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Traditional or Standards-Based Mathematics? The Choices of Students and Parents in One District

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In 1989, the National Council of Teachers of Mathematics (NCTM) published its *Curriculum and Evaluation Standards*, calling for "mathematical literacy and power for all students."[1] In this and subsequent documents, NCTM has promoted a vision of mathematics teaching centered around problem solving, student reasoning, and classroom discourse.[2] By 1993, more than half of the 50 states had changed their testing or curricular recommendations in light of the *Standards*.[3] Additionally, the National Science Foundation funded 13 multimillion-dollar curriculum development projects to implement NCTM's vision. These curricula began making their way into schools by the mid-1990s, and their use is continuing to expand. However, as Fullan has observed, the implementation and sustainability of education reforms is dependent upon the mobilization and coherence of forces from both inside the schools (administrators, teachers, students) and outside (parents, community leaders).[4] This article focuses on two forces that have received relatively little attention among scholars and in educators' implementation of mathematics education reform: parents and students.

The benefits of *Standards*-based instruction have been the subject of much debate in various education communities. Proponents of the *Standards* highlight the fact that scores on the main mathematics portion of the National Assessment of Educational Progress (NAEP) rose substantially between 1990 and 2000.[5] On the other hand, critics have noted that scores on NAEP's long-term-trend mathematics test, which focuses more on basic computational skills than does the main mathematics NAEP, have remained flat.[6]

Evidence from pilot tests of the new, NSF-funded, *Standards*-based curricula has generally been promising, with students in *Standards*-based classrooms outscoring control groups on a variety of measures and in a variety of contexts.[7] In particular, in field tests of *Core Plus*, the curriculum discussed in this study, students using the new materials had better attitudes toward mathematics and performed better than peers in the areas of probability, statistics, calculus readiness, algebraic concepts, and algebraic problem solving. However, some pilot tests showed that students using trial versions of *Core Plus* performed less well than peers on

abstract symbol manipulation.[8]

Although the *Standards* have become the subject of much debate among scholars and within local communities, few researchers have examined what students and parents make of the reforms, including how they might choose between *Standards*-based and traditional instruction, if given the choice. In writing about NCTM's struggles to reach parents, past NCTM President Jack Price stated: "What has been most distressing since we released the *Standards*documents is that our efforts to inform parents better have fallen short."[9] Mathematics education researcher Dominic Peressini notes that parents can be "crucial in supporting or in obstructing" mathematics reform efforts.[10] Peressini calls for proactive, rather than reactive, approaches to involving parents in school reform.[11] The public outcry against *Standards*-based mathematics in California and the consequent reversion of the many instructional reforms in place in that state a decade ago highlight the importance of this point.[12]

Although reformers have argued that parents need to be convinced of the importance of the *Standards*, less attention has been given to parents' beliefs and goals, including how these are or are not compatible with current reforms. Fullan and Miles argue that when instructional change occurs, both school personnel and parents need to have opportunities to question the changes, to evaluate how the changes bear on their self-interest, and to learn from each other.[13] Fullan and Miles point out that too often parents' (and teachers') opposition to instructional change is written off as knee-jerk resistance or considered an individual "matter of attitude."[14]

A proactive approach to working with parents to reform mathematics education must be built upon deeper understandings of parents' desires and concerns for their children's mathematics learning and academic or vocational futures.[15] Additionally, researchers and educators should not view parents as a homogeneous group, but should instead seek to understand their diversity.

Past research suggests that socioeconomic status (SES) differences, in particular, shape parents' involvement with, and perspectives on, schooling.[16] High-SES parents tend to have more access to information about school policies and reforms, including those relating to mathematics curriculum and instruction. Some researchers also suggest that high-SES parents tend to make greater demands on school personnel, including pushing for programs and practices (such as tracking) that further their own children's advantages.[17] However, little attention has been given specifically to ways in which SES affects parents' perspectives on mathematics education reform.[18]

In addition to parent attitudes, there is much to learn about students' attitudes toward the changes occurring in mathematics classrooms.[19] *Standards*-based instruction calls for new roles for students, and such instruction depends upon their active fulfillment of those roles. Understanding students' interpretations of, and reactions to, their new roles is critical in order to most effectively implement *Standards*-based instruction. Yet few studies have examined students' perspectives on these reforms. Information available to date suggests that students'

reactions are diverse[20] and can vary by SES.[21]

This study examines students' and parents' perspectives on *Standards*-based mathematics instruction, including how these perspectives differ by option chosen and SES. Increased understanding of these perspectives can better position reformers, administrators, and teachers to implement mathematics instruction that best meets students' needs.

Context of the Study

A recent development in one Midwestern school district provides a unique opportunity to consider parent and student attitudes toward mathematics reform. The Plainview district serves 5,000 students in a relatively affluent community (population 50,000) encompassing a major university. However, the district also includes students from lower- and working-class backgrounds (11 percent qualify for free/reduced lunch). Plainview students are primarily white, with Asian students making up most of the 16 percent minority population in the schools. Plainview was chosen for this study because of particular changes in mathematics instruction occurring there.

In the mid-1990s, the Plainview elementary mathematics program changed to include the NSF-funded, *Standards*-based *Investigations*mathematics curriculum in grades K through 4. At that time, Plainview also began piloting the NSF-funded *Standards*-based *Mathematics in Context (MiC)* curriculum in grades 5 through 8. The district's curriculum leaders and mathematics cabinet (made up of local teachers, parents, university representatives, and the district's mathematics coordinator) collaborated with *MiC*'s creators to provide three years of mandatory professional development for 5th through 8th grade math teachers. This professional development included summer workshops, monthly study groups, and further individual assistance from *MiC* consultants and the district mathematics coordinator. One teacher at each grade level became a lead teacher and received additional training with the *MiC* developers.

Despite the strong support of the mathematics cabinet, administrators, and most mathematics teachers, heated controversy emerged among parents, school board members, and a few teachers about the transition to *MiC*. In contrast, the transition to *Investigations* in grades K through 4 received relatively little attention. This might be because parents were less concerned about these early grades, which are further removed from college trajectories, and because several K through 4 teachers maintained portions of their more traditional, skills-based curricula as they implemented the new curricula. The controversy over *MiC* was fueled partly by a decline in middle-school scores on the computation portion of the Iowa Test of Basic Skills that became apparent just as *MiC* was beginning to be piloted in some Plainview classrooms. (According to district and *MiC* leaders, the drop occurred too early to be attributable to *MiC*). In conjunction with *MiC* developers, the district developed multiple ways to address the community's concerns.[22] Yet despite Plainview's attempts to address parents' concerns, and despite the complete rebound in computation scores (and the fact that other standardized test scores in mathematics concepts and problem solving have remained steady or increased slightly), dissension about *MiC* has persisted. However, the district continues to use *Investigations* and *MiC*for its elementary and middle school curricula.

The community controversy over *MiC* slowed plans to replace the high school's traditional mathematics sequence with a *Standards*-based program. Mathematics instruction at the high school remained unchanged until fall 2000, when the district's mathematics cabinet and mathematics teachers introduced a four-year, integrated mathematics sequence based on the new, NSF-funded *Core Plus*texts. Hoping to avoid the controversies that had arisen in the community upon the transition to *MiC*, district leaders decided to offer parents, students, and teachers a choice between the traditional sequence (Algebra, Geometry, Algebra II, Pre-Calculus) and the *Standards*-based *Core Plus* sequence that integrates algebra, geometry, pre-calculus, and statistics (and is therefore referred to in the district as "Integrated Mathematics"). Accelerated middle school students beginning high school mathematics in 7th or 8th grade were also given the choice.

Information about the two options was sent home to parents in school newsletters and was presented via local-access television. The district held a parent meeting to prepare parents of 8th graders for the transition to high school. A meeting was also held specifically for parents of accelerated 6th and 7th grade students who would be taking Algebra I or Integrated Mathematics I (*Core Plus*) at the middle school the following year. At these meetings, the district's mathematics coordinator and teachers explained the differences between the two mathematics options, as outlined in Table 1. These mathematics leaders emphasized the differences in teaching and learning styles between the two instructional approaches and the fact that *Core Plus* integrated algebra, geometry, algebra II, and precalculus (and included some statistics/probability that the traditional sequence did not include). The leaders did not delineate details of test results from previous studies of *Core Plus* implementation (but when asked by parents they would say that *Core Plus* students did as well or better than control groups). Web site addresses were provided for parents who wished to examine more detailed information about the *Core Plus* curriculum (including pilot-testing data from other districts). Additionally, the Merrill *Algebra 1* text (copyright 1992) and the *Core Plus* texts were made available for parents to examine at parent meetings.

Table 1. Comparing Traditional and Integrated Mathematics

Traditional Algebra Sequence	**Integrated Sequence (*Core Plus*)**

• Mathematics strands are studied separately, one each year. • The teacher demonstrates. • Students practice.	• Mathematics strands are integrated each year. • The teacher guides and assesses (using multidimensional assessment). • Students investigate real-life contexts (often in groups) and develop a rich understanding of mathematics that enables them to solve new problems.

In fall 2000 and 2001, 600 Plainview students (primarily 8th and 9th graders) and their parents chose between the traditional and Integrated sequences. In this context, I examined the following questions:

1. How many students enrolled in Algebra, and how many enrolled in Integrated Mathematics? Are there patterns in option chosen that relate to prior achievement or SES?
2. What factors influenced student and parent choices between the two options? Were there SES differences in parents' access to information about the two options? Were there patterns in influencing factors that correlated with SES or option chosen?

These questions have been the focus of the first two years of this study. Over the next several years, changes in students' achievement and attitudes will be compared between the two mathematics options.

Method

Data Collection

With input from district mathematics teachers and administrators, I developed a parent/guardian permission form and survey, as well as a student survey. The forms and surveys were distributed to all of the Algebra I and Integrated I students and parents in fall 2000 and 2001.[23] Of the 600 students involved (107 Integrated and 493 Algebra), 375 secured parent permission. Surveys were completed by 338 of the 375 students (89 Integrated and 249 Algebra) and 333 of the 375 parents (90 Integrated and 243 Algebra). Hence, survey completion rates were more than 80 percent for Integrated students and parents, and only 50 percent for Algebra students and parents. The higher participation rate in Integrated was likely due to greater interest on the part of Integrated parents and greater support for this study by the Integrated teachers (e.g., Integrated teachers offered reminders and incentives for returned permission forms—regardless of whether permission was granted).

The parent survey listed 16 factors that might have influenced their choice between Algebra or

Integrated Mathematics, and parents were asked to rank the top four factors. The Algebra version of the parent survey listed the following factors:

- Your student wanted to take Algebra.
- A counselor encouraged your student to take Algebra.
- A teacher encouraged your student to take Algebra.
- You wanted your student to have the teacher who was going to teach Algebra.
- You thought Algebra would be more enjoyable/interesting for your student.
- You thought Algebra would be easier than Integrated Math.
- You thought Algebra would be more challenging than Integrated Math.
- You thought your student would understand math better with Algebra.
- You thought Algebra would be more like the middle school math curriculum.
- You thought Algebra would be less like the middle school math curriculum.
- You thought Algebra would better prepare your student for college.
- You thought Algebra would better prepare your student for real life.
- You thought Algebra would teach the math content you desired for your student.
- You thought an older, traditional program would be better than a new program.
- You thought your child could get more help at home (e.g., from you or siblings) if taking Algebra.
- You thought Algebra would best fit your child's learning style.
- Other: _____

These questions were modified as appropriate for the Integrated version of the survey.

Additionally, parents were given a list of possible sources of information about the two programs (school newsletter, parent night, examinations of the textbooks, Web site, "other") and asked to indicate which sources they accessed when making their decision. Finally, parents were asked to indicate the highest level of education obtained by either parent in the household. This parent education information was used as an approximation for SES.[24]

Participating students completed surveys in their mathematics classes. Like their parents, they were asked the reasons underlying their choice to be in Algebra or Integrated Mathematics (with the wording of the survey modified to fit each option). In Year 1, this question differed from the question on the parent survey by being presented as an open-ended response item. However, the responses received from most students were similar to the existing options presented on the parent survey (with the exception of students also naming parents and friends as influences). Hence, the Year 2 student survey paralleled the parent survey by asking respondents to rank the four most important factors from a list provided or to write in their own responses. The list of items was similar to the parents' list, with the addition of both

parents and friends as potential influences.

Data Analysis

In addition to the surveys collected from participating students and parents, I analyzed general data from the district (with names removed) for all 600 students involved. These data included students' option choice and previous test scores. I compared Algebra and Integrated students' previous test scores with t-tests to determine whether higher- or lower-achieving students were more likely to choose one option or the other. I used linear regression analyses to examine test score differences while controlling for grade level.

Analyses of open-ended survey responses regarding the reasons for parents' and students' choices (including written responses to the "other" prompts on the surveys) began with an examination of which responses were elaborations of predefined options on the parent survey, and which were new. The vast majority of the 71 responses written by parents were elaborations upon existing reasons (e.g., comments regarding the existing middle school curriculum, student's learning style, or family tradition). Students also gave responses that fit with predetermined options, but in Year 1, when no options were listed on the student survey, many students also named parents and friends as influences (which then became listed options on the Year 2 student survey, as explained previously). The relatively few remaining comments from parents and students were grouped under more than a dozen themes that emerged from repeatedly reading the parent and student comments. Examples of such themes included concerns about moving to another district, concerns about meshing with existing district programs (such as the gifted program), and scheduling issues.

Similarly, analyses of parents' written responses to the "other" prompt regarding which information sources they accessed began with an examination of which comments were merely elaborations of existing options, and which were new. Most of the 62 write-in responses were new, with parents pointing to a wide variety of sources (and few parents naming any one source). These responses were grouped into the categories of resources suggested by the data, including other parents, other students, counselors, college personnel, a television program, the newspaper, or administrators.

Once open-ended responses were categorized, I used cross-tabulation tables to examine the prevalence of both predefined and newly emergent parent/student decision factors, by parent education level and option choice. In the analyses reported here, responses were Boolean coded to indicate whether or not a factor was "selected," or, in other words, whether a parent or student ranked the factor among the four most important in their decision.

I initially recorded parent education level using a four-step ordinal variable that distinguished among students whose highest parent education level was high school (11 percent), bachelor's degree (27 percent), master's degree (23 percent), and Ph.D. (38 percent). Hence, the vast majority of sampled students had college-educated parents, with more than one-third having a parent with a Ph.D. These percentages do not reflect the general Plainview population because those students who were not on the standard college-preparatory mathematics track were not given the choice between Algebra and Integrated Mathematics.[25] The most popular factors

influencing students' and parents' choices of option were listed by parent education level. The contrasts in these lists were strongest between parents holding a college degree versus parents who did not. Hence, education level was Boolean coded (college-educated versus not college-educated), and Chi Square tests were used to examine patterns for significance. Similarly, Chi Square tests were also used to test patterns relating parent education and information sources accessed.

Additionally, I examined parent and student decision factors by the mathematics course chosen. Chi Square tests were used to analyze differences in the prevalence of decision factors for Algebra versus Integrated parents and students.

Given the large number of Chi Square comparisons made in the analyses of survey data, one must interpret significance tests cautiously. Taken individually, 25 differences were significant at the .05 level and are reported here as "significant." However, given that 84 comparisons were made during these analyses, one would expect at least 4 differences to be significant just by chance. Using the more conservative Bonferroni correction, differences would be considered significant only if $p<.05/84=.0006$. Differences meeting this more stringent $p<.0006$ significance level are also noted.

Eleven percent of responding students were Asian, 5 percent were black, 3 percent were Hispanic, and the remaining students were white. Race-related analyses are not reported here, because of the small sample sizes within some racial groups and consequent district concerns about student confidentiality. Additionally, great diversity occurs within the ethnic groups sampled because a large portion of Plainview's ethnic minority students are from other countries. Hence, for example, many of the Asian students are not Asian Americans, but are citizens of a wide variety of countries. Thus, discussing these students as a single group is less useful in this context than in other contexts in which ethnic groups are more homogenous.

Results

Integrated and Algebra Enrollment

The district's mathematics cabinet and many mathematics teachers and administrators supported the Integrated option and hoped that many students would choose it. However, relatively few students did. Despite the district's efforts to promote the Integrated sequence, less than 18 percent of the 600 eligible students enrolled in the Integrated option. However, this percentage varied by prior achievement and SES.

Because of its importance as a potential confounding variable, grade-level differences must be discussed before addressing patterns related to prior achievement and SES. A greater percentage of the accelerated middle school students (27 percent) than high school students (13 percent) chose Integrated Mathematics. The district personnel involved in informing parents about the options believe that these enrollment differences are due, at least in part, to their more active promotion of the Integrated option at the parent meeting for accelerated middle school students. (The high school meeting served a larger variety of purposes, allowing less time for discussion of the mathematics options.)

On average, the Integrated students had higher prior standardized mathematics test scores than the Algebra students. However, there were no significant differences between the test scores of Integrated and Algebra students within each grade. In other words, when controlling for grade level, prior achievement did not relate to option chosen.

Level of parent education correlated positively with Integrated enrollment. For example, whereas only 8 percent of students with non-college-educated parents were in Integrated mathematics, 31 percent of students with a Ph.D.-holding parent were in Integrated. However, again, grade level must be considered a confounding variable, because more students of parents with doctorates were accelerated and therefore making this choice in middle school, and more middle school students chose Integrated. When controlling for grade level, the correlation between option choice and parent education level was still present but weaker and no longer significant.

The above data raise the question: Why are so many Plainview parents and students choosing the traditional algebra option? Examinations of parents' and students' reasons for their choices shed some light on this question.

Parents' and Students' Decision Factors in General

When parents were asked to indicate the four most important factors influencing their mathematics option choice, students' desires (51 percent) and college preparation (45 percent) were selected most frequently (see Table 2). Student understanding of mathematics (40 percent), the course's mathematical content (34 percent), and student enjoyment (27 percent) were also popular responses.

Table 2. Top 5 Decision Factors for Parents and Students

Parent Responses (n = 333)	**Student Responses (n = 338)**
1. Student preference—51% 2. College preparation—45% 3. Student understanding—40% 4. Course content—34% 5. Student enjoyment—27%	1. Parent preference—30% 2. Student understanding—24% 3. Student enjoyment—24% 4. Less like middle school—23% 5. College preparation—20%

Note: Percentages are lower for student responses than parent responses because the student survey question was completely open-ended the first year of administration. The percentages include both Year 1 and Year 2 students.

Students' reasons for their choice of option differed somewhat from those given by parents. Parent preference was the factor most often cited, with 30 percent of students listing this as a primary reason for their choice. Wanting to understand mathematics, wanting to enjoy mathematics, and preferring a course less like middle school mathematics (*MiC*) were also popular reasons, each being mentioned by roughly 24 percent of students. College preparation was the next most popular reason, mentioned by 20 percent of students.

Parent and Student Decision Factors by Parent Education Level

Although parents' education level did not significantly affect their option choices (once grade-level differences were accounted for, as discussed earlier), the *reasons* parents gave for their choices varied significantly by education level (see Table 3). For parents with limited education, college was by far the most important decision factor, named by 70 percent of parents. Parents with limited education were also significantly more likely than college-educated parents to indicate that a teacher's advice (38 percent of non-college-educated parents versus 21 percent of college-educated parents) or counselor's advice (19 percent of non-college-educated parents versus 5 percent of college-educated parents) influenced their decision. In contrast, college-educated parents were significantly more likely than less educated parents to indicate that their desire for students to better understand mathematics (46 percent versus 27 percent) was a factor in their decision.

Table 3. Top 5 Parent Decision Factors, by Parent Education Level

H.S. (n = 37)	B.A. (n = 91)	M.A. (n = 77)	Ph.D. (n = 128)
1. College—70%	1. Student preference—57%	1. Student preference—56%	1. Student preference—53%
2. Student preference—49%	2. College—54%	2. Student understanding—52%	2. Student understanding—46%

3. Content—43%	3. Student understanding—39%	3. College—46%	3. College—45%
4. Teacher advice—38%	4. Content—37%	4. Content—42%	4. Student enjoyment—38%
5. Real life—35%	5. Student enjoyment—(28%)	5. Real life—33%	5. Content—33%
*Significant difference between college- and non-college-educated parents at p<.05 level (without Bonferroni correction)			

Students' responses showed much less variation across parent education levels. In fact, the top four reasons for each group were the same: parents' wishes, wanting a course less like middle school math, enjoyment, and understanding. The ordering of these four varied, somewhat, with parent advice being mentioned more often by students with college-educated parents. However, no differences were statistically significant.

Information sources were also examined by parent education level. Significantly more highly educated parents accessed information through parent nights and textbooks than did parents with limited education (see Table 4). School newsletters appeared to be the most equally accessible information source, with roughly 40 to 50 percent of parents from each category indicating this was an information source for them. Additionally, newsletters were the primary source of information for parents with limited formal education. More than 20 percent of high-school educated parents reported having no information about the two options (this was about double the percentage of other parents).

Table 4. Percentage of Parents Reporting Access to Various Types of Information, by Education

H.S. (n = 37)	B.A. (n = 91)	M.A. (n = 77)	Ph.D. (n = 128)

Newsletter—41%	Parent night—63%	Parent night—57%	Parent night—57%
Parent night—32%	Newsletter—51%	Discussed w/ teacher—43%	Discussed w/ teacher—41%
Discussed w/ teacher—27%	Discussed w/ teacher—41%	Newsletter—42%	Newsletter—39%
No information—22%	Texts—19%	Natl. trends—33%	Texts—36%
Natl. trends—19%	Natl. trends—12%	Texts—23%	Natl. trends—33%
Texts—11%	No information—9%	No information—14%	No information—9%
*Significant difference between college- and non-college-educated parents at p<.05 level (without Bonferroni correction)			

Interestingly, although 38 percent of high-school-educated parents reported that their decision was influenced by their child's teacher, only 27 percent actually talked with a teacher (see Table 3 and Table 4). A careful comparison of the survey questions' wording, along with analyses of written comments of parents and students, suggests that parents with limited education were influenced indirectly through statements made to their child by a teacher. In contrast, although 41 percent of college-educated parents reported discussing the options with a teacher, only 20 percent indicated that teacher advice actually influenced their decision.

Parent and Student Decision Factors by Option Choice

To further understand parents' and students' perspectives on the two options, differences were examined by option choice (see Table 5). Parents of Integrated students were significantly more likely than Algebra parents to indicate that student understanding (52 percent versus 36 percent), student enjoyment (48 percent versus 20 percent), and preparation for real life (43 percent versus 18 percent) were reasons for their course choice. Parents of Algebra students

were significantly more likely than Integrated parents to identify college preparation (51 percent versus 29 percent), course content (38 percent versus 23 percent), teacher advice to their student (29 percent versus 17 percent), and a desire to have a course less like middle school mathematics (17 percent versus 7 percent) as reasons for their choice.

Table 5. Top 5 Parent Decision Factors, by Course

Algebra (n = 243)	**Integrated (n = 90)**
1. Student preference—51% 2. College—51% 3. Content—38% 4. Student understanding—36% 5. Teacher advice—29%	1. Student understanding—52% 2. Student preference—51% 3. Enjoyment—48% 4. Real life—43% 5. College—29%
*Significant difference between Algebra and Integrated parents at p<.05 level (without Bonferroni correction) **Significant difference between Algebra and Integrated parents after Bonferroni correction (p<.0006)	

Integrated parents were significantly more likely than Algebra parents to report being aware of national trends in mathematics education (15 percent versus 2 percent), attending a parent night (70 percent versus 51 percent) and discussing the options with a teacher (55 percent versus 34 percent). This last finding might seem to contradict the fact that more Algebra than Integrated parents identified teacher advice to their student as a factor in their decision. This disparity could relate to the fact that disproportionately more low-SES parents both chose Algebra and received information from teachers through their students as opposed to talking directly with a teacher.

Many patterns in the student survey data were similar to trends noted in the parent data. More Algebra than Integrated students identified college preparation (22 percent versus 14 percent) and wanting a course less like middle school mathematics (25 percent versus 15 percent) as primary decision factors. Also, as with parents, significantly more Integrated than Algebra students identified enjoyment (39 percent versus 19 percent), real-life preparation (27 percent versus 9 percent), and understanding (32 percent versus 21 percent) as decision factors.[26]

However, unlike their parents, more Integrated than Algebra students said that teacher advice influenced their decisions. Additionally, significantly more Integrated than Algebra students said they chose their course because they thought it would be easier (20 percent versus 10 percent) or would match their learning style (15 percent versus 5 percent).

Written Responses: A Closer Look at Parent and Student Perspectives by Option Choice

In addition to selecting factors listed on the survey, many parents and students wrote comments to explain their choice between Algebra and Integrated mathematics. Some of their comments elaborated on why they chose the prelisted factors they did, whereas others explained additional reasons that were not among the listed options. Their comments shed light on some of the patterns in the survey data and also raise additional issues. Although the written responses were analyzed by SES, by far the strongest patterns related to option chosen. Comments from Integrated parents and students tended to focus on their preference for learning in *Standards*-based ways, whereas comments from Algebra parents and students tended to focus on their aversion to *MiC* mathematics, as well as the traditional, widespread acceptance of algebra.

Integrated Perspectives: Learning Styles

Consistent with survey data indicating that student understanding and enjoyment were particularly important for Integrated parents and students, written comments from 16 Integrated parents (18 percent) and 24 students (27 percent) elaborated on the match between students' learning styles and Integrated instruction (although some of these respondents did not select “learning style” as one of their reasons, perhaps because the term was not meaningful to them). Group work, contextualized problems, topic variety, and an emphasis on reasoning were each mentioned by several Integrated parents, as in the following comments:

> My son likes working in groups and reasoning about solutions.
>
> More hands on, not just do problems, applies to real life.
>
> The variety sounded better than doing algebra every day all year.

The 24 Integrated students' responses had similar themes:

> You get to work in groups.
>
> I learn better with questions from stories and stuff (like the *MiC* math in middle school).
>
> I like to figure things out and find out why/how they work—Integrated supports this.
>
> I thought it would be easy, because *MiC* math was easy. I wouldn't have to memorize rules like in Algebra.
>
> My great-uncle said I should try it (he's a math teacher). This way I don't do the same thing all year.

However, as discussed earlier, most parents and students were not convinced of the merits of Integrated and chose Algebra instead. Comments from Algebra parent and student surveys shed light on the reasons they chose Algebra—reasons that go beyond the general factors discussed earlier. The majority of comments from Algebra parents and students pertained to two aspects: a negative reaction to *MiC* mathematics and the traditional, widespread acceptance of algebra.

Algebra Theme 1: MiC Backlash

As with Integrated, several Algebra parents and students made general comments about their desire for instruction that fit with students' preferred ways of learning. For example, 6 parents and 4 students said they chose Algebra because the students did not like working in groups. Additionally, 11 parents and 6 students stated a preference for learning through practice of teacher-given rules. Three parents and 6 students mentioned that Integrated would demand too much explanation of "why," which would pose difficulties for some students with limited English proficiency and for others who simply liked to give the answer. Finally, 17 students said they chose Algebra because they thought it would be confusing to learn mathematics in an *integrated* way and instead preferred focusing on algebra one year, geometry the next, and so on. For example, one student explained, "I wouldn't like all of those mixed things and ideas; I like building up."

Still, by far the most prevalent and passionate comments made by Algebra parents and students were those that pertained to their dislike of *MiC* mathematics instruction. Such comments indicated parents' and students' belief that Integrated mathematics would be similar to *MiC* mathematics. In fact, Plainview mathematics cabinet members anticipated this reaction and even feared that parents and students would reject *Core Plus* solely because of its "Mathematics in Context" subtitle. The cabinet selected *Core Plus* in spite of its name because members believed that it was the most appropriate *Standards*-based high school option available. Whereas dozens of parents and students made general, antireform comments, such as use of the terms "guinea pig" or "fad," 32 parents and 36 students specifically expressed negative views about their experiences with *MiC*-based instruction. (In contrast, fewer than a dozen parents or students made positive comments about *MiC*.) About half of these parents made very general statements, such as "I was not happy with the MIC program and did not want a repeat performance" or "Tired of MIC math—didn't really like it." Those who did offer specifics tended to cite their child's unhappiness and confusion in *MiC*, as well as a lack of emphasis on "basic skills." For example, parents wrote:

> Our child did not like *MiC* math, and it was weak on computation.
>
> *Math in Context* has done more harm than good for 4 out of 4 of my children . . . Time spent on basic facts and concepts is being slighted so that more time can be spent on "real-world" situations that often involve thinking skills considerably above the students' current conceptual ability level and using skills they have not been taught yet.
>
> *MiC* math was totally frustrating to many students and parents. It might have been

> OK for the top elite math students, but not for most students.

Similar to the parents, more than half of students' anti-*MiC* comments stated a general dislike of *MiC* and a belief that *MiC* and Integrated were similar. Here are some typical student comments: "I didn't want to take Integrated because I heard it was a lot like *MiC*math," and "I wanted it to be as different from *MiC* as possible." When students did explain their specific aversion to *MiC*, their complaints varied widely, with some students stating *MiC* was too easy or boring, and others stating it was too confusing or too focused on contexts and explanations. For example, students wrote:

> I was getting confused with the *MiC* math system, and I just like getting problems that I can understand.
>
> *MiC* math was too easy, and I didn't want to take it over.
>
> I prefer learning straight math—I just get annoyed when they try to put it in context —really don't care about the # of Suzy's rugs, etc.
>
> I figured Integrated might be like *MiC* math so I didn't do Integrated. I would rather just do problems without expanding or pondering stuff.

Although this *MiC* backlash was the most prevalent theme among students' and parents' written comments, a second theme was also prominent: the view that algebra is the tried and true standard for high school mathematics.

Algebra Theme 2: Tried and True

Many parents' and students' comments raised issues that stem from the widespread, long-standing acceptance of "Algebra"—both the substance of the course and its name. Despite school administrators' attempts to present the two courses as equal but different "options" (as opposed to "tracks"), 12 parents' and 18 students' written responses suggest that Algebra was viewed as "real" high school mathematics that has stood the test of time. One student wrote, "Algebra is real math. I can use Algebra later in life. It has been used for years and has been successful. My dad is a scientist/mathematician and said Integrated was worthless." Moreover, 16 students indicated that Integrated was less rigorous and more suitable for students not yet ready for Algebra. For example, one student said she chose Algebra because "I wanted to prove that I was smarter than my other friends."

Another student chose Algebra because "I got a good score on the Algebra Aptitude Test." This student was one of several who referred to their scores on this test, which was administered annually to 6th grade students to inform decisions relating to acceleration. These students seemed to assume that a high score on the Algebra Test implied that Algebra was the sensible choice. Additionally, seven students indicated that they had already learned some "algebra" (e. g., at a summer program or with their regular teachers) and therefore wanted to be in "Algebra." For example, one student explained that she chose Algebra because "when we did parts of algebra in math, I really understood and liked it." Hence, just the prevalence of the term "algebra" in the Plainview schools seemed to privilege the Algebra course.

Additionally, 9 parents and 16 students said that family tradition was a factor, preferring the course that parents or older siblings took (in part so that help could be provided at home). For example, one parent wrote that they preferred Algebra for their child "because we took Algebra." Another parent wrote, "Our other older children had taken Algebra." One student explained, "My brother took Algebra, and I thought I'd get help." Furthermore, six Algebra parents mentioned that they might move in the near future and were concerned that Integrated would not match what other schools were doing. For example, one parent wrote, "School officials could not answer the question, 'What happens if my boy moves from Plainview —how would the Integrated math program fit into the other school system?'"

Hence, the Algebra sequence was privileged because of its long-standing status in Plainview schools, as well as in high schools across the nation. The traditional Algebra sequence's long-standing status as a college gatekeeper also shaped parents' and students' views. As explained earlier, more than half of the Algebra parents reported that college concerns influenced their option choice. Parent and student comments revealed that these concerns related to fears both that the content of Integrated instruction would not adequately prepare students for traditional college course work, and that colleges would not recognize the Integrated sequence as valid when evaluating student transcripts. For example, one student wrote, "I wasn't sure if colleges accepted Integrated math, so I decided on Algebra."

All of these comments from Algebra parents and students are rooted in the long-standing, widespread acceptance of "Algebra" in the Plainview schools, as well as across geographical regions and among higher education institutions.

Discussion

The case of Plainview highlights how passionately and persistently many parents and students resist *Standards*-based mathematics instruction, particularly at the secondary level. Despite district leaders' promotion of the Integrated sequence, 82 percent of students and parents chose Algebra.

The fact that the instructional shifts in grades K through 4 received relatively little community attention suggests that Plainview parents were more concerned about instructional shifts in middle and upper grades, where college and career trajectories are at stake. This study has unearthed a variety of factors that highlight the great difficulty of introducing change into the firmly entrenched high school mathematics curriculum.

Barriers to Reform Implementation in Plainview

Parents' beliefs about appropriate secondary mathematics instruction were rooted in their own school experiences, as well as that of their older children. The long-standing history of "Algebra" that permeates various facets of the system has inhibited reform efforts. For example, the district's established Algebra Aptitude Test biased some parents and students toward the Algebra course, just with its name.[27] Even when students or parents believed there were intrinsic benefits of the Integrated curriculum, concerns remained about whether the new course would mesh with mathematics courses in other communities or at colleges. In fact, 45 percent of parents cited college concerns as a major factor in their option choice.

Currently, many mathematics education reformers are hoping that once reforms are implemented, parents' and students' experiences with *Standards*-based instruction will garner their support. This did appear to be true for some of the parents and students who, after having *Standards*-based curricula in grades K through 8, chose Integrated. However, the majority of Plainview parents and students remained unconvinced of the merits of *Standards*-based instruction, and much of their resistance to reform at the high school level appeared to be a reaction against their prior experiences with mathematics reform in grades 5 through 8. Although the primary focus of this article is not Plainview's *MiC* implementation, the district's history with *MiC* is an important contextual factor in its attempts to reform high school instruction, and therefore merits some further consideration here.

Through conversations with district personnel and community members, several hypotheses have emerged regarding why many in this community hold such negative views of *MiC* mathematics. First, the apparent slippage in standardized test scores at the start of *MiC*implementation appears to be one factor. Despite the fact that *MiC*was just beginning to be used in some classrooms at the time the slip in test scores became apparent, and despite the fact that test scores rebounded the following year and have not shown any long-term declines, some parents continue to believe that students do not learn the basics with *MiC* (as mentioned by several parents in this study). Clearly, the drop in test scores received more media attention than their recovery. Additionally, some evidence indicates that a few teachers who were being asked to use *MiC* expressed reservations about the program to parents. This fueled the fire of parental resistance to the curriculum. It needs to be noted that the district was piloting trial versions of *MiC* at the beginning, and this, combined with diverse teachers' attempts to change their teaching, made for some bumpy and uneven implementation that is not necessarily representative of all *MiC* instruction. Additionally, it should be noted that *MiC*is one, and only one, rendition of *Standards*-based curricula and should not be taken to represent all *Standards*-based programs.

Many unanswered questions remain about why, exactly, parents are continuing to resist *Standards*-based instruction in Plainview. The district had greater than average human and capital resources to implement the reforms well. The mathematics teachers received intensive, sustained professional development by the curriculum developers themselves, and have continued to receive professional development in *Standards*-based instruction. Given that parents did not specifically refer to the drop in test scores in their survey responses (but many did talk in general terms about students not learning their “basics”), it is unclear to what extent districtwide scores, parents' beliefs about quality mathematics instruction, or their own children's experiences are driving parents' resistance. Certainly, the resistance in Plainview highlights the difficulties that some districts can face when implementing and sustaining mathematics reform.

SES and Parental Perspectives

In addition to examining overall patterns in choices between Algebra and Integrated mathematics, this study also examined patterns relating to SES. There has been some debate

about whether and how high-SES parents are more engaged with their children's schooling than low-SES parents.[28] On average, Plainview's high-SES parents accessed more information sources than did low-SES parents. For example, more high-SES parents reported that they attended parent meetings, talked with teachers about the mathematics options, and were aware of national trends in mathematics education. However, the low-SES parents were as likely as high-SES parents to report reading about the options in school newsletters, and they were more likely to report that teachers and counselors influenced their decisions. Additionally, parents with no college degree expressed more concern about their child's college preparation than did college-educated parents. In contrast, higher-SES parents seemed more concerned than lower-SES parents about the intrinsic benefits of courses (e.g., student understanding and enjoyment).

These patterns suggest that the low-SES Plainview parents were, indeed, concerned about their children's education, particularly in terms of future career gatekeepers (i.e., college). They also gave attention to information sent home from schools. However, they were less likely than higher-SES parents to seek additional sources of information at the schools (e.g., by attending parent meetings).[29]

Limitations

Limitations of this study include the fact that Plainview has a particular history with mathematics reform that is not representative of all school districts. The issues facing Plainview are certainly similar to those in many other districts, but the presence of a particular context here needs to be considered in generalizing lessons learned to other districts.

Other limitations include the fact that when making their choices, students were not acting independently (e.g., friends influenced some students' course decisions), and therefore patterns in students' course enrollments should be interpreted with care. Additionally, the survey samples involved only those parents and students who were willing to participate. The majority (80 percent) of Integrated parents and students participated in the survey, and therefore the results for those parents could be more reliable than the results for the 50 percent of Algebra parents and students who participated. On the other hand, there were more Algebra parents and students, and therefore the sample of Algebra parents and students was larger than the sample of Integrated students. Comparisons of the sample of survey respondents with the entire population of 600 Algebra I and Integrated I students revealed that the sample was similar to the population in terms of both student gender and percentages of black and Hispanic students. However, the students qualifying for free/reduced lunch were slightly underrepresented among respondents (5 percent in the sample versus 7 percent in the population), and Asian students were overrepresented among respondents (11 percent in the sample versus 6 percent in the population—with Caucasian students correspondingly underrepresented in the sample). Hence, the views expressed by the sample may not be representative of the entire population of Plainview's Algebra I and Integrated I students and parents. Additionally, one should keep in mind that many of the differences reported here as significant at the $p<.05$ level did not meet the more stringent requirement of $p<.0006$, as required by the Bonferroni correction for multiple comparisons. Therefore, significant

differences reported should be interpreted with caution.

Further research is needed in more ethnically diverse districts to examine the role that ethnicity plays in student and parent perspectives on mathematics instruction and reform. Student gender is also an important factor to consider but is beyond the scope of this article.

Conclusion

The case of Plainview challenges the notion that students and parents will be "won over" after several years of *Standards*-based instruction. In Plainview, a significant contingent of parents and students continue to oppose the reforms already in place and do not support efforts to create a viable *Standards*-based option at the high school level. This study highlights the need to gain broad-based support for reforms, but also reveals the difficulty of doing so, given the diversity and deep-rooted nature of parents' and students' beliefs about secondary mathematics instruction, in particular.

A significant portion of parents' and students' resistance to integrated, *Standards*-based mathematics would naturally be addressed if such instruction became more prevalent nationwide. For example, if integrated mathematics became the norm in U.S. high schools, parents' concerns about transferability to other districts and to colleges would diminish.

However, currently changes are occurring in isolated districts with varying degrees of community acceptance. This study suggests some practical strategies districts should consider when implementing *Standards*-based reforms, yet it also raises several critical dilemmas about when and how reform should occur.

Some Strategies for Change

This study provides insights into parents' and students' perspectives on secondary mathematics reform, including how they can vary by SES. Plainview parents, particularly those with limited formal education, were very concerned about their children's preparation for college. Arguments for reform based on students' enjoyment of mathematics, the need for real-world problem-solving skills, or the benefits of student discovery were not compelling to the majority of parents in this study. Districts hoping to reform high school mathematics instruction will need to actively address the perception that algebra is "real" college-preparatory mathematics, and that colleges will not recognize Integrated mathematics. Reformers must provide clear information about ways in which local colleges are handling *Standards*-based mathematics credit.

Many schools hold parent or family math nights to help parents understand, first-hand, the benefits of *Standards*-based instruction. The fact that significantly more Integrated than Algebra parents attended parent nights and discussed options with teachers suggests that the staff's efforts to educate parents regarding the merits of *Core Plus* were not in vain. However, the low-SES parents in this study were more likely to access information through school newsletters than parent nights. Still, this study suggests that teachers can be particularly important influences on the curricular decisions of low-SES families, even though, ironically, the low-SES parents in this study were the least likely to discuss issues directly with teachers.

Teachers and other school personnel should not underestimate the power of their comments to low-SES parents, as well as to low-SES students—this study suggests that such comments can have a substantial impact on the perspectives and decisions of low-SES families.

After having *Standards*-based instruction throughout elementary school, many students argued that they prefer learning in a "straightforward" manner, and that they learn best when teachers explain and provide guided practice. Indeed, the vast majority of students in this study chose traditional instruction, with "understanding" and "enjoyment" often given as reasons for their choice. These findings challenge the rhetoric of reform that suggests that students will experience learning through problem solving as engaging and beneficial.[30] This is not to say that problem-centered instruction did not actually benefit the Plainview middle school students, but rather that many of them did not *perceive* such benefits and instead felt confused and frustrated. These feelings then influenced parents' perceptions of *Standards*-based instruction.

If reforms are to be successful and sustaining, reformers and educators will need to help students and parents see the benefits of reform-based instruction. Making students and parents more aware of the growing pool of evidence regarding the success of *Standards*-based curricula is one step.[31] Still, the majority of Plainview's parents appeared less interested in national test scores and more influenced by their children's and their community's experiences with *MiC* mathematics. The continued perceptions of *MiC* mathematics as harmful, despite several years of test results that do not support that belief, point out the need for districts to ensure that positive test results are publicized as widely and loudly as negative results.

However, concerns about students' actual experiences in *Standards*-based classrooms must also be addressed. Most parents' concerns about *MiC* appeared to be related to their own child's learning experiences, particularly their frustration in *MiC* classrooms. Teachers must make classroom expectations clear for students and parents, so that all understand the student's and teacher's roles in instruction. Issues related to learning through problem solving, including the frustration that can accompany this, should be directly addressed. This would include acknowledging that many students do get frustrated learning in *Standards*-based environments, explaining why some amount of frustration tends to be a necessary part of genuine mathematical activity, and developing strategies for addressing such frustrations.[32] This issue raises the importance of helping teachers become as skilled as possible in implementing *Standards*-based approaches in ways that help students understand and realize the benefits of such approaches.

Dilemmas of Change

Despite the fact that many parents' concerns about high school reform relate to issues of national scope that cannot be addressed by a single school district, many districts are attempting to change their high school mathematics programs. The case of Plainview raises dilemmas about if, when, and how such changes should occur in districts with significant contingents of dissenting parents and teachers. Despite Plainview's considerable efforts to get all parties on board, the fact that some vocal teachers and parents were unhappy when initial change occurred in grades K through 8 has led to a long-standing battle that might have been

avoided if teachers and parents had been offered a choice about elementary instruction, similar to what is now occurring at the high school level.

Yet, choice mechanisms can create not only curricular chaos within schools, but also increased inequality based on SES and race. For example, in the case of Plainview, significantly more higher-SES students are now receiving *Standards*-based high school mathematics instruction, both because of parents' and students' choices and because the lowest-performing students who are not ready for Algebra I in 9th grade are receiving traditional instruction in a slower track. Hence, the choices being offered in Plainview are exacerbating inequalities uncovered by research that indicates that lower-SES students tend to be given didactic instruction, whereas higher-SES students are more often challenged to think critically and solve problems.[33]

However, this study also raises the issue that not all students and parents want mathematics instruction centered around contextualized mathematics problems, group work, and classroom discourse. Despite years of experience with at least one version of such instruction, the majority of Plainview's 600 students and their parents believe secondary students benefit more from traditional instruction. Although much of the mathematics education community currently holds strong beliefs that *Standards*-based instruction is beneficial for all students, the views of parents and students should not be simply written off as naïve. Although recent studies of *Standards*-based instruction are certainly encouraging, continued research is needed to determine if such instruction does, indeed, benefit all students as intended, and whether particular *Standards*-based instructional curricula and strategies (e.g., contextualized problems, group work, whole-class discussion, technology use) are more beneficial for some students than others.

Fullan argues that when schools face opposition to change, this is actually a positive sign that substantial (as opposed to shallow) change is being attempted. However, he also warns that such opposition should be understood and addressed—not ignored. For successful instructional reform to occur, Fullan argues, school leaders must understand and bring coherence to the disparate perspectives of groups both inside and outside of schools.[34]

Clearly this is no easy task for district leaders attempting to reform their mathematics programs. This article sheds light on diverse students' and parents' perspectives on reform-oriented mathematics instruction. Increased understanding of these perspectives can better position administrators and teachers to address community concerns and to implement mathematics instruction that best meets students' needs.

Endnotes

[1] National Council of Teachers of Mathematics, *Curriculum and Evaluation Standards for School Mathematics* (Reston, VA: NCTM, 1989), p. 19.

[2] National Council of Teachers of Mathematics, *Professional Standards for Teaching Mathematics* (Reston, VA: NCTM, 1991); National Council of Teachers of Mathematics, *Principles and Standards for School Mathematics* (Reston, VA: NCTM, 2000).

[3] Zalman Usiskin, "What Changes Should Be Made for the Second Edition of the NCTM

Standards?" *University of Chicago School Mathematics Project Newsletter*(Winter 1993): 6–11.

[4] Michael G. Fullan, "The Three Stories of Education Reform," *Phi Delta Kappan* (April 2000): 581–584.

[5] James S. Braswell, Anthony D. Lutkis, Wendy S. Grigg, Shari L. Santapau, Brenda Tay-Lim, and Matthew Johnson, *The Nation's Report Card: Mathematics 2000 (NCES No. 2001-517)* (Washington, DC: U.S. Department of Education, National Center for Education Statistics, 2001).

[6] Tom Loveless and Paul Diperna, *The Brown Center Report on American Education: How Well Are American Students Learning? Focus on Math Achievement*, vol. 1, no. 1 (Washington, DC: Brookings Institution, 2000), p. 32.

[7] For example, see Julie E. Riordan and Pendred E. Noyce, "The Impact of Two Standards-Based Mathematics Curricula on Student Achievement in Massachusetts," *Journal for Research in Mathematics Education* 32 (July 2001): 368–398; Alan Schoenfeld, "Making Mathematics Work for All Children: Issues of Standards, Testing, and Equity," *Educational Researcher* 1 (2002): 13–25.

[8] Because of the field test results, the *Core Plus* developers increased their emphasis on symbol manipulation in the published materials. For more information about the curriculum, see Arthur F. Coxford, James T. Fey, Christian R. Hirsch, Harold L. Schoen, Gail Burrill, Eric W. Hart, Brian A. Keller, Ann E. Watkins, with Mary Jo Messenger, Beth E. Ritsema, and Rebecca K. Walker, *Contemporary Mathematics in Context: A Unified Approach, Course 1, Course 2, Course 3, and Course 4* (Chicago: Everyday Learning Corporation, 1997, 1998, 1999, 2001). Studies on the *Core Plus* field tests include the following: Mary Ann Huntley, Chris L. Rasmussen, Roberto S. Villarubi, Jaruwan Sangtong, and James T. Fey, "Effects of Standards-Based Mathematics Education: A Study of the Core-Plus Mathematics Project Algebra and Functions Strand," *Journal for Research in Mathematics Education* 31 (May 2000): 328–361; Harold L. Schoen and Christian R. Hirsch, "The Core-Plus Mathematics Project: Perspectives and Student Achievement," in Sharon L. Senk and Denisse R. Thompson, eds., *Standards-Oriented School Mathematics Curricula: What Does the Research Say About Student Outcomes?* (Hillsdale, NJ: Lawrence Earlbaum Associates, Inc., in press); Harold L. Schoen and Johnette Pritchett, "Students' Perceptions and Attitudes in a Standards-Based High School Mathematics Curriculum" (paper presented at the 1998 annual meeting of the American Educational Research Association, San Diego, 1998).

[9] Jack Price, "President's Report: Building Bridges of Mathematical Understanding for All Children," *Journal for Research in Mathematics Education* 27 (1996): 606.

[10] Dominic Peressini, "Parental Involvement in the Reform of Mathematics Education," *The Mathematics Teacher* 90 (1997): 426.

[11] Dominic Peressini, "The Portrayal of Parents in the School Mathematics Reform Literature: Locating the Context for Parental Involvement," *Journal for Research in Mathematics Education* 29 (1998): 555–582.

[12] For more on the backlash in California, see Suzanne Wilson, *California Dreaming: Reforming Mathematics Education* (New Haven, CT: Yale University Press, 2002).

[13] Michael G. Fullan and Matthew B. Miles, "Getting Reform Right: What Works and What Doesn't," *Phi Delta Kappan* (June 1992): 745–752.

[14] Ibid.: 748.

[15] Margaret Meyer, Mary Delagardelle, and James A. Middleton, "Addressing Parents' Concerns over Curriculum Reform," *Educational Leadership* 53 (April 1996): 54–57.

[16] Annette Lareau, *Home Advantage: Social Class and Parental Intervention in Elementary Education* (Philadelphia, PA: Falmer Press, 1989).

[17] Daniel J. McGrath and Peter J. Kuriloff, "The Perils of Parent Involvement: Tracking, Curriculum, and Resource Distortions in a Middle School Mathematics Program," *Research in Middle Level Education Quarterly* 22 (Spring 1999): 59–83. Richard Rothstein, Martin Carnoy, and Luis Benveniste, *Can Public Schools Learn from Private Schools?* (Washington, DC: Economic Policy Institute and the Aspen Institute, 1999).

[18] One study did examine SES in relation to parents' reactions to science and mathematics curricular reform in general. This study indicated that higher-SES parents resisted reforms more than lower-SES parents. See Ronald Anderson, "Curriculum Reform: Dilemmas and Promise," *Phi Delta Kappan* 77 (September 1995): 33–36.

[19] Douglas B. McLeod, "Research on Affect in Mathematics Education: A Reconceptualization," in *Handbook of Research on Mathematics Teaching and Learning*, ed. Doug Grouws (New York: MacMillan, 1992), pp. 575–596.

[20] Jack Smith and Jon Star, "Students' Experiences Moving Between Traditional and Reform Curricula: What Are the Implications for K-16 Mathematics Education?" (paper presented at the National Council of Teachers of Mathematics Research presession, Las Vegas, 2002).

[21] Sarah T. Lubienski, "Problem Solving as a Means Toward Mathematics for All: An Exploratory Look Through a Class Lens," *Journal for Research in Mathematics Education* 31 (2000): 454–482.

[22] In fact, the national *MiC* implementation coordinators publicized Plainview's efforts so that other districts might learn from its work with parents. See Margaret Meyer, Mary Delagardelle, and James A. Middleton, "Addressing Parents' Concerns over Curriculum Reform," *Educational Leadership* 53 (April 1996): 54–57.

[23] It is important to note that some Plainview high school students take a slower-paced Algebra I course, and these students were not involved in this study because they are not offered the Integrated option.

[24] The highest education level of either parent in the household is commonly used as a primary SES indicator. For example, this method is used by the National Assessment of Educational Progress—see Department of Education, National Center for Education Statistics, *The Condition of Education, 2002* (NCES 2002-025) (Washington, DC: U.S. Government Printing Office, 2002).

[25] Specifically, disproportionate numbers of low-SES high school students opted to take the slower-paced Algebra I course, which had no Integrated alternative.

[26] Differences in Integrated versus Algebra students' responses of "real life" and "understanding" were significant even after the Bonferroni correction ($p<.0006$).

[27] Additionally, as one reviewer of this manuscript suggested, it is possible that the term "integrated mathematics," itself, conjured up notions of "general mathematics," which has typically been a low-level course taken by students not ready for algebra.

[28] Gerald W. Bracey, "SES and Involvement," *Phi Delta Kappan* 78 (October 1996): 169–170.

[29] Other authors have described barriers to school involvement that low-SES parents can face, such as feeling awkward in schools and having difficulty obtaining child care and transportation. For example, see Annette Lareau, *Home Advantage: Social Class and Parental Intervention in Elementary Education* (Philadelphia, PA: Falmer Press, 1989).

[30] National Council of Teachers of Mathematics, *Curriculum and Evaluation Standards for School Mathematics* (Reston, VA: NCTM, 1989); National Council of Teachers of Mathematics, *Professional Standards for Teaching Mathematics* (Reston, VA: NCTM, 1991); National Council of Teachers of Mathematics, *Principles and Standards for School Mathematics* (Reston, VA: NCTM, 2000).

[31] For example, Thomas Romberg, Mary Shafer, and Norman Webb report positive results of *MiC* implementation in *Study of the Impact of Mathematics in Context on Student Achievement* (Madison, WI: Wisconsin Center for Education Research, 2000). Other studies have also reported positive results of *Standards*-based curricula, including Julie E. Riordan and Pendred E. Noyce, "The Impact of Two Standards-Based Mathematics Curricula on Student Achievement in Massachusetts," *Journal for Research in Mathematics Education* 32 (2001): 368–398; Alan Schoenfeld, "Making Mathematics Work for All Children: Issues of Standards, Testing, and Equity," *Educational Researcher* 31 (2002): 13–25; and Sharon Senk and Denisse R. Thompson, eds., *Standards-Oriented School Mathematics Curricula: What Does the Research Say About Student Outcomes?* (Hillsdale, NJ: Lawrence Earlbaum Associates, Inc., in press).

[32] Examples of such strategies include creating support structures (e.g., teacher tutoring times, peer study groups) to help students complete homework, as well as establishing grading policies that reward students for clearly describing their confusion and the strategies they attempted when stuck on a particular mathematics problem (as opposed to rewarding only complete solutions).

[33] Jean Anyon, "Social Class and School Knowledge," *Curriculum Inquiry* 11 (1981): 3–42.

[34] Michael G. Fullan, "The Three Stories of Education Reform," *Phi Delta Kappan* (April 2000): 581–584.

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