional 45-minute test.
O	Other. (Please describe.)

SECTION D: TEACHING AND LEARNING MATHEMATICS

All questions in this section of the survey are about mathematics instruction in your class(es) and the kinds of mathematics professional development you may have experienced over the past five years.

1. **Instructional Time**: Listed below are types of activities that students in your class(es) could engage in during mathematics instruction. For each activity, please estimate the relative amount of time a typical student will spend engaged in that activity during classroom instruction over the course of a school year. The activities are not mutually exclusive; please consider each activity individually.

Activity	None	Small Amount	Moderate Amount	Considerable Amount
Listen to the teacher present mathematical concepts, ideas, applications, or results	O	O	O	O
Watch the teacher demonstrate or explain how to do a procedure or solve a problem.	O	O	O	O
Work individually on non-routing problems, investigations, or tasks.	O	O	O	O
Participate in peer discussions about non-routine problems, investigations, or tasks, including justifying solutions.	O	O	O	O
Complete routine exercises or computational procedures (e.g., from a textbook or worksheet).	O	O	O	O
Present or demonstrate solutions to a mathematics problem to the whole class.	O	O	O	O
Use manipulatives, measurement instruments, and data collection devices.	O	O	O	O
Use computers, calculators, or other technology.	O	O	O	O
Write about mathematics (e.g., journaling, quick writes, keeping a math log).	O	O	O	O

2. **Student Activities**: Listed below are types of activities that students in your class(es) might have engaged in when working on mathematics exercises, problems, investigations, or tasks. For each activity, please estimate the relative amount of time your students will spend engaged in that activity during classroom instruction over the course of a school year. The activities are not mutually exclusive; please consider each activity individually.

Activity	None	Small Amount	Moderate Amount	Considerable Amount
Solve non-routine problems (i.e., where the solution method is not given or obvious).	O	O	O	O
Use several sentences orally or in writing to explain the reasoning or thinking used in solving a problem.	O	O	O	O
Solve real-world problems or work on real-world scenarios. (By real-world, we mean problems applied to contexts beyond mathematics. For example, an applied business problem might involve solving an equation for a single unknown, such as the interest rate at which an investment opportunity becomes unprofitable.)	O	O	O	O
Make estimates, predictions, or hypotheses.	O	O	O	O
Analyze mathematical situations, including those involving data, to make inferences or draw conclusions.	O	O	O	O
Reflect upon and analyze their solution(s) to develop or understand procedures or strategies.	O	O	O	O
Work on routine exercises designed to help students master mathematical operations (such as factoring equations).	O	O	O	O
Use multiple representations to demonstrate understanding and communicate connections between and among ideas/concepts.	O	O	O	O

3. **Professional Development Topics**: Over the last five years, how much emphasis have your professional development activities placed on the following topics? (If you have been teaching for fewer than five years, please comment on that shorter period of time.)

Topic	None	Small Amount	Moderate Amount	Considerable Amount
Alignment of instruction to curriculum/standards/ mandated tests.	0	0	0	0
Deconstructing/unpacking standards.	0	0	0	0
Instructional approaches or strategies.	0	0	0	0
In-depth study of mathematics.	0	0	0	0
Study of how students learn mathematics.	0	0	0	0
Individual differences in student learning.	0	0	0	0
Teacher- or school-developed classroom mathematics assessment.	0	0	0	0
Interpretation of assessment data for use in instruction.	0	0	0	0
Technology to support student learning.	0	0	0	0
Strategies for teaching English Learners.	0	0	0	0
Analyzing high-stakes tests (district benchmarks, CST released items)	0	0	0	0
Response to Instruction and Intervention (RTI^2).	0	0	0	0

4. **Professional Development Types**: How frequently did you engage in each of the following professional development activities (specifically related to the teaching and learning of mathematics) during the last school year?

Professional Development Type	**None**	**Once or Twice**	**Monthly**	**Weekly**	**Daily**
Attended conferences outside school related to mathematics or mathematics education.	O	O	O	O	O
Attended mathematics department meetings focused on mathematics or mathematics education.	O	O	O	O	O
Participated in a teacher study group about mathematics or mathematics education.	O	O	O	O	O
Participated in a committee or task force focused on mathematics curriculum and instruction.	O	O	O	O	O
Observed another teacher teaching a lesson in person or through media (computer or television).	O	O	O	O	O
Discussed student work or scored assessments with another teacher.	O	O	O	O	O
Acted as a coach or mentor to another mathematics teacher.	O	O	O	O	O
Received coaching or mentoring about mathematics or mathematics education.	O	O	O	O	O
Engaged in self-directed learning about mathematics or mathematics education.	O	O	O	O	O
Course Alikes	O	O	O	O	O
Modified Lesson Study	O	O	O	O	O
Response to Intervention and Instruction (RTI^2)	O	O	O	O	O
Quality Teaching for English Learners (QTEL)	O	O	O	O	O
i21 Training (Active Inspire – Promethean)	O	O	O	O	O

You're almost finished!

Below, we ask for your contact information so that we can send you a $10 gift card for completing this survey. Please be assured that nobody will be able to identify individual teachers and their responses to this survey – except for the research team at UC San Diego. **Your name, contact information, and responses will be kept completely confidential**.

YOUR CONTACT INFORMATION

Last Name:	First Name:
SDUSD School Where You Now Teach:	
Email Address:	

THANK YOU SO MUCH FOR TAKING THE TIME TO COMPLETE THIS SURVEY!

Table A1
Reported Use of MDTP Test Results from District-Mandated Administration, *Before the End of the School Year of Administration*, by Greater than Expected/Less than Expected Student Gain

Use of MDTP Test Results from Spring Administration	**Percent Reporting Use *Before End of School Year***	
	Greater than Expected Gain	Less than Expected Gain
Described Use of MDTP Test Results Before End of Year	15 of 15 (100%)	10 of 11 (90.1%)
Reviewed results on my own to determine overall strengths and weaknesses	80.0	70.0
Used to inform placement decisions for next school year	66.7	70.0
Reviewed on my own to determine misunderstandings and errors shared by students	60.0	40.0
Discussed results with students in my classes	40.0	70.0
Distributed MDTP student letters to students	40.0	60.0
Modified teaching to help students understand and correct misunderstandings and errors revealed by test	33.3	50.0
Discussed results at a formal meeting of school's mathematics department	33.3	50.0
Spent additional time working on areas in which my students performed poorly	33.3	40.0
Reviewed with other teachers	26.7	40.0
Reviewed with a school administrator, counselor, or mathematics coach	13.3	20.0
Reported students' test results to parents	13.3	20.0
Used one or more of MDTP Written Response items	0.0	0.0

Table A2
Reported Use of MDTP Test Results from District-Mandated Administration, in the *School Year Following Administration*, by Greater than Expected/Less than Expected Student Gain

Use of MDTP Test Results from Spring Administration	**Percent Reporting Use *Next School Year***	
	Greater than Expected Gain	Less than Expected Gain
Described Use of MDTP Test Results in Following Year	9 of 15 (60.0%)	8 of 11 (72.7%)
Modified teaching to help students understand and correct misunderstandings and errors revealed by test	66.7	50.0
Reviewed results on my own to determine overall strengths and weaknesses	55.6	62.5
Reviewed on my own to determine misunderstandings and errors shared by students	55.6	37.5
Discussed results at a formal meeting of school's mathematics department	44.4	12.5
Spent additional time working on areas in which my students performed poorly	44.4	37.5
Discussed my last year's students' individual results with the teacher who was teaching them in the current school year.	33.3	12.5
Reviewed with other teachers	22.2	62.5
Reviewed with a school administrator, counselor, or mathematics coach	11.1	12.5
Used one or more of MDTP Written Response items	0.0	0.0
Discussed my current year's students' results with the teacher who had taught those students last year.	0.0	50.0

Table A3
Percent Reporting Moderate or Considerable Amount of Instructional Time, by Activity Type, by Greater than Expected/Less than Expected Student Gain

Activity	**Overall**	**Greater than Expected Gain**	**Less than Expected Gain**
	n=115	n= 30	n=26
Watch teacher demonstrate or explain how to do a procedure or solve problem	82.6	83.3	96.2
Listen to teacher present mathematical concepts, ideas, applications, or results	81.7	83.3	80.8
Complete routine exercises or computational procedures	70.4	76.7	69.2
Use computers, calculators, or other technology	67.3	53.3	57.7
Work individually on non-routine problems, investigations, or tasks	53.9	60.0	61.5
Present or demonstrate solutions to a mathematics problem to the whole class	47.0	43.3	42.3
Participate in peer discussions about non-routine problems, investigations, or tasks	42.6	40.0	46.2
Use manipulatives, measurement instruments, and data collection devices	29.9	26.7	30.8
Write about mathematics	22.8	16.7	15.4

Table A4
Percent Reporting Moderate or Considerable Amount of Instructional Time, by Activity Type, for District-Mandated Use, Voluntary Use, and No Use of MDTP Readiness Tests

Activity	**Overall**	**No MDTP Use**	**Voluntary MDTP Use**	**District-Mandated Use**
	n=115	n=29	n=78	n=49
Watch teacher demonstrate or explain how to do a procedure or solve problem	82.6	89.7	80.8	83.3
Listen to teacher present mathematical concepts, ideas, applications, or results	81.7	93.1	78.2	79.7
Complete routine exercises or computational procedures	70.4	79.3	66.7	64.6
Use computers, calculators, or other technology	67.3	65.5	67.9	70.8
Work individually on non-routine problems, investigations, or tasks	53.9	48.3	55.1	52.1
Present or demonstrate solutions to a mathematics problem to the whole class	47.0	65.5	39.7	50.0
Participate in peer discussions about non-routine problems, investigations, or tasks	42.6	62.1	37.2	31.3
Use manipulatives, measurement instruments, and data collection devices	29.9	41.4	24.1	27.1
Write about mathematics	22.8	30.0	21.8	18.8

Table A5
Percent Reporting Moderate or Considerable Amount of Instructional Time, by Activity Type, by Length of Teaching Experience

Activity	**Overall**	**≤10 Years Experience**	**11-20 Years Experience**	**>20 Years Experience**
	n=115	n=42	n=30	n=33
Watch teacher demonstrate or explain how to do a procedure or solve problem	82.6	78.6	80.0	87.9
Listen to teacher present mathematical concepts, ideas, applications, or results	81.7	78.6	73.3	87.9
Complete routine exercises or computational procedures	70.4	78.6	63.3	63.6
Use computers, calculators, or other technology	67.3	61.9	60.0	72.7
Work individually on non-routine problems, investigations, or tasks	53.9	59.5	53.3	51.5
Present or demonstrate solutions to a mathematics problem to the whole class	47.0	45.2	43.3	48.5
Participate in peer discussions about non-routine problems, investigations, or tasks	42.6	52.4	30.0	42.4
Use manipulatives, measurement instruments, and data collection devices	29.9	21.4	30.0	30.3
Write about mathematics	22.8	31.0	13.3	23.5

Table A6
Percent Reporting Moderate or Considerable Amount of Time Spent Engaged in Activity While Students Work on Mathematics Exercises, Problems, Investigations, or Tasks, by Activity Type, by Greater than Expected/Less than Expected Student Gain

Activity	**Overall**	**Greater than Expected Gain**	**Less than Expected Gain**
	n=115	n= 30	n=26
Work on routine exercises designed to help students master mathematical operations	83.4	80.0	80.8
Use multiple representations to demonstrate understanding and communicate connections between and among ideas/concepts	70.5	80.0	73.1
Reflect upon and analyze their solution(s) to develop or understand procedures or strategies	61.1	60.0	65.4
Solve real-world problems or work on real-world scenarios	55.7	60.0	50.0
Make estimates, predictions, or hypotheses	44.4	36.7	42.3
Analyze mathematical situations, including those involving data, to make inferences or draw conclusions	39.2	40.0	38.5
Solve non-routine problems	36.5	46.7	42.3
Use several sentences orally or in writing to explain the reasoning or thinking used in solving a problem	34.8	26.7	38.5

Table A7
Percent Reporting Moderate or Considerable Amount of Time Spent Engaged in Activity While Students Work on Mathematics Exercises, Problems, Investigations, or Tasks, by Activity Type, by District-Mandated Use, Voluntary Use, and No Use of MDTP Readiness Tests

Activity	**Overall**	**No MDTP Use**	**Voluntary MDTP Use**	**District-Mandated Use**
	n=115	n=29	n=78	n=49
Work on routine exercises designed to help students master mathematical operations	83.4	93.1	76.9	79.6
Use multiple representations to demonstrate understanding and communicate connections between and among ideas/concepts	70.5	62.1	73.1	75.5
Reflect upon and analyze their solution(s) to develop or understand procedures or strategies	61.1	65.5	57.7	57.1
Solve real-world problems or work on real-world scenarios	55.7	55.2	60.3	57.1
Make estimates, predictions, or hypotheses	44.4	37.9	47.4	51.0
Analyze mathematical situations, including those involving data, to make inferences or draw conclusions	39.2	34.5	41.0	36.7
Solve non-routine problems	36.5	37.9	33.3	30.6
Use several sentences orally or in writing to explain the reasoning or thinking used in solving a problem	34.8	44.8	33.3	28.6

Table A8
Percent Reporting Moderate or Considerable Amount of Time Spent Engaged in Activity While Students Work on Mathematics Exercises, Problems, Investigations, or Tasks, by Activity Type, by Length of Teaching Experience

Activity	**Overall**	**≤10 Years Experience**	**11-20 Years Experience**	**>20 Years Experience**
	n=115	n=42	n=30	n=33
Work on routine exercises designed to help students master mathematical operations	83.4	90.5	70.0	84.8
Use multiple representations to demonstrate understanding and communicate connections between and among ideas/concepts	70.5	66.7	80.0	75.8
Reflect upon and analyze their solution(s) to develop or understand procedures or strategies	61.1	59.5	60.0	66.7
Solve real-world problems or work on real-world scenarios	55.7	59.5	60.0	51.5
Make estimates, predictions, or hypotheses	44.4	38.1	53.3	57.6
Analyze mathematical situations, including those involving data, to make inferences or draw conclusions	39.2	33.3	40.0	51.5
Solve non-routine problems	36.5	42.9	43.3	24.2
Use several sentences orally or in writing to explain the reasoning or thinking used in solving a problem	34.8	31.0	30.0	48.5

Table A9
Emphasis in Mathematics Professional Development in Last Five Years

Topic	None	Small Amount	Moderate Amount	Considerable Amount
Alignment of instruction to curriculum, standards, and mandated tests	1.7	21.7	33.9	42.6
Deconstructing/unpacking standards	13.2	49.1	28.1	9.6
Instructional approaches or strategies	0.0	30.1	52.2	17.7
In-depth study of mathematics	30.7	47.4	17.5	4.4
Study of how students learn mathematics	26.3	43.9	27.2	2.6
Individual differences in student learning	9.7	40.7	38.1	11.5
Teacher- or school-developed classroom mathematics assessment	11.4	43.0	31.6	14.0
Interpretation of assessment data for use in instruction	6.1	28.7	39.1	26.1
Technology to support student learning	2.7	25.7	37.2	34.5
Strategies for teaching English Learners	8.7	33.0	40.9	17.4
Analyzing high-stakes tests (district benchmarks, CST released items)	5.3	25.4	40.4	28.9
Response to Instruction and Intervention (RTI^2)	27.7	45.5	21.4	5.4

Table A10
Percent Reporting Moderate or Considerable Amount of Emphasis in Professional Development in Last Five Years, by Topic, by Greater than Expected/Less than Expected Student Gain

Activity	**Overall**	**Greater than Expected Gain**	**Less than Expected Gain**
	n=115	n= 30	n=26
Alignment of instruction to curriculum, standards, and mandated tests	76.5	76.7	73.1
Technology to support student learning	71.7	73.3	73.1
Instructional approaches or strategies	69.9	70.0	76.9
Analyzing high-stakes tests (district benchmarks, CST released items)	69.3	60.0	96.2
Interpretation of assessment data for use in instruction	65.2	66.7	76.9
Strategies for teaching English Learners	58.3	46.7	69.2
Individual differences in student learning	48.7	43.3	46.2
Teacher- or school-developed classroom mathematics assessment	45.2	43.3	46.2
Deconstructing/unpacking standards	37.4	23.3	46.2
Study of how students learn mathematics	26.7	20.0	42.3
Response to Instruction and Intervention (RTI^2)	26.1	26.7	26.9
In-depth study of mathematics	21.7	26.7	26.9

Table A11
Percent Reporting Moderate or Considerable Amount of Emphasis in Professional Development in Last Five Years, for District-Mandated Use, Voluntary Use, and No Use of MDTP Readiness Tests

Activity	**Overall**	**No MDTP Use**	**Voluntary MDTP Use**	**District-Mandated Use**
	n=115	n=29	n=78	n=49
Alignment of instruction to curriculum, standards, and mandated tests	76.5	79.3	78.2	79.6
Technology to support student learning	70.4	55.2	75.6	75.5
Instructional approaches or strategies	69.9	75.9	79.5	61.2
Analyzing high-stakes tests (district benchmarks, CST released items)	69.3	69.0	70.5	71.4
Interpretation of assessment data for use in instruction	65.2	72.4	64.1	59.2
Strategies for teaching English Learners	58.3	72.4	56.4	51.0
Individual differences in student learning	48.7	62.1	44.9	49.0
Teacher- or school-developed classroom mathematics assessment	45.2	55.2	44.9	38.8
Deconstructing/unpacking standards	37.4	34.5	42.3	36.7
Study of how students learn mathematics	26.7	34.5	29.5	28.6
Response to Instruction and Intervention (RTI^2)	26.1	55.2	15.4	14.3
In-depth study of mathematics	21.7	20.7	24.4	22.4

Table A12
Percent Reporting Moderate or Considerable Amount of Emphasis in Professional Development in Last Five Years, by Length of Teaching Experience

Activity	**Overall**	**≤10 Years Experience**	**11-20 Years Experience**	**>20 Years Experience**
	n=115	n=42	n=30	n=33
Alignment of instruction to curriculum, standards, and mandated tests	76.5	83.3	60.0	84.8
Technology to support student learning	70.4	73.8	70.0	70.0
Instructional approaches or strategies	69.9	81.0	76.7	48.5
Analyzing high-stakes tests (district benchmarks, CST released items)	69.3	88.1	46.7	75.8
Interpretation of assessment data for use in instruction	65.2	81.0	46.7	63.6
Strategies for teaching English Learners	58.3	78.6	40.0	48.5
Individual differences in student learning	48.7	66.7	33.3	39.4
Teacher- or school-developed classroom mathematics assessment	45.2	64.3	33.3	36.4
Deconstructing/unpacking standards	37.4	42.9	33.3	33.3
Study of how students learn mathematics	26.7	40.5	26.7	21.2
Response to Instruction and Intervention (RTI^2)	26.1	47.6	13.3	6.1
In-depth study of mathematics	21.7	31.0	23.3	15.2

Table A13
Frequency of Mathematics Professional Development in Last School Year, by Type

Professional Development Type	Never	Once or Twice	Monthly	Weekly	Daily
Attended conferences outside school related to mathematics or mathematics education	28.1	69.3	1.8	0.9	0.0
Attended mathematics department meetings focused on mathematics or mathematics education	8.7	20.9	55.7	14.8	0.0
Participated in a teacher study group about mathematics or mathematics education	44.3	31.3	15.7	7.0	1.7
Participated in a committee or task force focused on mathematics curriculum and instruction	61.4	21.9	12.3	4.4	0.0
Observed another teacher teaching a lesson in person or through media	21.7	50.4	13.9	7.0	7.0
Discussed student work or scored assessments with another teacher	13.9	31.3	21.7	27.8	5.2
Acted as a coach or mentor to another mathematics teacher	46.1	27.8	10.4	8.7	7.0
Received coaching or mentoring about mathematics or mathematics education	49.1	31.6	11.4	7.9	0.0
Engaged in self-directed learning about mathematics or mathematics education	20.2	28.1	32.5	10.5	8.8
Course Alikes	54.9	21.2	14.2	4.4	5.3
Modified Lesson Study	56.1	21.1	8.8	6.1	7.9
Response to Instruction and Intervention (RTI^2)	56.4	25.5	10.9	2.7	4.5
Quality Teaching for English Learners (QTEL)	50.0	33.3	8.8	4.4	3.5
i21 Training (Promethean)	14.0	51.8	22.8	6.1	5.3

Table A14
Most Frequent Types of Mathematics Professional Development in Last School Year, by Greater than Expected/Less than Expected Student Gain

Activity	**Overall**	**Greater than Expected Gain**	**Less than Expected Gain**
	n=115	n= 30	n=26
Attended mathematics department meetings focused on mathematics or mathematics education	91.3	96.7	92.3
Discussed student work or scored assessments with another teacher	86.1	86.7	84.6
i21 Training (Promethean)	86.1	86.7	86.6
Engaged in self-directed learning about mathematics or mathematics education	80.0	76.7	92.3
Observed another teacher teaching a lesson in person or through media	78.3	83.3	73.1
Attended conferences outside school related to mathematics or mathematics education	72.2	70.0	80.8
Participated in a teacher study group about mathematics or mathematics education	55.7	96.7	50.0
Acted as a coach or mentor to another mathematics teacher	53.9	56.7	65.4
Received coaching or mentoring about mathematics or mathematics education	51.3	46.7	53.8
Quality Teaching for English Learners (QTEL)	50.4	43.3	50.0
Course Alikes	46.1	56.7	50.0
Response to Instruction and Intervention (RTI^2)	46.1	56.7	38.5
Modified Lesson Study	44.3	46.7	30.8
Participated in a committee or task force focused on mathematics curriculum and instruction	39.1	40.0	38.5

Table A15
Most Frequent Types of Mathematics Professional Development in Last School Year, District-Mandated Use, Voluntary Use, and No Use of MDTP Readiness Tests

Activity	Overall	No MDTP Use	Voluntary MDTP Use	District-Mandated Use
	n=115	n=29	n=78	n=49
Attended mathematics department meetings focused on mathematics or mathematics education	91.3	86.2	94.9	91.8
Discussed student work or scored assessments with another teacher	86.1	86.2	85.9	87.8
i21 Training (Promethean)	86.1	75.9	88.5	91.8
Engaged in self-directed learning about mathematics or mathematics education	80.0	86.2	78.2	77.6
Observed another teacher teaching a lesson in person or through media	78.3	75.9	80.8	75.5
Attended conferences outside school related to mathematics or mathematics education	72.2	55.2	82.1	79.6
Participated in a teacher study group about mathematics or mathematics education	55.7	55.2	57.7	51.0
Acted as a coach or mentor to another mathematics teacher	53.9	51.7	57.7	49.0
Received coaching or mentoring about mathematics or mathematics education	51.3	75.9	44.9	38.8
Quality Teaching for English Learners (QTEL)	50.4	58.6	48.7	51.0
Course Alikes	46.1	55.2	43.6	36.7
Response to Instruction and Intervention (RTI^2)	46.1	65.5	38.5	46.9
Modified Lesson Study	44.3	58.6	39.7	44.9
Participated in a committee or task force focused on mathematics curriculum and instruction	39.1	51.7	38.5	32.7

Table A16
Most Frequent Types of Mathematics Professional Development in Last School Year, by Length of Teaching Experience

Activity	Overall	≤10 Years Experience	11-20 Years Experience	>20 Years Experience
	n=115	n=42	n=30	n=33
Attended mathematics department meetings focused on mathematics or mathematics education	91.3	90.7	96.7	87.9
Discussed student work or scored assessments with another teacher	86.1	92.9	90.0	75.8
i21 Training (Promethean)	86.1	88.1	86.7	87.9
Engaged in self-directed learning about mathematics or mathematics education	80.0	88.1	80.0	75.8
Observed another teacher teaching a lesson in person or through media	78.3	83.3	83.3	72.7
Attended conferences outside school related to mathematics or mathematics education	72.2	73.8	76.7	69.7
Participated in a teacher study group about mathematics or mathematics education	55.7	59.5	60.0	51.1
Acted as a coach or mentor to another mathematics teacher	53.9	54.8	60.0	51.5
Received coaching or mentoring about mathematics or mathematics education	51.3	69.0	50.0	30.3
Quality Teaching for English Learners (QTEL)	50.4	61.9	53.3	39.4
Course Alikes	46.1	61.9	46.7	27.3
Response to Instruction and Intervention (RTI^2)	46.1	50.0	56.7	33.3
Modified Lesson Study	44.3	54.8	50.0	30.3
Participated in a committee or task force focused on mathematics curriculum and instruction	39.1	50.0	26.7	39.4